Cascadia Associates, LLC

February 14, 2020

Mr. Craig Rankine, Site Manager
Department of Ecology
12121 NE 99th Street, Suite 2100
Vancouver, Washington 98682

Subject: **Submittal of Second Semi-Annual 2019 Groundwater Monitoring Report**
NuStar Vancouver Facility
Vancouver, Washington
0060-002-004

Dear Mr. Rankine:

Enclosed, please find the *Semi-Annual Groundwater Monitoring Report: July through December 2019.* The report was prepared on behalf of NuStar Terminals Services, Inc. (NuStar) by Cascadia Associates, LLC (Cascadia) and presents data collected from July through December 2019.

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

Sincerely,

Stephanie Bosze Salisbury

Stephanie Bosze Salisbury, L.G.
Senior Associate Geologist

ENCLOSURE

Semi-Annual Groundwater Monitoring Report July through December 2019 (2 hard copies)

cc: Mr. Joe Aldridge, NuStar Energy, L.P. (electronic deliverable)
Ms. Patty Boyden, Port of Vancouver (electronic deliverable)
Mr. Richard Roché, Parametrix (electronic deliverable)
Mr. R.J. Sherman, P.G., Kinder Morgan (electronic deliverable)

Semi-Annual Groundwater Monitoring Report – July through December 2019

NuStar Vancouver Facility

2565 NW Harborside Drive, Port of Vancouver

Vancouver, Washington

Prepared for:

NuStar Terminals Services, Inc.

Prepared by:

Cascadia Associates, LLC
5820 SW Kelly Avenue, Suite B
Portland, Oregon 97239

Project No. 0060-002-004
February 14, 2020

Semi-Annual Groundwater Monitoring Report – July through December 2019

NuStar Vancouver Facility

2565 NW Harborside Drive, Port of Vancouver

Vancouver, Washington

Prepared for:

NuStar Terminals Services, Inc.
Project No. 0060-002-004
February 14, 2020

Prepared by:

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CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This semi-annual groundwater monitoring report was prepared by Cascadia Associates, LLC (Cascadia) on behalf of NuStar Terminals Services, Inc. (NuStar) for the NuStar Vancouver Facility (Facility) in Vancouver, Washington (Figure 1). This report presents the results of the groundwater monitoring activities completed at the Facility during the third and fourth quarters of 2019. Additionally, the report includes a summary and evaluation of interim action monitoring data for the reporting period.

The Facility is located at the Port of Vancouver (POV) Terminal No. 2 in Vancouver, Washington (Figure 1). The Facility Site Plan is shown on Figure 2. The property address is 2565 NW Harborside Drive, Port of Vancouver, Vancouver, Washington 98660 (Latitude: N45° 38.26', Longitude: W122° 42.20'). The property is owned by the POV and leased by NuStar; the current extent of the leasehold is shown on Figure 2. The Facility is on the north shore of the Columbia River. Land adjacent to the Terminal is industrial property also owned by the POV. The Facility is approximately 19 acres in size located on Clark County Tax Lot Nos.: 151979-000, 502010-002, 502010-000, and a portion of 502020-000, as well as a portion of the Washington Department of Natural Resources tideland area managed by the POV.

2.0 GROUNDWATER MONITORING FIELD ACTIVITIES

The groundwater monitoring was performed in general accordance with the *Groundwater Monitoring Plan* (GWMP; Ash Creek, 2008), which was approved by the Washington State Department of Ecology (Ecology) in a letter to NuStar dated July 30, 2009. The monitoring program for the third and fourth quarters of 2019 is summarized in Table 1.

Two monitoring events were conducted during this period: the third quarter 2019 groundwater monitoring event was conducted from September 23 through 27, 2019, and the fourth quarter 2019 event was conducted from December 2 through 5, 2019.

During the fourth quarter 2018 monitoring event, bentonite was observed in the well casing of monitoring well EX-1, indicating a compromise within the well casing. Well EX-1 has not been sampled since that time. Abandonment and replacement of well EX-1 was proposed in the *Well Decommissioning, Well Installation, and Well Monument Replacement Work Plan* that was submitted to Ecology on May 17, 2019 (Cascadia, 2019). Well EX-1 was decommissioned during third quarter 2019. A replacement well for well EX-1 will be installed adjacent to the previous location in early 2020. Well decommissioning and related future activities are described in further detail in Section 6.0.

2.1 WATER LEVEL MEASUREMENTS

Third quarter 2019 groundwater levels were measured on September 23, 2019, and fourth quarter 2019 groundwater levels were measured on December 2, 2019. Monitoring well locations are

shown on Figure 2. Depth to groundwater and groundwater elevation data are summarized in Table 2. The wells are screened in three different groundwater zones: Shallow, Intermediate, and Deep as defined in the Remedial Investigation report for the Facility (Apex, 2013). The depth to groundwater was measured at Facility monitoring wells, multi-level groundwater monitoring (MGMS) wells, and selected off-site wells (MW-14, MW-17, MW-23i, MW-25i, MW-26, MW-F, S-1, and S-2).

2.2 MONITORING WELL SAMPLING AND ANALYSIS

The sampling and analysis program for third and fourth quarter 2019 is summarized in Table 1. Groundwater monitoring data sheets for the sampling events are included in Appendix A. For quality assurance/quality control (QA/QC), field blanks and equipment blanks were prepared, and sample duplicates were collected from wells MW-7, MW-12, MW-19, and MGMS3-40 during third and fourth quarter 2019 sampling events.

For both sampling events, the samples were uniquely labeled, stored in insulated coolers with ice, and transported under chain-of-custody protocol to Apex Laboratories of Tigard, Oregon, for laboratory analysis. Samples were analyzed for halogenated volatile organic compounds (HVOCs) by U.S. Environmental Protection Agency (EPA) Method 8260B. Select samples were analyzed for total organic carbon (TOC) by SIM 5010C. Groundwater analytical results for both events are shown in Table 3. Historical data are tabulated in Appendix B.

The terminal currently handles and distributes bulk fertilizer products, primarily urea but also mono-ammonium phosphate. Urea cannot be directly measured in water but can be estimated by analysis of the primary urea constituents: ammonia, nitrate, and nitrite. To evaluate for urea in groundwater during the third and fourth quarter 2019 monitoring events, facility monitoring wells were sampled for nitrate as nitrogen and nitrite as nitrogen by EPA Method 300.0 and ammonia as nitrogen by EPA Method 350.1.

Samples from select wells were also analyzed for ethene, ethane, and methane to assist in evaluating remedial parameters. Apex Laboratories subcontracted to Air Technology Laboratories of City of Industry, California, using chain-of-custody protocols, for laboratory analysis of ethene, ethane, and methane by RSK 175.

3.0 GROUNDWATER ELEVATIONS

Groundwater elevations and estimated elevation contours for the Shallow and Intermediate Zone wells for the third quarter 2019 are shown on Figures 3 and 4, respectively. Groundwater elevations and estimated elevation contours for the Shallow and Intermediate Zone wells for the fourth quarter 2019 are shown on Figures 5 and 6, respectively.

3.1 THIRD QUARTER 2019

Shallow Zone. On September 23, 2019, depth-to-groundwater measurements were made at Shallow Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. The observed depths to groundwater in these wells ranged from 27.54 to 34.22 feet below the top of casing (BTOC), and the corresponding groundwater elevations in these wells ranged from 2.84 to 5.93 feet above mean sea level (MSL; Table 2).

During the third quarter 2019 monitoring event, gauging of the Shallow Zone wells was completed between 9:26 AM and 3:00 PM. During that time interval, the water level in the adjacent Columbia River increased by 1.7 feet. River stage data were obtained from the nearest National Oceanographic and Atmospheric Administration (NOAA) tide station (Columbia River – Vancouver), which is located approximately 0.5 mile upstream of the Facility.

As shown in Table 2, groundwater elevations on average were 5 feet lower in September 2019 than during the previous monitoring event in May 2019. During the third quarter 2019 gauging event, groundwater elevations in the Shallow Zone were variable, with groundwater highs in the northwest and southeastern corners of the terminal, near wells MW-10 and MW-6, respectively (Figure 3). Between wells MW-10 and MW-6, there was a northwest to southeasterly groundwater divide; to the south/southwest of the divide, groundwater flow was to the river; and to the north/northeast of the divide, groundwater flow was away from the river to the east/northeast.

Intermediate Zone. On September 23, 2019, depth-to-groundwater measurements were made at Intermediate Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. Groundwater levels in Intermediate Zone wells were measured during a predicted tidal inflection to minimize the magnitude of tidal influence on water levels during the gauging event. Water levels were measured from Intermediate Zone wells between 9:16 AM and 12:29 PM on September 23, 2019. During the time interval in which Intermediate Zone wells were gauged, water levels in the adjacent Columbia River increased by 1.4 feet.

During the September 23, 2019 water level measurements, the observed depths to groundwater in the Intermediate Zone wells ranged from 28.39 to 31.45 feet BTOC, and groundwater elevations in these wells ranged from 2.72 to 3.32 feet above MSL (Table 2). As shown in Table 2, groundwater elevations in the Intermediate Zone were approximately 6 feet lower in September 2019 than during the previous monitoring event in May 2019. During the September 2019 gauging event, groundwater was relatively flat, with a slight inland gradient (Figure 4).

Deep Zone. Depth to groundwater was measured in well MW-24d, which is screened from 210 to 230 feet below ground surface (bgs), within the Troutdale Formation. Depth to water in well MW-24d was 29.74 feet BTOC, corresponding to an elevation of 4.17 feet above MSL. A groundwater potentiometric map was not prepared for Deep Zone groundwater.

3.2 FOURTH QUARTER 2019

Shallow Zone. On December 2, 2019, depth-to-groundwater measurements were made at Shallow Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. The observed depths to groundwater in these wells ranged from 26.45 to 33.86 feet BTOC, with groundwater elevations ranging from 4.37 to 6.04 feet above MSL (Table 2).

During the fourth quarter 2019 monitoring event, gauging of the Shallow Zone wells was completed between 9:37 AM and 1:11 PM. During the gauging activities, the water level in the adjacent Columbia River decreased by 0.8 foot. As shown in Table 2, groundwater elevations on average were around 1 foot higher in December 2019 than the previous gauging event in September 2019.

A northwest to southeast trending groundwater divide was observed in the western and central portion of the property, with a groundwater high in the vicinity of well MW-10 and an approximate northwest to southeast groundwater divide across the property, as shown on Figure 5.

Intermediate Zone. During the December 2, 2019 gauging event, depth-to-groundwater was measured in Intermediate Zone wells between 10:08 AM and 11:48 AM. During the December 2, 2019 gauging event, water levels in the adjacent Columbia River increased by 0.3 foot. The observed depths to groundwater in Intermediate Zone wells ranged from 26.45 to 29.36 feet BTOC, and groundwater elevations in these wells ranged from 4.81 to 5.71 feet above MSL (Table 2). As shown in Table 2, groundwater elevations on average were around 2 feet higher in December 2019 than the previous monitoring event in September 2019. During the December 2, 2019 gauging event, groundwater flow was relatively flat, with an isolated groundwater high around well S-1, in the southwest portion of the Facility (Figure 6).

Deep Zone. Depth to water in Deep Zone well MW-24d was 28.70 feet BTOC, corresponding to an elevation of 5.21 feet above MSL (Table 2).

4.0 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Complete copies of the laboratory reports for the third and fourth quarter 2019 groundwater monitoring events, including the quality assurance evaluation report and chain-of-custody documentation, are included in Appendix C.

4.1 THIRD QUARTER 2019

The September 2019 monitoring program included the collection of groundwater samples from the wells identified in Table 1. Groundwater samples from these wells were analyzed for HVOCs, nitrate as nitrogen, nitrite as nitrogen, and ammonia as nitrogen. The HVOC and nitrate/nitrite/ammonia results for third quarter 2019 are summarized in Tables 3 and 4, respectively; VOC data are shown on Figure 7, and nitrate and ammonia results are shown on Figure 8.

4.2 FOURTH QUARTER 2019

The December 2019 monitoring program included the collection of groundwater samples from the wells as shown in Table 1. These wells were analyzed for HVOCs, nitrate as nitrogen, nitrite as nitrogen, and ammonia as nitrogen. The sample results for fourth quarter 2019 are summarized in Tables 3 and 4; VOC data are shown on Figure 9, and nitrate and ammonia results are shown on Figure 10.

4.3 EVALUATION OF RESULTS

VOC concentration trend plots for each monitoring well are provided in Appendix D. Monitoring results demonstrate decreasing VOC concentration trends in Shallow and Intermediate Zone groundwater in 30 of 33 monitoring wells. VOC concentration trends were slightly increasing for trichloroethene (TCE) in wells MW-17, MW-19, and MGMS3-132 and tetrachloroethene (PCE) in wells MW-17 and MGMS3-132. The concentrations of PCE and TCE in wells MW-17 and MGMS3-132 have consistently been variable and relatively low (i.e., PCE ranging from less than 1 microgram per liter [µg/L] to 16.3 µg/L for MGMS3-132 and TCE ranging from less than 0.5 µg/L to 28.2 µg/L for MW-17); therefore, it is difficult to identify a discernable concentration trend for the wells. While concentrations of PCE have declined in well MW-19, concentration trends for TCE have been predominately stable to slightly increasing. The increase in TCE may be the result of the conversion of chlorinated hydrocarbon mass from PCE to TCE during reductive dechlorination. A discussion of reductive dechlorination and total molar ethene mass is discussed in Section 5.3.

Ammonia, nitrate and nitrite results are provided in Table 4 and on Figures 8 and 10. The highest concentrations of ammonia and nitrate were found in the western area of the property in Shallow Zone groundwater. Concentrations of ammonia and nitrate in the Intermediate Zone groundwater were more similar throughout the Facility, with slightly higher concentrations being found in localized areas in the center on the Facility. Fertilizer products have historically been stored at the Facility, although the specific products and storage areas have changed over time. Historical fertilizer handling operations ceased in late August 2008. The Facility obtained a new contract in 2014, and, at that time, resumed fertilizer handling and distribution processes. Historical nitrate results are also provided in Table 4. For wells in which historical data are available, the concentrations of nitrate and ammonia in September and December 2019 are generally similar to or less than historical results, with one exception. Ammonia in groundwater from well MW-21i-105 increased from 0.0645 milligrams per liter (mg/L) in 2008 to 13 mg/L by 2018 and has fluctuated between 0.4 to 49.6 mg/L in 2018 and 2019. Ammonia in well EX-1 also appears to have increased between 2007 and 2018; however, as described in Section 2.0, EX-1 has not been able to be sampled since fourth quarter 2018. A Supplemental Remedial Investigation is currently being implemented to further assess the nature and extent of ammonia, nitrates, and nitrites at the Facility.

5.0 INTERIM ACTION MEASURE ACTIVITIES

Several interim actions have been implemented at the Facility, as listed below.

- Between 2000 and 2005, a remediation system operated at the Facility that included (1) a re-circulating system to treat groundwater and (2) vapor extraction to treat soil. The interim action system pumped groundwater from extraction wells installed near the river, treated the pumped water with potassium permanganate, and then filtered and pumped the water into a series of injection wells along the railroad tracks. For soil, a soil vapor extraction (SVE) system withdrew soil vapors from wells IW-1, IN-2, IN-3, IN-4, EX-1, EX-3, EX-4, and EX-5. This SVE system was inactivated in 2005 because it no longer was removing significant VOC mass.

- Bioremediation injections for remediation of Facility groundwater and the installation of an SVE system for the remediation of VOCs in vadose-zone soils was completed in the spring/summer of 2008. These activities are herein referred to as the 2008 interim action. This SVE system has been operating since 2008.

- The SVE system was expanded and additional bioremediation injections were completed during the summer of 2011, which is referred to herein as the 2011 interim action. Details of the 2008 and 2011 interim actions are provided in the Interim Action Installation Report (Ash Creek, 2009b) and the 2011 Interim Action Evaluation Report (Ash Creek, 2012), respectively.

- Additional bioremediation injections were completed in 2016 adjacent to the seawall at the Facility in accordance with the 2015 Interim Action Work Plan (Apex, 2016). This work is referred to as the 2016 interim action. The Interim Action Summary Report (Apex, 2017) describes the scope and preliminary results of the 2016 interim action.

The 2008, 2011, and 2016 interim actions and results to date are described in the following subsections.

5.1 SUMMARY OF 2008 AND 2011 INTERIM ACTIONS

The 2008 interim action consisted of SVE in the vadose zone and enhanced anaerobic bioremediation of the Shallow Zone groundwater. The 2008 enhanced bioremediation locations and the SVE system layout are shown in Appendix E. The 2008 SVE system removed approximately 3,150 pounds of VOCs between startup in September 2008 and the expansion in 2011. The mass removal rate at startup in 2008 was 58.8 pounds per day (lbs/day). The removal rate decreased to an average of 1.7 lbs/day by the third quarter of 2011. Historical monitoring tables and a mass removal chart are provided in Appendix E.

A soil and groundwater investigation in 2010 indicated that the 2008 interim action had reduced VOCs in vadose-zone soils by 90 percent for PCE and 98 percent for TCE and had reduced total molar ethene concentrations in source area groundwater by 77 percent (Ash Creek, 2011). The

investigation results were summarized in an appendix to the *2011 Interim Action Work Plan* (Work Plan; Ash Creek, 2011) that was submitted to Ecology on March 25, 2011. The Work Plan included a proposal for the expansion of the SVE system to include 17 additional SVE well locations, additional bioremediation injections in the 2008 interim action area, and bioremediation injections in an expanded interim action area. On May 23, 2011, Ecology approved the Work Plan. The bioinjection activities were conducted from July 21 through August 31, 2011, and the SVE installation activities were conducted from August 2 through 5, 2011, and August 29 through October 3, 2011. The 2008 and 2011 bioremediation injection locations are shown on Figure 11.

The initial Facility SVE system installed in 2008, herein referred to as the 2008 SVE system, was comprised of 17 wells, divided among five branches, which were connected by a network of underground piping as shown on drawings provided in Appendix E. As part of the 2011 SVE system expansion, Branches 4 and 5 were disconnected from the other system branches and were connected to a new blower unit located approximately 150 feet to the northeast of the railroad tracks (Figure 13). The wells and piping associated with Branches 4 and 5 and the associated blower unit are herein referred to as the "North System".

In August 2011, 17 additional SVE well pairs (for a total of 34 additional SVE wells) were installed within and to the south of Warehouse No. 13 (a.k.a. the Butler Building), in general accordance with the *2011 Interim Action Work Plan* (Ash Creek, 2011; Figure 13). For each well pair, one well is screened in vadose-zone soils from 10 to 15 feet bgs and the second well is screened in vadose-zone soils from 15 to 25 feet bgs. These 17 well pairs, along with the Branch 1 through 3 wells from the 2008 SVE system, are piped underground to a blower unit located outside of the southeast corner of Warehouse No. 13. These SVE wells, associated underground piping, and the blower unit are herein referred to as the "South System".

5.2 SUMMARY OF 2016 INTERIM ACTION

NuStar and the POV submitted a joint Feasibility Study (FS) to Ecology in March 2014 (Apex and Parametrix, 2014). To avoid potential delays in groundwater treatment while working through the FS and the associated regulatory approval process, NuStar proposed to implement a portion of the recommended remedial action for the NuStar source area as an interim action. The details of the proposed interim action were submitted to Ecology in an *Interim Action Work Plan* on September 15, 2015. After a 30-day public comment period from May 12 to June 10, 2016, the work plan was approved on June 14, 2016. The interim action consisted of bioremediation injections along the southern portion of the NuStar terminal near the seawall. Per Ecology's request, the interim action also included baseline sediment and surface water sampling in the Columbia River. Additionally, enhanced bioremediation injections were implemented in an isolated area to the northwest of the NuStar terminal (the "Northwest [NW] Area") which has been less responsive to monitored natural attenuation than at the NuStar terminal. The NW Area bioremediation injections were completed as a joint project between NuStar and the POV.

The NW Area injections were completed in July 2016 and included the injection of 52,000 gallons of bioremediation oil substrate (EosPro; diluted with water) into the shallow zone groundwater through 30 boreholes in the vicinity of and between (NuStar) monitoring wells MW-14 and MW-26. Figure 12 illustrates the approximate boring locations in the NW Area. The same substrate material was injected at the NuStar terminal in August and September 2016 and included the injection of 100,000 gallons of EosPro (diluted with water) into 72 borings along the southern portion of the Facility, adjacent to the seawall. Figure 12 identifies the approximate locations of the injection borings near the NuStar seawall. In accordance with the approved *Interim Action Work Plan*, a summary of the groundwater injection and surface/water sampling activities was provided to Ecology in an *Interim Action Summary Report* on June 29, 2017 (Apex, 2017). The report included the results of the baseline surface water and sediment sampling as well as the results of two quarters of post interim action groundwater monitoring. A brief evaluation of the groundwater monitoring results from the interim action area is summarized in Section 5.3 below.

5.3 INTERIM ACTION MONITORING AND EVALUATION

This section summarizes the scope and results of groundwater monitoring that has been performed to evaluate the effectiveness of interim actions. Effectiveness is evaluated by reviewing HVOC and ethene concentration trends and TOC concentrations in groundwater. Effectiveness of the SVE system is evaluated based on the mass removal rate.

5.3.1 Enhanced Bioremediation Injections

Groundwater samples collected from wells MP-1, MW-12, MW-13, MW-14, MW-19, MW-24i, MW-26, MGMS1-43, MGMS2-40, and MGMS3-43 during the third and fourth quarter 2019 events were analyzed for TOC by EPA Method 5310 D and ethene by EPA Method RSK-175M, to evaluate the performance of the bioremediation injections.

In addition to the laboratory analysis of groundwater samples, field measurements of oxidation-reduction potential (ORP) and dissolved oxygen (DO) were collected from the monitoring wells during the third and fourth quarter 2019 monitoring events. Table 5 shows the results of interim action groundwater monitoring from the February 2007 baseline event through the fourth quarter 2019 monitoring event. Wells MW-24i and MGMS2-40 are not located within the 2008 interim action injection area but are located within the footprint of the 2011 and 2016 interim action areas; therefore, interim action monitoring data for these wells are presented from the second quarter 2011 baseline event through fourth quarter 2019. Wells MW-13, MW-14, MW-19, MW-26, MGMS-1, and MGMS-3 are not located within the 2008 or 2011 interim action areas but are within the 2016 interim action area; therefore, monitoring data for those wells are presented from September 2016 through December 2019.

A discussion of reductive dechlorination of VOCs in groundwater from prior to the 2008 interim action through fourth quarter 2019 is provided below.

5.3.1.1 VOC Concentrations Evaluation

Bioremediation injections in the primary source area at the Facility were initiated in 2008 and expanded in 2011[1]; bioremediation injections along the riverbank and in the NW Area were completed in 2016. Additionally, seven injection boreholes were advanced in 2016 in the area of wells MP-1 and EX-1, located on the western side of the (former) primary source area. The following paragraphs evaluate the results to date in each of these areas.

Primary Source Area. Concentration trend plots for PCE, TCE, total dichloroethene (DCE), and vinyl chloride (VC) in 2008/2011 interim action area wells MW-7, EX-1, MP-1, and MGMS2-40 are provided in Appendix F. VOC data are included from the baseline monitoring event that was completed prior to the 2008 interim action (first quarter 2007; second quarter 2007 for well MGMS2-40) through December 2019. As described in Section 2.0, monitoring well EX-1 was not able to be sampled since the fourth quarter 2018, but results through the fourth quarter 2018 monitoring event were included. The concentrations of PCE and TCE have decreased in each well. The concentrations of PCE and TCE in wells MW-7, EX-1, and MGMS2-40 have been reduced by more than 90 percent since the interim measures were initiated. The concentrations of PCE and TCE in well MP-1 have decreased by approximately 80 percent and 85 percent, respectively, between the February 2007 baseline event and the December 2019 monitoring event.

Another indicator of effective treatment of chlorinated ethenes is a decrease in the total molar chloroethene concentration (the molar concentration of PCE, TCE, DCE, and VC combined). The use of total molar concentrations allows an assessment of changes in the total number of related contaminant molecules as the reductive dechlorination process transitions from the relatively heavy PCE to the progressively lighter TCE, DCE, and VC. Molar concentration trend plots for wells MW-7, EX-1, MP-1, and MGMS2-40 are provided in Appendix F. Between the February 2007 baseline event and the December 2019 monitoring event, total molar concentrations in wells MP-1, MW-7 and MGMS2-40 decreased between 84 percent (well MP-1) to over 99 percent (well MW-7). Between the February 2007 baseline event and the December 2018 monitoring event, total molar concentrations in well EX-1 decreased over 99 percent.

Riverbank Area. Wells MW-12, MW-13, MW-19, MGMS1-43, and MGMS3-40 are located within the 2016 riverbank interim action area and, therefore, are useful for evaluating the effectiveness of the 2016 interim action. Concentration trend plots for PCE, TCE, DCE, and VC in these wells are provided in Appendix F. As shown on the trend plots, monitoring results from the 2016 interim action area indicate reductions in concentrations of PCE and TCE of over 98 percent in groundwater from wells MW-12, MW-13, and MGMS3-40 after the 2016 enhanced bioremediation injections. For example, concentrations of PCE and TCE in well MW-13 in June 2016, prior to the injection event, were 2,470 and 1,820 µg/L, respectively. By December 2019, neither PCE nor TCE was detected at concentrations above the detection limit (0.400 µg/L) in well MW-13. DCE concentrations have also

[1] The description of the primary source area or "source area" is detailed in the Remedial Investigation Report (Ash Creek, 2009a); the location is identified on Figure 2 of this report.

decreased. The DCE concentrations in wells MW-12, MW-13, and MGMS3-40 have all been reduced by greater than 98 percent; concentrations of DCE in well MGMS1-43 have decreased by approximately 80 percent. Unlike wells MW-12 and MW-13, VOC concentrations in well MW-19 have not shown a response to the 2016 oil injections. Well MW-19 is in an area of consistently flat groundwater gradient, and it appears based on the TOC readings from this well (see Table 5) that the oil substrate did not reach the area of this well. However, the presence of VC and ethene in the groundwater samples from the well support that reductive dechlorination is occurring near the well.

The third and fourth quarter 2019 results showed a continued decrease of ethenes in most of the riverbank wells suggesting that the oil substrate is rapidly becoming depleted, and enhanced reductive dechlorination has slowed significantly in response. Additional discussion of ethene production is provided in the sections below. Future quarterly monitoring will be utilized to further evaluate these concentration trends, both in the Shallow Zone source area as well as outside of the source area treatment zone and in Intermediate Zone groundwater.

Northwest Area. Wells MW-14 and MW-26 are located within the 2016 NW Area interim action area and, therefore, are useful for evaluating the effectiveness of the interim action in this area. Concentration trend plots for PCE, TCE, DCE, and VC in these wells are provided in Appendix F. Response to the 2016 interim action injections was delayed and reduced in these wells, likely due to the typically flat or north/northwest groundwater gradient slowing the spread of the oil substrate. However, average concentrations of PCE and TCE pre-2016 injections remain higher than average concentrations post-2016 injections for MW-14 and MW-26, indicating that although injections were not as effective in the NW Area, there still has been moderate success at decreasing concentrations. These wells are located on the periphery of the injection area, limiting their utility in monitoring the effectiveness of the injections. Continued quarterly groundwater monitoring will be conducted to further evaluate concentration trends.

5.3.1.2 Ethene Evaluation

Ethene is an end product of the reductive dechlorination process. The detection of ethene confirms the completion of the reductive dechlorination pathway and the destruction of the target VOCs at the Facility. Ethene degrades quickly in most natural environments; therefore, observing increases in ethene concentration can be difficult. During the second semi-annual 2019 monitoring period, ethene was detected in five of the eleven 2016 interim action area monitoring wells sampled (MW-12, MW-19, MW-24i, MGMS2-40, and MGMS3-40). Further discussion of ethene results is provided below.

Primary Source Area. While the focus of the 2016 interim actions was not located in the area historically identified as the "primary source area", there was some overlap between the 2008/2011 interim action injection areas and the 2016 interim action injection area, namely in the vicinity of wells MP-1 and EX-1. Concentrations of ethene in well MP-1 reached a maximum of 328 µg/L in March 2017, decreased to 83.2 µg/L in June 2017, and then decreased to below reporting limits (1.0 to 13 µg/L) in all samples collected since then (September 2017 through December 2019). These

data suggest that the 2016 bioremediation substrate injected near well MP-1 was effective for stimulating reductive dechlorination; however, the mass of substrate may be diminished.

Ethene has been detected in well EX-1, with the highest concentration measured in June 2018 (99.2 µg/L). In the September 2018 monitoring event, ethene was detected an order of magnitude lower (2.9 µg/L) and not detected in well EX-1 during the December 2018 monitoring event. As described in Section 2.0, well EX-1 has not been sampled since the December 2018 sampling event due to damage to the well and was abandoned in September 2019.

Monitoring well MGMS2-40 is located near, but outside of, the 2016 interim action injection area, and within the footprint of the 2011 interim action injection area. Ethene concentrations in well MGMS2-40 increased in response to the 2011 injections and remained elevated, although with variability through March 2018. Ethene was not detected in well MGMS2-40 in the July 2018 sample but has been detected again in all subsequent monitoring event samples, at concentrations ranging from 1.4 to 78 µg/L. The presence of ethene in several interim action area wells, along with decreasing PCE and TCE concentrations, indicate that reductive dechlorination has been ongoing near this well since the 2011 injections.

Riverbank Area. Prior to the 2016 interim action injections, ethene was not present in groundwater in wells located in the 2016 interim action area, including wells MW-12, MW-13, and MGMS3-40, as shown in Table 5. Since the completion of the 2016 interim action injections, ethene has been detected in all four 2016 interim action area wells. The presence of ethene suggests that the 2016 injections have successfully resulted in the complete reductive dechlorination of the PCE and TCE. A summary of the presence and persistence of ethene in each riverbank area interim action well is provided below; ethene concentrations are tabulated in Table 5:

- Ethene concentrations in well MW-12 increased from non-detect prior to the 2016 interim action, to 75.2 µg/L in March 2017, and remained elevated between March 2017 and September 2017. Concentrations of ethene in well MW-12 have been non-detect since November 2017 (reporting limit of 1.0 to 13.0 µg/L).
- PCE and TCE concentrations in MW-13 have decreased significantly between September 2016 and December 2019 (from 5,090 µg/L and 951 µg/L, respectively, to <0.400 µg/L for both), but it was not until November 2017 that ethene was detected in the well. Since then, concentrations of ethene continued to rise to 500 µg/L by July 2018 and then decreased to 7.1 µg/L in December 2018. Ethene concentrations have been below the reporting limit (1.0 µg/L) since then. Ethene was first detected in well MW-19 during the September 2017 monitoring event and was detected in every sampling event since until December 2019, with the highest concentration (271 µg/L) detected during the June 2018 sampling event. Concentrations have since decreased and were below the detection limit (1.0 µg/L) in the December 2019 sampling period. As previously stated, VC concentrations in groundwater samples collected from well MW-19 in the June 2018 monitoring event were the highest since the well was first sampled in 2002. Since then, concentrations of VC have continued to

decrease, although they remain higher than 2016 levels. Collectively, these data confirm reductive 12ichlorination around well MW-19 and that chlorinated VOC mass is being degraded.

- Ethene was detected in well MGMS3-40 during the first monitoring event after the 2016 injections (December 2016) and was detected during each subsequent monitoring event through September 2019, at concentrations ranging from 4.9 µg/L to 242 µg/L. Concentrations of ethene in the December 2019 event were below the detection limit (1.0 µg/L).

Northwest (NW) Area. Ethene concentrations in wells MW-14 and MW-26 have not been detected above the reporting limit (1.0 to 13 µg/L) since ethene monitoring was initiated in September 2016. As stated above, these wells are located on the periphery of the injection area, limiting their utility in monitoring the effectiveness of the injections.

5.3.1.3 Total Organic Carbon Evaluation

The presence of elevated TOC indicates that the bioremediation injections have increased the electron donor carbon source needed to reductively dechlorinate the VOCs present in groundwater at the Facility. While a baseline monitoring event was not conducted prior to the 2016 injection event, TOC data are available for wells MP-1 and MW-12 (riverbank area) for the event prior to the injections (June 2016) and the two events concurrent with and following the injections (September and December 2016). TOC was further analyzed between March 2017 and December 2019 at select wells. A discussion of the TOC results is provided below.

Primary Source Area. Seven bioremediation injection points were located near well MP-1 during the 2016 interim action. In well MP-1, TOC values increased by over three orders of magnitude between June and September 2016, with concentrations remaining elevated during the December 2016 event. During the March 2017 event, the TOC values remained stable from the previous event; however, TOC values decreased in June 2017 by an order of magnitude and further decreased in September 2017 by another order of magnitude before remaining stable through December 2019. At well EX-1, the TOC concentration increased by two orders of magnitude following the 2016 interim action injections, then decreased an order of magnitude during the June 2017, and has remained relatively consistent since that time at concentrations ranging between 11 and 44 mg/L. As described in Section 2.0, well EX-1 has not been sampled since the December 2018 sampling event due to damage to the well and was abandoned in September 2019. These results indicate utilization of the oil substrate in the dechlorination of VOCs, supporting the significant decreases in VOC concentrations observed following the 2016 bioremediation injections in this area.

Riverbank Area. The following describes TOC results in the riverbank portion of the 2016 interim action area (wells MW-12, MW-13, MW-19, MGMS3-40, and MGMS1-43). TOC results are tabulated on Table 5.

- In groundwater collected from well MW-12, TOC concentrations increased by over three orders of magnitude between June and September 2016, with concentrations remaining elevated during the December 2016 monitoring event. Between December 2016 and March 2017, TOC concentrations in well MW-12 decreased by an order of magnitude and then gradually decreased another order of magnitude between June 2017 and June 2018. TOC concentrations have remained stable to slightly decreasing from July 2018 to December 2019.

- At well MW-13, TOC concentrations were elevated during the September 2016 sampling event, and then decreased by three orders of magnitude by the November 2017 event. TOC concentrations have remained relatively stable in well MW-13 through the December 2019 sampling event.

- At well MW-19, TOC values were low (one to two orders of magnitude below concentrations observed in wells MP-1 and MW-12) from September 2016 through November 2017, then increased by an order of magnitude in the March 2018 through June 2018 results. TOC concentrations decreased from June to September 2018, where they have remained relatively stable (between 5.38 and 19.1 µg/L).

- At well MGMS3-40, TOC concentrations increased during the September and December 2016 groundwater monitoring events, then decreased by an order of magnitude during the March 2017 event and have remained stable through December 2019.

- At well MGMS1-43, the TOC concentration in groundwater has remained relatively low and steady from September 2016 through December 2019 and does not appear to be significantly influenced from the oil injections in 2016.

With the exception of well MGMS1-43, TOC concentrations in riverbank area wells indicate utilization of the oil substrate in the dechlorination of VOCs, which is supported by decreasing VOC concentrations in most riverbank area wells.

NW Area. In wells MW-14 and MW-26, TOC concentrations did not increase after the September 2016 injections. TOC levels in these wells have historically been low and stable. Concentrations of TOC in well MW-14 increased an order of magnitude, from 5.06 mg/L in September 2018 to 50.0 mg/L in December 2019. TOC concentrations in this well will continue to be monitored to better assess the accuracy of the increased TOC measurement.

Summary of Enhanced Bioremediation Results Following the 2016 Interim Action. The 2016 groundwater interim action was implemented in July through September 2016 and included over 72 bioremediation injections at the NuStar Facility and 30 bioremediation injections at the off-facility Northwest Area. Since implementation, groundwater in the 2016 interim action area has been monitored for 14 quarters for indicators of reductive dechlorination. The results from the third and fourth quarter 2019 sampling events are consistent with previous events and indicate that reductive dechlorination is occurring. Specifically:

- Up to three orders of magnitude reduction of PCE and TCE concentrations have been observed between the September 2016 and December 2019 monitoring events in some of the 2016 interim action area wells.
- Observed trends in breakdown product concentrations are consistent with reductive dechlorination of chlorinated ethene compounds.
- After the 2016 injections, ethene was first detected in four riverbank interim action monitoring wells in March 2017. Detections of ethene in Facility wells have continued through December 2019, although concentrations are starting to taper off in many of the wells. TOC concentrations are also decreasing and are below 10 mg/L in the majority of wells, indicating that an additional injection event may be needed in the area to further reduce VOC concentrations and achieve site goals.

As identified above, wells MW-14 and MW-26 are located on the periphery of the injection area in the Northwest Area and provide limited utility in evaluating the effectiveness of the 2016 interim action in this area. However, VOC and ethene concentrations in these wells have continued to decrease supporting that reductive dechlorination is occurring in this area.

5.3.2 SVE Systems – Monitoring and Mass Removal Evaluation

The following paragraphs summarize the monitoring and analytical results as well as the total VOC mass removal for the North and South SVE Systems at the Facility. Field vapor measurements were collected with a photoionization detector (PID). Effluent vapor samples from the SVE systems were collected into Summa™ canisters and submitted to Eurofins TestAmerica Laboratories (Test America) in West Sacramento, California, for analysis of VOCs by method TO-15.

The North SVE System has been non-operational since May 2017 due to the blower motor failing. The rotor is locked and blown fuses were noted on two of the three legs. A replacement blower is required to return the North SVE system to operation. The terminal is planning modifications to the rail alignment at the Facility to accommodate modifications to one of its storage areas; part of the planned work will require the abandonment and potential relocation of several of the SVE wells in the North system. As of December 2019, the modifications to the terminal infrastructure have not been initiated and the North SVE system remains non-operational.

Starting in May 2018, SVE monitoring events have occurred on a bi-monthly, rather than monthly basis after it was deemed frequent enough to sufficiently maintain the system and quantify mass removal. SVE monitoring events (limited to the South SVE system) occurred on July 8, 2019, September 9, 2019, and November 4, 2019 during this reporting period. North SVE System operating and analytical data are provided in Tables 6 and 7, respectively. As discussed above, the North SVE system was not operational during this reporting period; therefore, data are from the period prior to May 2017. South SVE System operating and analytical data are provided in Tables 8 and 9, respectively.

SVE System Mass Removal. The approximate VOC mass removed by the North and South SVE Systems is presented in Tables 10 and 11 and on Figures 14 and 15, respectively. The North and South Systems have removed approximately 232 and 4,359 pounds of VOCs, respectively, since startup in October 2011. Including the mass removed from the 2008 SVE System, the total mass removal by SVE at the Facility to date is approximately 7,741 pounds. The results from the next SVE monitoring events (January, March, and May 2020) will be reported in the next semi-annual groundwater monitoring report.

6.0 INFRASTRUCTURE MAINTENANCE

The following sections describe maintenance on the SVE and monitoring well systems infrastructure conducted during the reporting period.

6.1 SVE SYSTEM

In November 2017, blue water was observed in the knockout drum for the south SVE system and has been observed intermittently since that time. Troubleshooting to find the source of the blue water has been ongoing.

During the second quarter 2019 SVE monitoring events (July 8, 2019, September 9, 2019, and November 4, 2019), no water was present in the knockout drum and no obvious signs of deterioration of the drum were noted.

During the November 4, 2019 SVE monitoring event, SVE wells within Building 2645 which had not been accessible for several years due to the presence of equipment were accessible. The location of Building 2645, also referred to as the Butler Building, is shown on Figure 2. Cascadia assessed the condition of the SVE well vaults and wells in Building 2645 to evaluate whether water could be entering the SVE system and getting into the knockout drum from these wells. Specifically, Cascadia field staff took PID and pressure readings from each individual outlet within the VE-7 and VE-8 vaults as well as recorded general conditions of the pipes and fittings. There were cracked fittings and/or apparent leaks in the lines associated with VE-8-4 (S), VE-8-1 (S), and VE-8-2(S). VE-8-2(D) did not have apparent cracks or leaks but no pressure was recorded at the outlet. The other lines associated with VE-7 and VE-8 recorded pressure readings between 5 and 8 inches of water (measured with a magnehelic gauge) when open and 0 inch of water when closed. For all outlets, PID readings were less than 1 parts per million (ppm). These results suggest the presence of leaks in the system that might allow infiltrating rainwater to enter the system and accumulate in the knockout drum.

The knockout drum was checked for the presence of blue water in December 2019 during the fourth quarter groundwater monitoring event. Approximately 10 gallons of water were observed and removed. Upgrades and/or repairs to the SVE lines identified in November 2019 in the vaults for VE-7 and VE-8 are planned for early 2020. The knockout drum will continue to be monitored for

the presence of blue water and to determine whether the repairs to VE-7 and VE-8 mitigate or decrease the volume of the blue water in the knockout drum.

6.2 MONITORING WELL REPAIR AND ABANDONMENT

Decommissioning of select Facility monitoring wells was completed during the third quarter 2019 in accordance with the *Well Decommissioning, Well Installation, and Well Monument Replacement Work Plan* that was submitted to Ecology on May 17, 2019 (Cascadia, 2019), Ecology approved the well decommissioning in a letter dated July 17, 2019, and verbally in a telephone conversation with Cascadia staff on August 29, 2019. These well abandonment activities were completed in conjunction with a large-scale repaving effort completed by the POV throughout the south/southwest portion of the Facility.

6.2.1 Monitoring Well Abandonment

As detailed in the *Response to Ecology Letter Regarding the May 17, 2019 Well Decommissioning, Well Installation, and Well Monument Replacement Work Plan* letter that was submitted to Ecology on January 6, 2020 (Cascadia, 2020), wells IW-1, MP-2, MP-3, MP-4, and EX-1 were decommissioned in September 2019.

Prior to decommissioning, the public utility notification center was contacted, and a private utility locator was contracted to check for the presence of buried utilities or infrastructure in the work area. Monitoring well decommissioning was performed by Cascade Environmental, Inc. (Cascade), a Washington licensed driller. Monitoring wells were grouted from the bottom to approximately 1 foot bgs with a bentonite slurry and topped (to ground surface) with hydrated bentonite chips on September 16, 2019. Well monuments were removed on September 17, 2019, by the contractors retained by the POV to complete the repaving work: representatives of NuStar were present to observe the removals. The POV contractors resurfaced the area with cobbles, cement-treated base, and an asphalt overlay.

As described in the January 6, 2020 letter (Cascadia, 2020), the second phase of work will include replacing EX-1 within 10 feet of its former location, abandoning additional wells (IN-1 through IN-9 and EX-3 through EX-5), and replacing select well monuments with heavy duty utility vaults. Site figures have been updated to reflect the current status.

6.2.2 Monitoring Well Repair

While onsite in September 2019, Cascade repaired a cracked casing in monitoring well MW-14. The casing was cut below the crack and a replacement piece was added to the approximate height of the old casing using a PVC coupler. New top of casing elevations for MW-14 will need to be resurveyed for accurate groundwater elevations. This work will be completed once the replacement well for former well EX-1 is installed.

7.0 FUTURE ACTIVITIES

Groundwater monitoring on a quarterly basis and reporting on a semi-annual basis will continue in accordance with the Groundwater Monitoring Plan approved by Ecology in 2008 (Ash Creek, 2008).

As proposed and agreed upon in a February 2018 joint NuStar, POV, and Ecology meeting, the sampling of Facility wells for nitrate, nitrite, and ammonia was conducted on a quarterly basis for four quarters initiated in November 2017. In 2019, Ecology issued Agreed Order DE 15806 for a supplemental remedial investigation for the presence of metals in site media due to operations at the adjacent Kinder Morgan Bulk Terminal and ammonia, nitrates, and nitrites due to fertilizer operations at NuStar. NuStar will continue to analyze groundwater samples collected during the VOC monitoring program to support the assessments for Order DE 15806.

SVE operations and maintenance will occur bi-monthly in accordance with the schedule proposed in the *2011 Interim Action Evaluation Report (*Ash Creek, 2012) at the South SVE system only until the North SVE system is repaired.

8.0 REFERENCES

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TABLES

Table 1
Groundwater Monitoring Plan: Third and Fourth Quarters 2019
NuStar Vancouver Facility
Vancouver, Washington

Monitoring Program	Well ID	Groundwater Zone	Included Monitoring Wells	
			Third Quarter	Fourth Quarter
Groundwater monitoring includes depth-to-water measurement.	MW-1	Shallow	☑	☑
	MW-2	Shallow	☑	☑
	MW-3	Shallow	☑	☑
	MW-5	Shallow	☑	☑
	MW-6	Shallow	☑	☑
	MW-7	Shallow	☑	☑
	MW-8	Shallow	☑	☑
	MW-9	Shallow	☑	☑
	MW-10	Shallow	☑	☑
	MW-12	Shallow	☑	☑
	MW-13	Shallow	☑	☑
	MW-14	Shallow	☑	☑
	MW-15	Shallow	☐	☐
	MW-16	Shallow	☑	☑
	MW-17	Shallow	☑	☑
	MW-18i	Intermediate	☑	☑
	MW-19	Shallow	☑	☑
	MW-19i	Intermediate	☑	☑
	MW-20i	Intermediate	☑	☑
	MW-21i-40	Intermediate	☑	☑
	MW-21i-105	Intermediate	☑	☑
	MW-22i	Intermediate	☑	☑
	MW-23i	Intermediate	☑	☑
	MW-24i	Intermediate	☑	☑
	MW-24d	Deep	☑	☑
	MW-25i	Intermediate	☑	☑
	MW-26	Shallow	☑	☑
	MW-30i	Intermediate	☐	☐
	MW-31i	Intermediate	☐	☐
	MW-32s	Shallow	☑	☐
	MW-32i	Intermediate	☐	☐
	MGMS1-3(43)	Shallow	☑	☑
	MGMS1-2 (60)	Intermediate	☑	☑
	MGMS1-1(110)	Lower Intermediate	☐	☑
	MGMS2-4(40)	Shallow	☑	☑
	MGMS2-3 (60)	Intermediate	☑	☑
	MGMS2-2(110)	Lower Intermediate	☐	☑
	MGMS2-1(132)	Lower Intermediate	☐	☑
	MGMS3-4(40)	Shallow	☑	☑

Please refer to notes at end of table.

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Table 1
Groundwater Monitoring Plan: Third and Fourth Quarters 2019
NuStar Vancouver Facility
Vancouver, Washington

Monitoring Program	Well ID	Groundwater Zone	Included Monitoring Wells	
			Third Quarter	Fourth Quarter
Groundwater monitoring includes depth-to-water measurement.	MGMS3-3(60)	Intermediate	☑	☑
	MGMS3-2(101)	Lower Intermediate	☐	☑
	MGMS3-1(132)	Lower Intermediate	☐	☑
	MW-E	Shallow	☐	☐
	MW-F	Shallow	☐	☐
	MW-G	Shallow	☐	☐
	EW-1	Shallow	☑	☑
	EX-1	Shallow	☐	☐
	MP-1	Shallow	☑	☑
	MP-2	Shallow	☐	☐
	MP-3	Shallow	☐	☐
	MP-4	Shallow	☐	☐
	S-1	Intermediate	☑	☑
	S-2	Shallow	☑	☑

Notes:
1. ☑ = Included in sampling program represented in this report.
2. ☐ = Not included in sampling program represented in this report: water level measurement only.
3. Wells MW-E, MW-G, MW-30i, MW-31i, and MW-32i are sampled by the Port of Vancouver.

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Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
Groundwater Monitoring Wells			
MW-1 (32.60)	3/18/2019	27.71	4.89
	5/31/2019	23.22	9.38
	9/23/2019	NM	NM
	12/2/2019	27.69	4.91
MW-2 (34.04)	3/18/2019	29.05	4.99
	5/31/2019	24.71	9.33
	9/23/2019	30.21	3.83
	12/2/2019	29.08	4.96
MW-3 (34.41)	3/18/2019	27.78	6.63
	5/31/2019	25.14	9.27
	9/23/2019	30.12	4.29
	12/2/2019	28.82	5.59
MW-5 (33.86)	3/18/2019	28.06	5.80
	5/31/2019	24.45	9.41
	9/23/2019	29.33	4.53
	12/2/2019	28.81	5.05
MW-6 (32.83)	3/18/2019	27.12	5.71
	5/31/2019	23.25	9.58
	9/23/2019	28.32	4.51
	12/2/2019	27.61	5.22
MW-7 (33.74)	3/18/2019	27.81	5.93
	5/31/2019	24.33	9.41
	9/23/2019	29.14	4.60
	12/2/2019	28.83	4.91
MW-8 (33.97)	3/18/2019	27.75	6.22
	5/31/2019	24.40	9.57
	9/23/2019	28.80	5.17
	12/2/2019	28.59	5.38
MW-9 (33.86)	3/18/2019	27.94	5.92
	5/31/2019	24.44	9.42
	9/23/2019	29.22	4.64
	12/2/2019	29.00	4.86
MW-10 (34.83)	3/18/2019	28.08	6.75
	5/31/2019	25.16	9.67
	9/23/2019	28.90	5.93
	12/2/2019	28.79	6.04

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-12 (31.43)	3/18/2019	26.46	4.97
	5/31/2019	22.03	9.40
	9/23/2019	27.76	3.67
	12/2/2019	26.60	4.83
MW-13 (33.15)	3/18/2019	27.61	5.54
	5/31/2019	23.78	9.37
	9/23/2019	28.01	5.14
	12/2/2019	28.26	4.89
MW-14 (33.81)	3/18/2019	28.02	5.79
	5/31/2019	24.12	9.69
	9/23/2019	28.92	4.89
	12/2/2019	29.00	4.81
MW-15 (39.13)	3/18/2019	33.29	5.84
	5/31/2019	30.09	9.04
	9/23/2019	34.22	4.91
	12/2/2019	33.86	5.27
MW-16 (33.05)	3/18/2019	27.74	5.31
	5/31/2019	23.72	9.33
	9/23/2019	29.55	3.50
	12/2/2019	27.94	5.11
MW-17 (32.65)	3/18/2019	27.12	5.53
	5/31/2019	23.31	9.34
	9/23/2019	28.49	4.16
	12/2/2019	27.86	4.79
MW-18i (33.40)	3/18/2019	28.92	4.48
	5/31/2019	23.91	9.49
	9/23/2019	30.44	2.96
	12/2/2019	28.19	5.21
MW-19 (33.59)	3/18/2019	27.95	5.64
	5/31/2019	24.30	9.29
	9/23/2019	29.18	4.41
	12/2/2019	28.71	4.88
MW-19i (33.62)	3/18/2019	29.22	4.40
	5/31/2019	24.41	9.21
	9/23/2019	30.72	2.90
	12/2/2019	28.43	5.19

Please refer to notes at end of table.

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Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-20i (33.14)	3/18/2019	28.71	4.43
	5/31/2019	24.11	9.03
	9/23/2019	30.23	2.91
	12/2/2019	28.01	5.13
MW21i-40 (34.10)	3/18/2019	29.5	4.60
	5/31/2019	24.84	9.26
	9/23/2019	30.78	3.32
	12/2/2019	28.94	5.16
MW-21i-105 (33.99)	3/18/2019	29.61	4.38
	5/31/2019	24.75	9.24
	9/23/2019	30.96	3.03
	12/2/2019	28.83	5.16
MW-22i (34.39)	3/18/2019	29.91	4.48
	5/31/2019	25.14	9.25
	9/23/2019	NM	NM
	12/2/2019	29.29	5.10
MW-23i (33.80)	3/18/2019	29.38	4.42
	5/31/2019	24.51	9.29
	9/23/2019	30.24	3.56
	12/2/2019	28.56	5.24
MW-24i (33.47)	3/18/2019	28.46	5.01
	5/31/2019	24.24	9.23
	9/23/2019	30.75	2.72
	12/2/2019	28.19	5.28
MW-25i (33.58)	3/18/2019	29.19	4.39
	5/31/2019	NM	NM
	9/23/2019	30.80	2.78
	12/2/2019	28.42	5.16
MW-26 (33.73)	3/18/2019	27.80	5.93
	5/31/2019	24.34	9.39
	9/23/2019	29.06	4.67
	12/2/2019	28.93	4.80
MW-24d (33.91)	3/18/2019	29.09	4.82
	5/31/2019	24.69	9.22
	9/23/2019	29.74	4.17
	12/2/2019	28.70	5.21

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
EW-1 (31.40)	3/18/2019	26.33	5.07
	5/31/2019	21.92	9.48
	9/23/2019	27.54	3.86
	12/2/2019	26.45	4.95
Secor Interim Action Pilot Study Wells			
S-1 (33.24)	3/18/2019	28.34	4.90
	5/31/2019	23.5	9.74
	9/23/2019	30.02	3.22
	12/2/2019	27.53	5.71
S-2 (33.15)	3/18/2019	27.64	5.51
	5/31/2019	23.92	9.23
	9/23/2019	30.31	2.84
	12/2/2019	28.05	5.10
Multi-Level Monitoring Wells			
MGMS1-3 (43)* (32.86)	3/18/2019	26.73	6.13
	5/31/2019	23.43	9.43
	9/23/2019	29.11	3.75
	12/2/2019	28.31	4.55
MGMS1-2(60)* (32.86)	3/18/2019	29.47	3.39
	5/31/2019	23.49	9.37
	9/23/2019	29.79	3.07
	12/2/2019	27.79	5.07
MGMS1-1(110)* (32.86)	3/18/2019	28.07	4.79
	5/31/2019	23.47	9.39
	9/23/2019	29.78	3.08
	12/2/2019	27.72	5.14
MGMS2-4(40)* (32.59)	3/18/2019	26.88	5.71
	5/31/2019	23.28	9.31
	9/23/2019	28.28	4.31
	12/2/2019	28.10	4.49
MGMS2-3(60)* (32.59)	3/18/2019	27.66	4.93
	5/31/2019	23.59	9.00
	9/23/2019	29.37	3.22
	12/2/2019	27.77	4.82
MGMS2-2(110)* (32.59)	3/18/2019	28.07	4.52
	5/31/2019	23.29	9.30
	9/23/2019	29.38	3.21
	12/2/2019	27.75	4.84

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MGMS2-1(132)* (32.59)	3/18/2019	27.80	4.79
	5/31/2019	23.45	9.14
	9/23/2019	29.38	3.21
	12/2/2019	27.78	4.81
MGMS3-4(40)* (31.65)	3/18/2019	27.09	4.56
	5/31/2019	22.34	9.31
	9/23/2019	28.18	3.47
	12/2/2019	26.64	5.01
MGMS3-3(60)* (31.65)	3/18/2019	27.19	4.46
	5/31/2019	22.39	9.26
	9/23/2019	28.41	3.24
	12/2/2019	26.45	5.20
MGMS3-2(101)* (31.65)	3/18/2019	27.38	4.27
	5/31/2019	22.48	9.17
	9/23/2019	28.39	3.26
	12/2/2019	26.50	5.15
MGMS3-1(132)* (31.65)	3/18/2019	27.39	4.26
	5/31/2019	22.47	9.18
	9/23/2019	28.45	3.20
	12/2/2019	26.52	5.13
Port of Vancouver Wells			
MW-30i (29.77)	03/27/17	11.42	18.35
	06/12/17	15.55	14.22
	09/25/17	26.36	3.41
	11/06/17	Well Abandoned	
MW-31i** (31.33)	3/18/2019	NM	NM
	5/31/2019	NM	NM
	9/23/2019	NM	NM
	12/2/2019	NM	NM
MW-32s (34.34)	3/18/2019	29.15	5.19
	5/31/2019	25.26	9.08
	9/23/2019	30.24	4.10
	12/2/2019	29.27	5.07
MW-32i (34.41)	3/18/2019	29.80	4.61
	5/31/2019	25.28	9.13
	9/23/2019	31.45	2.96
	12/2/2019	29.36	5.05

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 2
Groundwater Elevation Data: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-E ** (30.64)	3/18/2019	NM	NM
	5/31/2019	NM	NM
	9/23/2019	NM	NM
	12/2/2019	NM	NM
MW-F (33.48)	3/18/2019	29.02	4.46
	5/31/2019	24.81	8.67
	9/23/2019	30.47	3.01
	12/2/2019	29.11	4.37
MW-G (31.50)	3/18/2019	NM	NM
	5/31/2019	NM	NM
	9/23/2019	NM	NM
	12/2/2019	NM	NM

Notes:

1. TOC = Top of casing; BTOC = Below top of casing.
2. Utilizes new survey information from June 2010. NGVD29 datum (ft MSL).
3. * Water levels measurement points are located at the top of the plastic fittings mounted on the v
4. NM = Not measured.
5. ** The casing has been modified at Port of Vancouver wells MW-E and MW-31i. The TOC elevati has not yet been re-surveyed, so groundwater elevation data for these wells is likely inaccurate.
6. The casing for well MW-10 was lowered during a recent monument replacement event. Top of casing information will be updated once the well is resurveyed.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-1	3/21/2019	**4.37**	<0.400	**0.780**	**28.5**	**0.530**	<0.500	**2.78**	<0.400	<0.500	**6.65**	**0.400**
	6/5/2019	**2.54**	<0.400	<0.400	**27.6**	**0.481**	<0.500	**12.9**	<0.400	<0.500	**8.43**	<0.400
	9/27/2019	**8.66**	<0.400	**0.569**	**106**	**1.78**	**0.703**	**19.1**	**0.448**	<0.500	**18.4**	**2.97**
	12/4/2019	**3.22**	<0.400	<0.400	**26.6**	**0.494**	<0.500	**10.6**	<0.400	<0.500	**7.39**	**0.670**
MW-2	3/21/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/5/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-3	3/20/2019	**0.930**	<0.400	<0.400	**37.5**	**1.16**	**1.03**	**112**	**1.55**	<0.500	**33.2**	<0.400
	6/7/2019	**1.22**	<0.400	<0.400	**41.6**	**1.99**	**0.708**	**195**	**2.62**	<0.500	**39.8**	<0.400
	9/27/2019	**7.00**	**0.472**	<0.400	**72.3**	**1.25**	**1.32**	**130**	**1.70**	<0.500	**32.9**	<0.400
	12/4/2019	**1.54**	<0.400	<0.400	**36.5**	**1.07**	**0.634**	**136**	**1.33**	<0.500	**36.4**	<0.400
MW-5	3/26/2019	<0.400	<0.400	<0.400	**2.01**	<0.400	<0.500	**0.947**	<0.400	<0.500	**0.977**	<0.400
	6/7/2019	**0.404**	<0.400	<0.400	**11.1**	<0.400	<0.500	**20.4**	<0.400	<0.500	**8.63**	<0.400
	9/26/2019	<0.4	<0.400	<0.400	**10.7**	<0.400	<0.500	**0.972**	<0.400	<0.500	**1.35**	**1.1**
	12/4/2019	**0.817**	<0.400	**1.60**	**632**	**1.11**	<0.500	**0.925**	<0.400	<0.500	**9.85**	**10.7**
MW-6	3/22/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/5/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-7	3/20/2019	**1.87**	<0.400	<0.400	**22.2**	<0.400	<0.500	**22.3**	<0.400	<0.500	**10.8**	**0.605**
	3/20/19 DUP	**1.84**	<0.400	<0.400	**22.8**	<0.400	<0.500	**22.8**	<0.400	<0.500	**10.7**	**0.553**
	6/5/2019	**2.91**	<0.400	**0.559**	**20.2**	<0.400	<0.500	**28.1**	<0.400	<0.500	**12.7**	**1.11**
	6/5/2019 DUP	**2.87**	<0.400	**0.494**	**20.2**	<0.400	<0.500	**28.4**	<0.400	<0.500	**12.7**	**1.15**
	9/26/2019	**2.98**	<0.400	**0.650**	**20.1**	<0.400	<0.500	**41.7**	<0.400	<0.500	**17.9**	**0.420**
	9/26/2019 DUP	**2.95**	<0.400	**0.672**	**21.0**	<0.400	<0.500	**39.6**	<0.400	<0.500	**17.8**	<0.400
	12/3/2019	**4.61**	<0.400	**0.837**	**29.4**	<0.400	<0.500	**65.8**	<0.400	<0.500	**31.0**	<0.400
	12/3/19 DUP	**4.58**	<0.400	**0.839**	**29.7**	<0.400	<0.500	**66.1**	<0.400	<0.500	**31.8**	<0.400
MW-8	3/22/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**3.83**	<0.400	<0.500	<0.400	<0.400
	6/3/2019	**0.430**	<0.400	<0.400	**6.57**	<0.400	<0.500	**2.05**	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**4.20**	<0.400	<0.500	<0.400	<0.400
	12/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**4.06**	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-9	3/20/2019	<0.400	<0.400	<0.400	**2.47**	<0.400	<0.500	**58.9**	**1.47**	<0.500	**20.0**	<0.400
	6/7/2019	<0.400	<0.400	<0.400	**1.99**	<0.400	<0.500	**108**	**1.34**	<0.500	**49.4**	<0.400
	9/26/2019	<0.400	<0.400	<0.400	**3.34**	<0.400	<0.500	**81.3**	**2.34**	<0.501	**25.4**	<0.401
	12/3/2019	<0.400	<0.400	<0.400	**2.34**	<0.400	<0.500	**67.5**	**1.46**	<0.502	**24.3**	<0.402
MW-10	3/21/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**3.24**	<0.400	<0.500	**2.00**	<0.400
	06/06/19	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**7.51**	<0.400	<0.500	**4.19**	<0.400
	9/25/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**2.03**	<0.400	<0.500	**1.35**	<0.400
	12/4/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**1.65**	<0.400	<0.500	**1.15**	<0.400
MW-12	3/20/2019	**0.655**	<0.400	<0.400	**6.70**	**0.675**	<0.500	**2.11**	<0.400	<0.500	**1.33**	**1.64**
	3/20/19 DUP	**0.615**	<0.400	<0.400	**6.31**	**0.621**	<0.500	**2.05**	<0.400	<0.500	**1.15**	**1.56**
	6/5/2019	**0.716**	<0.400	<0.400	**9.17**	**0.756**	<0.500	**3.30**	<0.400	<0.500	**3.45**	**2.64**
	6/5/2019 DUP	**0.719**	<0.400	<0.400	**9.36**	**0.725**	<0.500	**3.64**	<0.400	<0.500	**3.41**	**2.74**
	9/26/2019	**6.26**	<0.400	<0.400	**5.31**	**0.565**	<0.500	<0.400	<0.400	<0.500	**0.442**	**6.82**
	9/26/2019 DUP	**6.12**	<0.400	<0.400	**5.06**	**0.550**	<0.500	<0.400	<0.400	<0.500	**0.459**	**6.45**
	12/5/2019	<0.400	<0.400	<0.400	**2.61**	<0.400	<0.500	**2.37**	<0.400	<0.500	**1.41**	**0.413**
	12/5/2019 DUP	<0.400	<0.400	<0.400	**2.51**	<0.400	<0.500	**2.18**	<0.400	<0.500	**1.23**	<0.400
MW-13	3/19/2019	<0.400	<0.400	<0.400	**2.69**	<0.400	<0.500	<0.400	<0.400	<0.500	**0.433**	**2.02**
	6/6/2019	<0.400	<0.400	<0.400	**4.62**	<0.400	<0.500	<0.400	<0.400	<0.500	**0.673**	**2.89**
	9/26/2019	**1.07**	<0.400	<0.400	**1.94**	**0.439**	<0.500	<0.400	<0.400	<0.500	<0.400	**2.01**
	12/3/2019	**1.50**	<0.400	<0.400	**1.06**	**0.488**	<0.500	<0.400	<0.400	<0.500	<0.400	**1.42**
MW-14	3/19/2019	**5.40**	<4.00	<4.00	**223**	**2.06**	<2.50	**31.4**	<2.00	<2.50	**178**	<2.00
	6/6/2019	**1.74**	<0.400	**1.09**	**151**	**0.937**	<0.500	**19.1**	<0.400	<0.500	**76.4**	<0.400
	9/25/2019	**12.5**	<0.400	**4.58**	**264**	**3.60**	<0.500	**91.8**	**1.47**	<0.500	**327**	**0.482**
	12/4/2019	**7.81**	<0.400	**3.17**	**242**	**2.88**	<0.500	**107**	**0.704**	<0.500	**351**	<0.400
MW-15	9/28/2017	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**0.64**	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	**0.596**	<0.500	<0.500	<0.500	<0.500
	6/6/2019	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	**0.531**	<0.500	<0.500	<0.500	<0.500
MW-16	3/22/2019	<0.400	<0.400	<0.400	**7.90**	<0.400	<0.500	**136**	**0.771**	<0.500	**24.3**	<0.400
	6/4/2019	**0.810**	<0.400	<0.400	**14.3**	<0.400	<0.500	**30.1**	<0.400	<0.500	**5.34**	<0.400
	9/25/2019	<0.400	<0.400	<0.400	**14.4**	<0.400	<0.500	**136**	**0.658**	<0.500	**23.9**	<0.400
	12/3/2019	<0.400	<0.400	<0.400	**8.75**	<0.400	<0.500	**102**	**0.598**	<0.500	**19.9**	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-17	3/19/2019	**0.623**	<0.400	<0.400	**10.5**	<0.400	<0.500	**6.91**	<0.400	<0.500	**15.2**	<0.400
	6/6/2019	**0.413**	<0.400	<0.400	**4.34**	<0.400	<0.500	**4.34**	<0.400	<0.500	**10.0**	<0.400
	9/26/2019	<0.400	<0.400	<0.400	**3.87**	<0.400	<0.500	**2.41**	<0.400	<0.500	**4.62**	<0.400
	12/3/2019	**0.829**	<0.400	<0.400	**26.8**	<0.400	<0.500	**5.54**	<0.400	<0.500	**15.1**	<0.400
MW-18i	3/21/2019	<0.400	<0.400	<0.400	**2.53**	<0.400	<0.500	**1.38**	<0.400	<0.500	**1.03**	<0.400
	6/3/2019	<0.400	<0.400	<0.400	**1.31**	<0.400	<0.500	**0.970**	<0.400	<0.500	**0.560**	<0.400
	9/25/2019	<0.400	<0.400	<0.400	**0.630**	<0.400	<0.500	**0.920**	<0.400	<0.500	**0.647**	<0.400
	12/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**1.30**	<0.400	<0.500	**0.589**	<0.400
MW-19	3/20/2019	**49.7**	<8.00	**39.5**	**1,910**	**13.9**	<10.0	**2,970**	**22.7**	<10.0	**2,090**	**75.8**
	3/20/19 DUP	**46.9**	<8.00	**37.6**	**1,820**	**13.5**	<10.0	**2,960**	**23.7**	<10.0	**2,040**	**70.2**
	6/7/2019	**108**	<10.0	**52.6**	**1,910**	**20.4**	<12.5	**894**	<10.0	<12.5	**793**	**70.1**
	6/7/2019 DUP	**89.6**	<8.0	**41.6**	**1,810**	**16.8**	<10.0	**772**	**8.60**	<10.0	**698**	**80.8**
	9/26/2019	**33.3**	<4	**35.1**	**958**	**9.59**	<5	**4,340**	**26.9**	<5	**1,430**	**35.4**
	9/26/2019 DUP	**41.9**	<4	**40.2**	**1,160**	**12.1**	<5	**4,010**	**30.6**	<5	**1,620**	**39.1**
	12/3/2019	**57.4**	<20.0	**28.6**	**1,250**	<20.0	<25.0	**1,670**	<20.0	<25.0	**1,190**	**25.6**
	12/3/19 DUP	**53.4**	<20.0	**27.2**	**1,190**	<20.0	<25.0	**1,650**	<20.0	<25.0	**1,200**	**23.2**
MW-19i	3/25/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<0.400	<0.400	<0.400	**0.433**	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/4/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-20i	3/22/2019	**0.492**	<0.400	<0.400	**10.5**	<0.400	<0.500	**2.04**	<0.400	<0.500	**1.65**	<0.400
	6/3/2019	<0.400	<0.400	<0.400	**4.58**	<0.400	<0.500	**0.950**	<0.400	<0.500	**0.590**	<0.400
	9/25/2019	**0.461**	<0.400	<0.400	**9.43**	<0.400	<0.500	**2.34**	<0.400	<0.500	**1.44**	<0.400
	12/3/2019	<0.400	<0.400	<0.400	**8.68**	<0.400	<0.500	**1.37**	<0.400	<0.500	**0.897**	<0.400
MW-21i-105	3/21/2019	<0.400	<0.400	<0.400	**1.04**	<0.400	<0.500	**1.08**	<0.400	<0.500	**0.760**	<0.400
	06/06/19	<0.400	<0.400	<0.400	**4.11**	<0.400	<0.500	**3.90**	<0.400	<0.500	**2.38**	<0.400
	9/25/2019	<0.400	<0.400	<0.400	**4.08**	<0.400	<0.500	**4.93**	<0.400	<0.500	**2.62**	<0.400
	12/4/2019	<0.400	<0.400	<0.400	**3.09**	<0.400	<0.500	**5.61**	<0.400	<0.500	**2.79**	<0.400
MW-21i-40	3/21/2019	**2.48**	<0.400	**0.700**	**48.8**	**0.500**	<0.500	**24.6**	<0.400	<0.500	**16.2**	<0.400
	6/3/2019	**2.23**	<0.400	**0.730**	**60.9**	**0.470**	<0.500	**24.1**	<0.400	<0.500	**16.9**	<0.400
	9/25/2019	**2.48**	<0.400	**0.768**	**55.5**	**0.657**	<0.500	**22.5**	<0.400	<0.500	**14.9**	<0.400
	12/3/2019	**2.50**	<0.400	**0.614**	**56.3**	**0.521**	<0.500	**32.1**	<0.400	<0.500	**19.1**	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-22i	3/21/2019	**0.510**	<0.400	<0.400	**12.2**	<0.400	<0.500	**1.24**	<0.400	<0.500	**4.92**	<0.400
	6/6/2019	**0.584**	<0.400	<0.400	**15.5**	<0.400	<0.500	**2.22**	<0.400	<0.500	**7.22**	<0.400
	9/25/2019	**0.577**	<0.400	<0.400	**15.5**	<0.400	<0.500	**3.12**	<0.400	<0.500	**6.88**	<0.400
	12/4/2019	**0.461**	<0.400	<0.400	**15.2**	<0.400	<0.500	**1.94**	<0.400	<0.500	**7.35**	<0.400
MW-23i	3/22/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	**0.589**	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-24i	3/25/2019	**0.888**	<0.400	<0.400	**8.46**	<0.400	<0.500	**11.7**	<0.400	<0.500	**5.91**	<0.400
	6/7/2019	**0.601**	<0.400	<0.400	**4.99**	<0.400	<0.500	**7.39**	<0.400	<0.500	**3.55**	<0.400
	9/27/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/3/2019	**0.775**	<0.400	<0.400	**3.82**	<0.400	<0.500	**8.78**	<0.400	<0.500	**3.72**	<0.400
MW-24d	3/25/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/4/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	**0.415**	<0.400	<0.400	**0.995**	<0.400	<0.500	**1.62**	<0.400	<0.500	**0.845**	<0.400
	12/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-25i	3/22/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/25/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/3/2019	<0.400	<0.400	<0.400	**0.536**	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-26	3/22/2019	**7.74**	<0.800	**2.18**	**142**	**3.18**	<1.00	**139**	**2.09**	<1.00	**383**	<0.800
	6/3/2019	**5.75**	<2.00	<2.00	**92.2**	**2.35**	<2.50	**148**	**2.10**	<2.50	**336**	<2.00
	9/26/2019	**5.14**	<2.00	<2.00	**104**	**2.60**	<2.50	**133**	<2.00	<2.50	**272**	<2.00
	12/3/2019	**2.63**	<2.00	<2.00	**95.0**	<2.00	<2.50	**137**	<2.00	<2.50	**216**	<2.00
MW-32s	10/1/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/10/2018	**0.860**	<0.400	<0.400	**16.5**	<0.400	<0.500	**14.7**	<0.400	<0.500	**5.99**	<0.400
	3/25/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
EW-1	3/25/2019	<0.400	<0.400	<0.400	**1.70**	<0.400	<0.500	**30.7**	**0.676**	<0.500	**11.2**	<0.400
	06/04/19	<0.400	**0.590**	<0.400	**2.56**	<0.400	<0.500	**27.4**	**0.690**	<0.500	**9.53**	<0.400
	9/26/2019	<0.400	<0.4	<0.400	**2.39**	<0.400	<0.500	**24.4**	**0.482**	<0.500	**7.40**	<0.400
	12/4/2019	<0.400	**0.552**	<0.400	**3.34**	<0.400	<0.500	**28.3**	**0.488**	<0.500	**9.99**	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
S-1	3/19/2019	**0.764**	<0.400	<0.400	**6.27**	<0.400	<0.500	**0.921**	<0.400	<0.500	**3.60**	<0.400
	6/5/2019	<0.400	<0.400	<0.400	**1.11**	<0.400	<0.500	**0.783**	<0.400	<0.500	**2.17**	<0.400
	9/25/2019	<0.400	<0.400	<0.400	**1.86**	<0.400	<0.500	**1.10**	<0.400	<0.500	**2.71**	<0.400
	12/4/2019	<0.400	<0.400	<0.400	**0.988**	<0.400	<0.500	**0.971**	<0.400	<0.500	**2.86**	<0.400
S-2	3/19/2019	**2.65**	<0.400	<0.400	**8.23**	<4.00	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/5/2019	**5.38**	<0.400	<0.400	**19.8**	<0.400	<0.500	<0.400	<0.400	<0.500	**0.925**	<0.400
	9/25/2019	**8.88**	<0.400	<0.400	**49.6**	**0.638**	<0.500	<0.400	**0.942**	<0.500	**2.85**	<0.400
	12/4/2019	**7.12**	<0.400	<0.400	**30.5**	<0.400	<0.500	<0.400	<0.400	<0.500	**1.75**	<0.400
MGMS1-3(43)	3/26/2019	**160**	<8.00	**22.3**	**3,210**	**42.2**	<10.0	**145**	<8.00	<10.0	**372**	**105**
	6/7/2019	**169**	<8.00	**26.5**	**3,090**	**40.8**	<10.0	**115**	<8.00	<10.0	**315**	**145**
	9/27/2019	**156**	<8.00	**30.5**	**3,240**	**53.9**	<10.0	**212**	<8.00	<10.0	**434**	**113**
	12/4/2019	**124**	<8.00	**17.5**	**2860**	**40.9**	<10.0	**162**	<8.00	<10.0	**398**	**11.8**
MGMS1-2(60)	3/26/2019	**0.439**	<0.400	<0.400	**9.10**	<0.400	<0.500	**12.9**	<0.400	<0.500	**8.37**	<0.400
	6/7/2019	**0.651**	<0.400	<0.400	**11.4**	<0.400	<0.500	**15.5**	<0.400	<0.500	**9.57**	<0.400
	9/27/2019	**4.58**	<0.400	**0.443**	**27.9**	<0.400	<0.500	**33.2**	<0.400	<0.500	**19.0**	**7.89**
	12/4/2019	**0.465**	<0.400	<0.400	**8.86**	<0.400	<0.500	**16.8**	<0.400	<0.500	**9.35**	<0.400
MGMS1-1(110)	7/1/2018	**3.30**	<0.500	**0.462 J**	**104**	**0.357 J**	<0.500	**18.5**	**0.132 J**	<0.500	**36.6**	**0.556**
	10/1/2018	**6.12**	<0.400	**0.723**	**153**	**0.485**	<0.500	**13.0**	<0.400	<0.500	**39.3**	**0.657**
	6/7/2019	**3.55**	<0.400	<0.400	**102**	<0.400	<0.500	**13.8**	<0.400	<0.500	**24.2**	<0.400
	12/4/2019	**4.61**	<0.400	<0.400	**134**	<0.400	<0.500	**14.0**	<0.400	<0.500	**31.9**	<0.400
MGMS2-4(40)	3/25/2019	**26.6**	<0.400	**2.58**	**136**	**0.752**	<0.500	**62.0**	**0.581**	<0.500	**35.9**	**155**
	6/4/2019	**28.2**	<0.400	**0.960**	**37.8**	<0.400	<0.500	**14.6**	<0.400	<0.500	**10.4**	**145**
	9/27/2019	**11.2**	<0.400	**0.729**	**73.8**	<0.400	<0.500	**17.0**	<0.400	<0.500	**13.1**	**101**
	12/4/2019	**20.6**	<0.400	**0.778**	**40.5**	<0.400	<0.500	**32.3**	<0.400	<0.500	**17.9**	**65.4**
MGMS2-3(60)	3/25/2019	**1.86**	<0.400	<0.400	**36.8**	**0.415**	<0.500	**40.1**	<0.400	<0.500	**23.3**	**0.773**
	6/4/2019	**0.580**	<0.400	<0.400	**18.00**	<0.400	<0.500	**32.3**	<0.400	<0.500	**15.7**	**0.420**
	9/27/2019	**1.59**	<0.400	<0.400	**35.2**	**0.470**	<0.500	**25.0**	<0.400	<0.500	**13.8**	**3.08**
	12/4/2019	**2.03**	<0.400	**0.427**	**54.5**	**0.422**	<0.500	**28.9**	<0.400	<0.500	**19.4**	**2.85**
MGMS2-2(110)	7/1/2018	**0.446 J**	<0.500	<0.500	<0.500	**6.74**	<0.500	**4.40**	**0.175 J**	<0.500	**3.42**	**3.87**
	9/28/2018	**0.410**	<0.400	<0.400	**11.3**	<0.400	<0.500	**4.98**	<0.400	<0.500	**4.27**	**4.63**
	6/4/2019	<0.400	<0.400	<0.400	**2.37**	<0.400	<0.500	**3.44**	<0.400	<0.500	**2.04**	**0.770**
	12/4/2019	<0.400	<0.400	<0.400	**5.49**	<0.400	<0.500	**4.29**	<0.400	<0.500	**2.73**	**2.32**
MGMS2-1(132)	7/1/2018	**0.531**	<0.500	<0.500	**13.8**	<0.500	<0.500	**4.47**	**0.191 J**	<0.500	**4.85**	**4.6**
	9/28/2018	**0.520**	<0.400	<0.400	**17.8**	<0.400	<0.500	**4.82**	<0.400	<0.500	**5.63**	**6.71**
	6/4/2019	<0.400	<0.400	<0.400	**5.43**	<0.400	<0.500	**2.76**	<0.400	<0.500	**2.13**	**2.07**
	12/4/2019	<0.400	<0.400	<0.400	**7.96**	<0.400	<0.500	**3.66**	<0.400	<0.500	**3.07**	**3.29**

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 3
Groundwater Analytical Results: 2019
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MGMS3-4(40)	3/26/2019	**8.36**	<0.400	**0.709**	**117**	<0.400	<0.500	**0.680**	<0.400	<0.500	<0.400	**151**
	6/3/2019	**7.22**	<0.400	**0.440**	**74.7**	<0.400	**0.520**	**0.530**	<0.400	<0.500	<0.400	**157**
	6/3/2019 DUP	**7.40**	<0.400	**0.420**	**75.6**	<0.400	**0.610**	**0.560**	<0.400	<0.500	<0.400	**144**
	9/27/2019	**5.09**	<0.400	<0.400	**80.5**	<0.400	<0.500	**0.497**	<0.400	<0.500	<0.400	**106**
	9/27/2019 DUP	**5.09**	<0.400	**0.413**	**80.4**	<0.400	<0.500	**0.578**	<0.400	<0.500	<0.400	**104**
	12/4/2019	**1.63**	<0.400	<0.400	**2.57**	<0.400	<0.500	**1.35**	<0.400	<0.500	**0.454**	**4.50**
	12/4/2019 DUP	**1.67**	<0.400	<0.400	**2.66**	<0.400	<0.500	**1.13**	<0.400	<0.500	<0.400	**5.79**
MGMS3-3(60)	3/26/2019	<0.400	<0.400	<0.400	**1.23**	<0.400	<0.500	**1.04**	<0.400	<0.500	**0.420**	<0.400
	6/3/2019	**0.420**	<0.400	<0.400	**8.52**	<0.400	<0.500	**0.790**	<0.400	<0.500	**0.730**	<0.400
	9/27/2019	**1.13**	<0.4	<0.4	**21.8**	<0.400	<0.500	**1.03**	<0.400	<0.500	**1.23**	**3.98**
	12/4/2019	<0.400	<0.400	<0.400	**3.62**	<0.400	<0.500	**1.17**	<0.400	<0.500	**0.634**	<0.400
MGMS3-2(110)	7/1/2018	<0.500	<0.500	<0.500	**1.71**	<0.500	<0.500	**1.82**	<0.500	<0.500	**1.04**	**0.359 J**
	9/28/2018	<0.400	<0.400	<0.400	**1.52**	<0.400	<0.500	**1.98**	<0.400	<0.500	**1.11**	<0.400
	6/3/2019	<0.400	<0.400	<0.400	**0.930**	<0.400	<0.500	**1.89**	<0.400	<0.500	**1.11**	<0.400
	12/4/2019	<0.400	<0.400	<0.400	**0.852**	<0.400	<0.500	**1.84**	<0.400	<0.500	**0.958**	<0.400
MGMS3-1(132)	7/1/2018	**0.247 J**	<0.500	<0.500	**3.98**	<0.500	<0.500	**5.63**	<0.500	<0.500	**4.06**	**0.359 J**
	9/28/2018	<0.400	<0.400	<0.400	**3.45**	<0.400	<0.500	**3.82**	<0.400	<0.500	**3.24**	<0.400
	6/5/2019	**0.412**	<0.400	<0.400	**5.97**	<0.400	<0.500	**9.45**	<0.400	<0.500	**6.79**	<0.400
	12/4/2019	<0.400	<0.400	<0.400	**5.34**	<0.400	<0.500	**8.69**	<0.400	<0.500	**6.21**	<0.400
EX-1	9/24/2018	**1.42**	<0.400	<0.400	**3.38**	**0.751**	<0.500	**3.07**	<0.400	<0.500	**2.42**	**7.56**
	12/4/2018	**0.876**	<0.400	<0.400	**8.18**	<0.400	<0.500	**6.35**	<0.400	<0.500	**3.60**	**1.88**
	9/24/2018	**1.42**	<0.400	<0.400	**3.38**	**0.751**	<0.500	**3.07**	<0.400	<0.500	**2.42**	**7.56**
	12/4/2018	**0.876**	<0.400	<0.400	**8.18**	<0.400	<0.500	**6.35**	<0.400	<0.500	**3.60**	**1.88**
MP-1	3/20/2019	**1.43**	<0.400	**3.08**	**69.0**	<0.400	<0.500	**146**	<0.400	<0.500	**36.6**	**1.55**
	6/7/2019	<8.00	<8.00	<8.00	**205**	<8.00	<10.0	**769**	<8.00	<10.0	**111**	<8.00
	9/26/2019	**1.36**	<0.800	**1.14**	**37.1**	<0.800	<1.00	**176**	<0.800	<1.00	**26.8**	<0.800
	12/3/2019	**1.57**	<0.800	**1.80**	**40.6**	<0.800	<1.00	**306**	<0.800	<1.00	**57.8**	<0.800
MP-3	6/28/2018	**5.24**	<0.500	**1.78**	**203**	**1.31**	<0.500	**398**	**1.82**	<0.500	**65.1**	**8.96**
	9/27/2018	**4.06**	<0.400	**3.52**	**187**	**1.60**	<0.500	**721**	**0.950**	<0.500	**148**	**0.730**

Notes:

1. µg/L (ppb) = Micrograms per liter (parts per billion).
2. **Bold** values represents detected concentration of listed analyte.
3. < = Not detected at or above the specified laboratory method reporting limit (MRL).
4. D = Relative percent difference (RPD) between sample and duplicate is outside of the acceptable range of +/- 30%.
5. J = Estimated concentration above the method detection limit and below the reporting limit.
6. B= Analyte was detected in the associated method blank.
7. Halogenated volatile organic compounds (HVOCs) analysis by U.S. Environmental Protection Agency (EPA) Method 8260B.

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
EX	2/6/2007	**26.7**	**108**	**0.49**
	3/23/2009	**14**	**43**	**0.54**
	3/16/2010	**3.4**	**89**	**0.71**
	6/7/2011	--	**150**	<0.10
	12/9/2011	--	<0.50	<0.10
	3/21/2018	**302**	**1.22**	**0.47**
	6/28/2018	**119**	<0.10	<0.050
	9/24/2018	**132**	**0.461**	<0.250
	12/4/2018	**117**	**24.1**	<0.250
MW-1	11/9/2017	**3.96**	**46.4**	<1.0
	3/20/2018	**6.20**	**1.84**	<0.10
	7/1/2018	**1.47**	<0.10	<0.10
	9/25/2018	**5.79**	<0.250	<0.250
	12/4/2018	**3.38**	**79.4**	<0.250
	3/21/2019	**22.0**	**2.8**	<0.250
	6/5/2019	**176**	**32.8**	**0.802**
	9/27/2019	**56.9**	**44.0**	<0.250
	12/4/2019	**112**	**134**	<0.250
MW-2	11/6/2017	**6.34**	**0.26**	<0.10
	7/2/2018	**9.85**	<0.10	<0.10
	3/21/2019	**11.0**	<0.250	<0.250
	6/5/2019	**9.86**	<0.250	<0.250
	9/27/2019	**9.82**	<0.250	<0.250
	12/4/2019	**9.72**	<0.250	<0.250
MW-3	11/8/2017	**1.68**	**2.7**	<1.0
	3/20/2018	<0.40	**19.7**	<0.10
	7/2/2018	**0.569**	**15.4**	**1.49**
	9/26/2018	**1.56**	**5.64**	<0.250
	12/7/2018	**1.18**	**10.2**	<0.250
	3/20/2019	<0.0200	**17.1**	<0.250
	6/7/2019	<0.0200	**15.1**	<0.250
	9/27/2019	**2.04**	**3.90**	<0.250
	12/4/2019	**0.212**	**11.5**	<0.250
MW-5	11/7/2017	**2.86**	<0.10	<0.10
	3/21/2018	<0.05	**2.63**	<0.10
	6/29/2018	**0.819**	<0.10	<0.10
	9/27/2018	**9.55**	<0.250	<0.250
	12/7/2018	**1.22**	<0.250	<0.250
	3/26/2019	**2.40**	**0.866**	<0.250
	6/7/2019	**2.94**	<0.250	<0.250
	12/4/2019	**0.570**	<0.250	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-6	11/7/2017	**0.608**	**0.35**	<0.10
	7/1/2018	**4.17**	<0.10	<0.10
	9/25/2018	**4.30**	<0.250	<0.250
	3/20/2019	**5.17**	**0.738**	<0.250
	6/5/2019	**0.964**	**0.883**	<0.250
	9/27/2019	**6.36**	<0.250	<0.250
	12/4/2019	**2.18**	<0.250	<0.250
MW-7	2/6/2007	**3.00**	**60.7**	< 0.100
	6/10/2008	**4.89**	**67.5**	**0.1**
	3/23/2009	**11**	**56**	<0.10
	3/16/2010	**2.4**	**99**	<0.50
	6/7/2011	--	**140**	<0.10
	12/9/2011	--	<0.50	<0.10
	11/7/2017	**9.09**	<0.10	<0.10
	3/21/2018	**13.4**	<0.10	<0.10
	3/21/2018 DUP	**16.9**	<0.10	<0.10
	6/29/2018	**7.9**	**10.8**	0.10
	9/27/2018	**16.7**	<0.250	<0.250
	12/7/2018	**22.4**	**13.3**	<0.250
	12/7/2018 DUP	**22.1**	**13.5**	<0.250
	3/20/2019	**34.5**	**13.1**	<0.250
	3/20/2019 DUP	**33.7**	**13.4**	<0.250
	6/5/2019	**16.6**	**30.4**	<0.250
	6/5/2019 DUP	**17.0**	**30.3**	<0.250
	9/26/2019	**19.8**	**11.5**	<0.250
	9/26/2019 DUP	**20.3**	**11.5**	<0.250
	12/3/2019	**33.1**	**47.4**	<0.250
	12/3/19 DUP	**34.9**	**49.7**	<0.250
MW-8	6/10/2008	<0.0500	**167**	<0.1
	11/6/2017	<0.050	**207**	<0.10
	3/19/2018	<0.40	**284**	<0.10
	6/29/2018	<0.050	**333**	<0.10
	9/25/2018	<0.0200	**235**	<0.250
	12/7/2018	**0.0230**	**260**	<0.250
	3/22/2019	**0.0350**	**544**	<0.250
	6/3/2019	<0.0200	**176**	<0.250
	12/3/2019	<0.0200	**276 E**	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-9	9/21/2010	**1.4**	**89**	<0.10
	11/9/2017	**17.4**	**559**	<0.10
	3/21/2018	<0.050	**230**	<0.10
	6/29/2018	**14.2**	**382**	**0.61**
	9/27/2018	**17.0**	**468**	<0.250
	12/7/2018	**5.60**	**311**	<0.250
	3/20/2019	**0.198**	**173**	<0.250
	6/7/2019	**0.022**	**125**	<0.250
	9/26/2019	**0.680**	**138**	<0.250
	12/3/2019	**0.618**	**101**	<0.250
MW-10	11/6/2017	**35.6**	**333**	**0.270**
	6/29/2018	**29.0**	**486**	<0.10
	9/25/2018	**37.2**	**413**	<0.250
	9/25/2018 DUP	**38.0**	**412**	<0.250
	3/21/2019	**45.0**	**412**	<0.250
	6/6/2019	**36.5**	**363**	**0.463**
	9/25/2019	**37.3**	**429**	<0.5
	12/4/2019	**36.6**	**460**	<0.250
MW-12	10/19/2010	--	**59**	--
	6/7/2011	--	**1.1**	<0.10
	12/7/2011	--	**67**	<0.10
	9/22/2015	**110**	**47**	--
	11/9/2017	**55.4**	**0.57**	<0.25
	3/20/2018	**39.4**	<0.10	<0.10
	3/20/2018 DUP	**39.9**	<0.10	<0.10
	7/1/2018	**33.0**	<0.10	<0.10
	9/25/2018	**126**	<0.250	<0.250
	9/25/2018 DUP	**129**	<0.250	<0.250
	12/4/2018	**37.2**	**82.2**	**0.487**
	12/4/2018 DUP	**37.1**	**80.0**	**0.526**
	3/20/2019	**53.2**	<0.250	<0.250
	3/20/2019 DUP	**48.2**	<0.250	<0.250
	6/5/2019	**19.8**	**2.34**	<0.250
	6/5/2019 DUP	**22.4**	**2.32**	<0.250
	9/26/2019	**107**	**0.371**	<0.250
	9/26/2019 DUP	**122**	**0.383**	<0.250
	12/4/2019	**22.8**	**36.4**	<0.250
	12/4/19 DUP	**20.2**	**35.6**	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-13	9/22/2015	**48**	**135**	--
	11/7/2017	**35.0**	**0.52**	<0.10
	3/20/2018	**191**	<0.10	<0.10
	7/1/2018	**23.5**	<0.10	<0.10
	9/25/2018	**37.7**	<0.250	<0.250
	12/5/2018	**49.8**	<0.250	<0.250
	3/19/2019	**110**	<0.250	<0.250
	6/6/2019	**78.5**	<0.250	<0.250
	9/26/2019	**76.2**	<0.250	<0.250
	12/3/2019	**63.2**	<0.250	<0.250
MW-14	11/8/2017	**34.7**	**50.3**	<1.0
	3/20/2018	**50.7**	**17.1**	<0.10
	6/28/2018	**31.6**	**104**	<2.5
	9/26/2018	**41.0**	**150**	<0.250
	12/5/2018	**53.7**	**75.5**	<0.250
	3/19/2019	**190**	**51.3**	<0.250
	6/6/2019	**33.9**	**28.6**	**0.958**
	9/25/2019	**29.6**	**145**	<0.250
	12/4/2019	**245**	**85.5**	<0.250
MW-15	11/6/2017	<0.050	**9.78**	<0.10
	7/2/2018	<0.050	**6.06**	<0.10
	6/6/2019	<0.0200	**2.42**	<0.25
MW-16	11/6/2017	<0.050	**9.95**	<0.10
	3/19/2018	<0.40	**15.7**	<0.10
	7/2/2018	<0.050	**19.4**	<0.10
	9/25/2018	<0.0200	**6.10**	<0.250
	12/6/2018	<0.0200	**10.2**	<0.250
	3/22/2019	**5.31**	**7.90**	<0.250
	6/4/2019	<0.0200	**8.58**	<0.250
	9/25/2019	<0.0200	**7.15**	<0.250
	12/3/2019	<0.0200	**7.93**	<0.250
MW-17	11/8/2017	**0.634**	**43.4**	<1.0
	6/28/2018	<0.050	**7.84**	<0.10
	9/26/2018	**2.13**	**0.760**	<0.250
	3/19/2019	**5.77**	**25.3**	<0.250
	6/6/2019	**0.119**	**24.7**	<0.250
	9/26/2019	**2.12**	**1.10**	<0.250
	12/3/2019	**0.353**	**15.9**	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-18i	6/10/2008	<0.0500	**0.35**	<0.1
	11/7/2017	<0.050	**1.07**	<0.10
	3/21/2018	<0.050	**0.75**	<0.10
	7/2/2018	<0.050	**1.13**	<0.10
	9/27/2018	<0.0200	**1.00**	<0.250
	12/6/2018	<0.0200	**0.715**	<0.250
	3/21/2019	<0.0200	**0.509**	<0.250
	6/3/2019	<0.0200	**0.755**	<0.250
	9/25/2019	<0.0200	**0.831**	<0.250
	12/3/2019	<0.0200	**0.846**	<0.250
MW-19	10/19/2010	--	**19**	--
	9/22/2015	**46**	**135**	--
	11/9/2017	**80**	**41**	<1.0
	3/21/2018	**150**	**47.8**	<0.10
	3/21/2018 DUP	**152**	**46.5**	<0.10
	6/28/2018	**194**	<0.10	<0.10
	9/25/2018	**122**	**120**	<0.250
	9/25/2018 DUP	**125**	**121**	<0.250
	12/5/2018	**188**	**118**	<0.250
	12/5/2018 DUP	**188**	**119**	<0.250
	3/20/2019	**242**	**195**	<0.250
	3/20/2019 DUP	**192**	**191**	<0.250
	6/7/2019	**145**	**34.8**	**1.06**
	9/26/2019	**113**	**232**	<0.250
	9/26/2019 DUP	**119**	**233**	<0.250
	12/3/2019	**131**	**129**	<0.250
	12/3/2019 DUP	**125**	**136**	<0.250
MW-19i	11/8/2017	**0.236**	<0.10	<0.10
	3/20/2018	<0.40	<0.10	<0.10
	7/2/2018	**0.158**	<0.10	<0.10
	9/27/2018	**0.213**	<0.250	<0.250
	12/6/2018	**0.240**	<0.250	<0.250
	3/25/2019	**0.212**	<0.250	<0.250
	6/3/2019	**0.178**	<0.250	<0.250
	12/4/2019	**0.169**	<0.250	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-20i	11/7/2017	**0.125**	**0.28**	<0.10
	3/21/2018	**1.01**	**1.06**	<0.10
	7/2/2018	**0.115**	**0.37**	<0.10
	9/25/2018	**0.244**	**1.11**	<0.250
	12/6/2018	<0.0200	<0.250	<0.250
	3/22/2019	**0.0270**	**0.261**	<0.250
	6/3/2019	**0.353**	**1.77**	<0.250
	9/25/2019	<0.0200	**0.617**	<0.250
	12/3/2019	**0.0300**	**1.84**	<0.250
MW-21i-40	6/10/2008	**0.0594**	<0.100	<0.100
	11/8/2017	<0.050	**1.90**	<1.0
	3/22/2018	**0.071**	**1.70**	<0.10
	6/29/2018	<0.050	**5.12**	<1.0
	9/27/2018	<0.0200	**3.61**	<0.250
	12/6/2018	<0.0200	**3.16**	<0.250
	3/21/2019	**0.0360**	**3.41**	<0.250
	6/3/2019	<0.0200	**1.49**	<0.250
	9/25/2019	<0.0200	**3.49**	<0.250
	12/3/2019	<0.0200	**4.61**	<0.250
MW-21i-105	6/10/2008	**0.0645**	<0.100	<0.100
	11/8/2017	<0.050	**1.6**	<1.0
	3/22/2018	**13.0**	**15.8**	**0.10**
	6/29/2018	**12.3**	**13.1**	<0.10
	9/26/2018	**0.409**	**0.759**	<0.250
	12/6/2018	**3.05**	**5.29**	<0.250
	3/21/2019	**49.6**	**0.755**	<0.250
	6/6/2019	**45.7**	**7.57**	**1.25**
	9/25/2019	**28.3**	**4.46**	**1.81**
	12/4/2019	**42.5**	**4.15**	**2.11**
MW-22i	11/7/2017	**0.354**	<1.0	<1.0
	3/22/2018	**1.25**	**0.63**	<0.10
	6/29/2018	**0.469**	<1.0	<1.0
	9/26/2018	**0.369**	<0.250	<0.250
	12/5/2018	**0.378**	<0.250	<0.250
	3/21/2019	**0.448**	<0.250	<0.250
	6/6/2019	**0.329**	<0.250	<0.250
	9/25/2019	**0.339**	<0.250	<0.250
	12/4/2019	**0.395**	<0.250	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-23i	6/10/2008	<0.0500	**0.440**	<0.100
	11/8/2017	<0.0500	**0.78**	<0.100
	3/21/2018	<0.0500	**0.72**	<0.100
	6/28/2018	<0.0500	**0.53**	<0.100
	9/27/2018	<0.0200	**1.04**	<0.250
	12/6/2018	<0.0200	**0.520**	<0.250
	3/22/2019	<0.0200	**0.592**	<0.250
	6/3/2019	<0.0200	**0.604**	<0.250
	12/4/2019	<0.0200	**0.534**	<0.250
MW-24i	6/7/2011	--	**0.50**	<0.10
	12/7/2011	--	**1.6**	<0.10
	11/9/2017	<0.050	**3.09**	<0.10
	3/21/2018	**0.687**	**7.36**	<0.10
	6/28/2018	<0.050	**2.37**	<0.050
	9/27/2018	<0.0200	**7.56**	<0.250
	12/4/2018	**0.0670**	**2.97**	<0.250
	3/25/2019	**0.0200**	**4.07**	<0.250
	6/7/2019	<0.0200	**2.19**	<0.250
	9/27/2019	**0.116**	<0.250	<0.250
	12/3/2019	<0.0200	**2.86**	<0.250
MW-24d	11/6/2017	**0.153**	<0.10	<0.10
	3/20/2018	<0.40	<0.10	<0.10
	6/27/2018	**0.160**	<0.10	<0.050
	9/28/2018	**0.145**	<0.250	<0.250
	12/10/2018	**0.993**	<0.250	<0.250
	3/25/2019	**0.147**	<0.250	<0.250
	6/4/2019	**0.131**	<0.250	<0.250
	9/27/2019	**0.050**	**3.76**	<0.250
	12/3/2019	**0.142**	<0.250	<0.250
MW-25i	11/8/2017	**0.138**	**0.53**	<0.25
	3/21/2018	<0.050	**0.40**	<0.10
	6/29/2018	<0.050	**0.27**	<0.10
	9/27/2018	<0.0200	**0.775**	<0.250
	12/6/2018	<0.0200	**0.541**	<0.250
	3/22/2019	**0.0250**	**0.0389**	<0.250
	6/3/2019	<0.0200	**0.383**	<0.250
	9/25/2019	<0.0200	**0.710**	<0.250
	12/3/2019	<0.0200	**0.405**	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-26	11/8/2017	**34.1**	**101**	<2.5
	3/20/2018	**30.0**	**271**	<0.25
	6/29/2018	**22.4**	**213**	<0.10
	9/24/2018	**30.2**	**212**	<0.250
	12/5/2018	**35.3**	**152**	<0.250
	3/22/2019	**60.6**	**544**	<0.250
	6/3/2019	**41.3**	**476**	<0.250
	9/26/2019	**32.4**	**383**	<0.500
	12/3/2019	**24.7**	**279**	<0.250
MW-32i	11/10/2017	<0.050	**1.33**	<0.10
MW-32s	11/10/2017	**0.235**	**0.58**	<0.10
	3/22/2018	<0.050	**0.16**	<0.10
	10/1/2018	<0.0200	<0.250	<0.250
	12/10/2018	**0.0690**	**1.81**	<0.250
	3/25/2019	<0.0200	<0.250	<0.250
	9/26/2019	**0.0630**	<0.250	<0.25
EW-1	11/9/2017	<0.050	**0.50**	<0.10
	7/1/2018	<0.050	**2.91**	<0.10
	9/27/2018	<0.0200	**0.686**	<0.250
	3/25/2019	<0.0200	**3.69**	<0.250
	6/4/2019	<0.0200	**3.42**	<0.250
	12/4/2019	<0.0200	**0.708**	<0.250
S-1	11/8/2017	**7.13**	**4.14**	<0.10
	3/20/2018	**35.5**	**11.4**	**0.24**
	6/28/2018	<1.3	**3.02**	<0.10
	9/26/2018	**0.259**	**3.03**	<0.250
	12/5/2018	<0.0200	**2.16**	<0.250
	3/19/2019	**0.846**	**3.35**	<0.250
	6/5/2019	**0.141**	**1.95**	<0.250
	9/25/2019	<0.0200	**3.72**	<0.250
	12/4/2019	<0.0200	**2.04**	<0.250
S-2	11/8/2017	**5.64**	**1.05**	<0.10
	3/20/2018	**6.1**	**1.25**	<0.10
	6/28/2018	**8.05**	**3.28**	**0.054**
	9/26/2018	**7.55**	**5.93**	<0.250
	12/5/2018	**7.76**	<0.250	<0.250
	3/19/2019	**25.6**	**3.23**	**0.259**
	6/5/2019	**6.06**	<0.250	<0.250
	9/25/2019	**0.691**	**1.77**	<0.250
	12/4/2019	**6.83**	**0.408**	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MGMS1-3(43)	10/19/2010	--	**390**	--
	11/7/2017	**217**	**120**	<1.0
	3/22/2018	**214**	<0.10	<0.10
	7/1/2018	**198**	<0.10	<0.10
	9/28/2018	**240**	**75.8**	<0.250
	12/4/2018	**246**	**30.6**	<0.250
	3/26/2019	**238**	**13.5**	<0.250
	6/7/2019	**209**	<0.25	<0.250
	9/27/2019	**233**	**84.1**	<0.250
	12/4/2019	**216**	**45.3**	<0.250
MGMS1-2(60)	11/7/2017	<0.050	**1.91**	<0.10
	3/22/2018	**0.054**	**3.18**	<0.10
	7/1/2018	<0.050	**1.83**	<0.10
	10/1/2018	<0.0200	**3.65**	<0.250
	12/4/2018	**0.104**	**0.697**	<0.250
	3/26/2019	<0.0200	**1.39**	<0.250
	6/7/2019	<0.0200	**1.08**	<0.250
	9/27/2019	<0.0200	**2.58**	<0.250
	12/4/2019	<0.0200	**0.732**	<0.250
MGMS1-1(110)	11/7/2017	**0.822**	**0.73**	<0.10
	7/1/2018	**0.134**	**0.11**	<0.10
	10/1/2018	**0.595**	**0.898**	<0.250
	6/7/2019	**0.179**	**0.533**	<0.250
	12/4/2019	**0.225**	**0.587**	<0.250
MGMS2-4(40)	9/21/2010	**130**	**560**	<0.10
	6/7/2011	--	**200**	<0.10
	12/7/2011	--	**8.0**	<0.10
	11/9/2017	**87.1**	<0.10	<0.10
	3/22/2018	**84.2**	<0.10	<0.10
	7/1/2018	**83.6**	**0.76**	<0.10
	9/28/2018	**85.2**	**9.38**	<0.250
	12/10/2018	**80.7**	<0.250	<0.250
	3/25/2019	**85.2**	<0.250	<0.250
	6/4/2019	**78.7**	<0.250	<0.250
	9/27/2019	**78.9**	**1.34**	<0.250
	12/4/2019	**76.1**	<0.250	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MGMS2-3(60)	11/9/2017	**1.03**	**0.12**	<0.10
	3/22/2018	**0.153**	**0.68**	<0.10
	7/1/2018	<0.050	**0.77**	<0.10
	12/10/2018	**1.39**	<0.250	<0.250
	3/25/2019	**0.407**	<0.250	<0.250
	6/4/2019	<0.0200	**0.852**	<0.250
	9/27/2019	**0.719**	<0.250	<0.250
	12/4/2019	**1.15**	<0.250	<0.250
MGMS2-2(110)	11/9/2017	<0.050	**0.37**	<0.10
	7/1/2018	**0.050**	**0.28**	<0.10
	9/28/2018	<0.0200	**0.412**	<0.250
	6/4/2019	<0.0200	**0.402**	<0.250
	12/4/2019	<0.0200	**0.400**	<0.250
MGMS2-1(132)	11/9/2017	<0.050	<0.10	<0.10
	7/1/2018	<0.050	<0.10	<0.10
	9/28/2018	**0.0500**	<0.250	<0.250
	6/4/2019	<0.0200	<0.250	<0.250
	12/4/2019	<0.0200	<0.250	<0.250
MGMS3-4(40)	9/22/2015	**1.1**	**<.10**	--
	11/10/2017	**1.71**	<0.10	<0.10
	3/22/2018	**1.55**	<0.10	<0.10
	7/1/2018	**0.971**	<0.10	<0.10
	9/28/2018	**1.71**	<0.250	<0.250
	9/28/2018 DUP	**1.68**	<0.250	<0.250
	12/10/2018	**1.04**	<0.250	<0.250
	3/26/2019	**2.67**	<0.250	<0.250
	6/3/2019	**1.31**	<0.250	<0.250
	6/3/2019 DUP	**1.32**	<0.250	<0.250
	6/3/2019 DUP	**1.32**	<0.250	<0.250
	9/27/2019	**1.14**	<0.250	<0.250
	9/27/2019 DUP	**1.26**	<0.250	<0.250
	12/4/2019	**0.906**	<0.250	<0.250
	12/4/19 DUP	**0.918**	<0.250	<0.250

Please refer to notes at end of table

Cascadia Associates, LLC

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MGMS3-3(60)	11/10/2017	<0.050	<0.10	<0.10
	3/22/2018	**0.272**	**0.39**	<0.10
	7/1/2018	**0.100**	**0.29**	<0.10
	9/28/2018	<0.0200	**0.393**	<0.250
	12/10/2018	<0.0200	<0.250	<0.250
	3/26/2019	<0.0200	**0.495**	<0.250
	6/3/2019	<0.0200	**0.371**	<0.250
	9/27/2019	<0.0200	<0.250	<0.250
	12/4/2019	<0.0200	**0.364**	<0.250
MGMS3-2(110)	11/10/2017	<0.050	**0.48**	<0.10
	7/1/2018	<0.050	**0.43**	<0.10
	9/28/2018	<0.0200	**0.506**	<0.250
	6/3/2019	<0.0200	**0.467**	<0.250
	12/4/2019	<0.0200	**0.451**	<0.250
MGMS3-1(132)	11/10/2017	<0.050	**0.52**	<0.10
	7/1/2018	<0.050	**0.46**	<0.10
	9/28/2018	<0.0200	**0.468**	<0.250
	6/5/2019	<0.0200	**0.560**	<0.250
	12/4/2019	<0.0200	**0.629**	<0.250
MP-1	2/6/2007	**42.4**	**247**	**0.18**
	3/23/2009	**35**	**210**	**1.2**
	3/16/2010	**37**	**990**	**0.76**
	6/7/2011	--	**160**	<0.10
	12/9/2011	--	**120**	**0.91**
	11/9/2017	**12.2**	**23.0**	<0.50
	3/21/2018	**7.13**	**37.8**	<0.10
	6/28/2018	**8.71**	**38.2**	<0.10
	9/26/2018	**10.9**	**113**	<0.250
	12/4/2018	**6.01**	**80.8**	<0.250
	3/20/2019	**7.05**	**77.6**	<0.250
	6/7/2019	**8.24**	**61.6**	**0.366**
	9/26/2019	**2.15**	**97.7**	**0.384**
	12/3/2019	**2.39**	**118**	<0.250
MP-3	6/28/2018	**18.8**	**138**	**0.42**

Notes:

1. Milligrams per liter (mg/L) = parts per million (ppm).
2. **Bold** value represents detected concentration of listed analyte.
3. -- = Not sampled or not analyzed.
4. < = Not detected at or above the specified laboratory method reporting limit (MRL).
5. Ammonia as nitrogen by Method 350.1.
6. Nitrate as nitrogen and nitrite as nitrogen by Method 300.0.
7. E = Estimated value.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-7	2/6/2007	**31,500**	**352**	<100	<100	<100	N/A	<100	<100	<100	<100	<1.0	1.20	245.7
	12/16/2008	**15,000**	**450**	**130**	<50	<50	N/A	<50	<50	<50	<50	**2.4**	0.72	-103.2
	3/23/2009	**3,300**	**270**	**420**	<15.0	<15.0	N/A	<15.0	<15.0	<0.50	<15.0	**6.7**	0.69	-614.5
	6/18/2009	**890**	**350**	**520**	<3.0	<3.0	N/A	<3.0	**3.7**	<3.0	**5.2**	N/A	6.97	-16.4
	9/18/2009	**2,600**	**250**	**930**	<3.0	<3.0	<1.0	**5.5**	**9.8**	<3.0	**10**	**4.1**	0.59	121.7
	12/18/2009	**1,600**	**160**	**330**	<5.0	<5.0	<1.0	<5.0	**6.7**	<5.0	**6.7**	**2.5**	1.23	162.1
	3/16/2010	**550**	**56**	**180**	<2.0	<2.0	<1.0	<2.0	<2.0	<2.0	**2.0**	**2.6**	1.37	147.7
	6/17/2010	**200**	**72**	**360**	<1.5	<1.5	<1.0	<1.5	<1.5	<1.5	**2.7**	**2.8**	1.86	240.0
	9/23/2010	**750**	**110**	**690**	<3.0	**4.8**	<1.0	<3.0	**3.3**	<3.0	**3.5**	**8.2**	0.64	-483.4
	12/10/2010	**220**	**36**	**94**	<0.90	**1.7**	**1.19**	<0.90	**1.8**	<0.90	**1.6**	**0.84**	6.29	111.6
	3/11/2011	**420**	**82**	**150**	**0.91**	**9.3**	**7.76**	**1.6**	**6.6**	<0.90	**5.1**	**1.10**	6.65	132.3
	6/7/2011	**430**	**110**	**1,400**	**3.3**	**7.9**	<1.0	**3.4**	**4.8**	<2.5	**4.0**	**4.7**	0.45	108.6
	9/19/2011	**410**	**84**	**1,300**	<5.0	**78**	N/A	<5.0	<5.0	<5.0	<5.0	**3,400**	4.53	695.8
	12/9/2011	**200**	**32**	**3,400**	**6.8**	**110**	**38.7**	**6.9**	**8.0**	<5.0	<5.0	**1,600**	1.19	-117.5
	3/12/2012	**41**	**8.6**	**1,600**	<5.0	**600**	**71**	<5.0	**9.2**	<5.0	<5.0	**1,000**	2.97	96.8
	06/22/2012	**25**	**5.2**	**500**	<2.0	**290**	**130**	<2.0	**9.0**	<2.0	<2.0	**790**	6.28	-137.9
	9/14/2012	**28**	**5.2**	**180**	**0.70**	**80**	**47**	**0.54**	**3.8**	<0.50	<0.50	**790**	2.29	93.3
	12/14/2012	**11**	**6.8**	**130**	<0.50	**18**	**19.5**	<0.50	**1.9**	<0.50	<0.50	**550**	0.34	24.1
	3/15/2013	**1.6**	**0.78**	**110**	<0.50	**11**	**13.3**	<0.50	**0.69**	<0.50	<0.50	**250**	1.02	53.3
	6/14/2013	**1.6**	<0.50	**58**	<0.50	**16**	**5.86**	<0.50	**0.51**	<0.50	<0.50	**220**	0.29	47.9
	9/20/2013	<0.50	<0.50	**56**	<0.50	**10**	**18.6**	<0.50	**1.5**	<0.50	<0.50	**270**	0.45	-189.3
	12/16/2013	**0.51**	<0.50	**6.9**	<0.50	**9.1**	**5.0**	<0.50	**2.9**	<0.50	<0.50	**250**	0.44	-66.1
	3/24/2014	**9.8**	**2.6**	**13**	<0.50	**7.6**	**220**	<0.50	**1.6**	<0.50	<0.50	**77**	0.43	76.9
	6/25/2014	<0.50	<0.50	**0.62**	<0.50	**1.4**	**21.9**	<0.50	**0.19**	<0.50	<0.50	**120**	0.6	-90.5
	9/30/2014	<0.50	<0.50	**4.5**	<0.50	**9.8**	<1.0	<0.50	**2.7**	<0.50	<0.50	**160**	1.93	-112.0
	12/15/2014	**0.61**	**1.5**	**16**	<0.50	**21**	<1.0	<0.50	**4.5**	<0.50	<0.50	**28.5**	1.61	-34.0
	3/20/2015	<0.50	**1.1**	**8.4**	<0.50	**1.0**	<6.2	<0.50	**1.0**	<0.50	<0.50	**23.5**	1.19	-76.8
	6/17/2015	**1.2**	**1.0**	**12**	<0.50	**12.6**	<10.0	<0.50	**2.6**	<0.50	<0.50	**46**	0.81	-4.9
	9/23/2015	**4.5**	**4.2**	**12.7**	<0.50	**4.8**	<10.0	<0.50	**1.8**	<0.50	<0.50	**40.6**	0.87	-30.5
	12/8/2015	**0.94**	**1.7**	**4.1**	<0.50	**1.9**	<10.0	<0.50	<0.50	<0.50	<0.50	**9.8**	1.98	84.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride	Ethene	1,1-Dichloroethene	1,1-Dichloroethane	1,2-Dichloroethane	1,1,1-Trichloroethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-7 (continued)	6/17/2016	**0.69**	**2.1**	**10.9**	<0.50	**5.4**	<10.0	<0.50	**0.60**	<0.50	<0.50	**18.9**	1.67	-120.1
	9/29/2016	<0.50	**6.0**	**10.9**	<0.50	**5.5**	N/A	<0.50	**1.1**	<0.50	<0.50	N/A	0.96	164.1
	12/14/2016	**0.78**	<0.50	**9.4**	<0.50	**1.0**	N/A	<0.50	<0.50	<0.50	<0.50	N/A	1.13	5.6
	3/28/2017	**1.2**	**0.73**	<0.50	<0.50	<0.50	N/A	<0.50	<0.50	<0.50	<0.50	N/A	0.89	-25.4
	6/14/2017	<0.50	**0.55**	**2.5**	<0.50	**2.5**	<10.0	<0.50	<0.50	<1.0	<0.50	**9.1**	1.08	-60.5
	9/27/2017	**2.6**	**1.60**	**1.7**	<0.50	**1.7**	<10.0	<0.50	<0.50	<1.0	<0.50	**7.8**	1.75	110.2
	11/7/2017	**6.3**	**7.8**	**2.6**	<0.50	**1.5**	<10.0	<0.50	<0.50	<0.50	<0.50	**3.1**	2.65	68.6
	3/21/2018	**0.228 J**	**2.86**	**17.6**	<0.500	**4.93**	<13.0	<0.500	**0.495 J**	<0.500	<0.500	**9.96**	6.03	10.5
	6/29/2018	**9.89**	**3.53**	**5.50**	<0.500	**1.47**	<10.0	<0.500	**0.461 J**	<0.500	<0.500	**5.0**	0.56	187.5
	9/27/2018	**6.50**	**10.8**	**8.48**	<0.400	**2.08**	N/A	<0.400	**1.23**	<0.400	<0.400	N/A	1.21	-9.0
	12/7/2018	**30.4**	**18.1**	**17.7**	<0.400	**1.62**	N/A	**0.472**	**3.97**	<0.400	<0.400	N/A	1.89	18.5
	3/20/2019	**22.8**	**10.8**	**22.2**	<0.400	**0.605**	<1.0	<0.400	**1.87**	<0.400	<0.400	**9.07**	3.20	93.4
	6/5/2019	**28.4**	**12.7**	**20.2**	<0.400	**1.15**	<1.0	**0.559**	**2.91**	<0.400	<0.400	**4.77**	6.02	92.2
	9/26/2019	**41.7**	**17.9**	**21.0**	<0.400	**0.420**	N/A	**0.672**	**2.98**	<0.400	<0.400	N/A	0.67	182.9
	12/3/2019	**66.1**	**31.8**	**29.7**	<0.400	<0.400	<1.0	**0.839**	**4.61**	<0.400	<0.400	**7.51**	6.61	194.0
MP-1	2/6/2007	**1,610**	**421**	**347**	**8.5**	**23.6**	N/A	<5.0	**18.4**	<5.0	**11.2**	< 1.00	0.39	208.9
	12/16/2008	**1,600**	**230**	**70**	<5.0	<5.0	N/A	<5.0	**<5.0**	<5.0	**10**	**1.80**	1.37	-78.5
	3/23/2009	**1,200**	**180**	**89**	<4.0	<4.0	N/A	<4.0	**6.0**	<4.0	**10**	**2.0**	1.05	127.3
	6/18/2009	**1,500**	**180**	**43**	<4.0	<4.0	N/A	<4.0	**4.3**	<4.0	**12**	N/A	3.65	-43.7
	9/18/2009	**1,100**	**310**	**240**	**8.9**	**7.3**	<1.0	<0.40	**14**	<4.0	**8.2**	**1.50**	0.48	99.7
	12/18/2009	**1,000**	**180**	**58**	<4.0	<4.0	<1.0	<4.0	<4.0	<4.0	**7.1**	**1.60**	0.78	155.3
	3/16/2010	**1,500**	**400**	**410**	**13**	**10**	**2.47**	**4.7**	**22**	<3.0	**8.6**	**2.4**	0.89	83.2
	6/17/2010	**800**	**140**	**120**	<3.0	<3.0	<1.0	<3.0	**3.2**	<3.0	**5.4**	**2.4**	3.22	228.3
	9/23/2010	**730**	**120**	**41**	<3.0	<3.0	<1.0	<3.0	<3.0	<3.0	**4.0**	**2.0**	0.53	-464.0
	12/10/2010	**1,000**	**150**	**27**	<3.0	<3.0	<1.0	<3.0	<3.0	<3.0	**4.5**	**1.0**	0.52	-4.6
	3/14/2011	**1,200**	**180**	**150**	<3.0	**5.9**	<0.0010	<3.0	**7.1**	<3.0	**6.4**	**0.96**	1.35	159.6
	6/7/2011	**640**	**130**	**75**	<2.5	<2.5	<1.0	<2.5	**4.9**	<2.5	**3.3**	**1.6**	0.52	48.9
	9/19/2011	**30**	**72**	**4.1**	<1.5	**1.6**	NA	<1.5	**2.4**	<1.5	**1.9**	**3.7**	0.69	913.5
	12/9/2011	**640**	**120**	**49**	**3.1**	<2.5	**3.28**	<2.5	**2.6**	<2.5	**3.1**	**8.3**	0.83	-51.7
	3/9/2012	**490**	**140**	**440**	**6.3**	**21**	**15.9**	**2.8**	**9.4**	<1.5	**3.5**	**16**	0.23	77.7
	6/22/2012	**690**	**120**	**530**	**2.9**	**48**	**66.6**	**2.8**	**5.6**	<2.5	**12**	**26**	0.83	-51.7
	9/14/2012	**340**	**83**	**170**	**2.2**	**4.5**	**16**	<1.5	**4.0**	<1.5	**2.0**	**23**	0.43	98.2
	12/14/2012	**230**	**48**	**170**	**1.7**	**1.8**	**21.1**	<0.90	**2.0**	<0.90	**1.0**	**18**	0.28	-15.2

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MP-1 (continued)	3/15/2013	**230**	**69**	**140**	**2.5**	**1.8**	**5.86**	**0.94**	**5.1**	<0.90	**1.0**	**35**	0.44	60.4
	6/14/2013	**330**	**70**	**190**	**1.6**	**1.8**	**2.96**	**1.4**	**4.5**	<0.90	**1.4**	**28**	0.34	187.2
	9/20/2013	**260**	**66**	**77**	**1.5**	<0.90	**3.17**	<0.90	**2.9**	<0.90	**0.95**	**35**	0.44	1.2
	12/16/2013	**290**	**70**	**67**	**0.92**	<0.90	<1.0	**1.1**	**1.7**	<0.90	**1.2**	**26**	1.10	10.3
	3/24/2014	**360**	**54**	**240**	<1.5	<1.5	**33**	<1.5	**2.2**	<1.5	**1.8**	**38**	0.69	-18.7
	6/23/2014	**1,200**	**130**	**290**	**1.7**	**5.0**	**19.6**	**2.3**	**4.9**	<1.5	**9.5**	**34**	3.00	-14.0
	9/30/2014	**360**	**63**	**110**	<2.0	**16**	<1.0	<2.0	**2.8**	<2.0	<2.0	**29**	4.09	42.3
	12/15/2014	**320**	**59**	**58**	<1.5	<1.5	<1.0	<1.5	**1.7**	<1.5	<1.5	**2.4**	0.88	-28.6
	3/20/2015	**570**	**96**	**190**	**1.5**	**25**	<6.2	**1.5**	**3.6**	<1.0	**1.0**	**7.8**	1.04	29.8
	6/18/2015	**376**	**80.8**	**91**	**0.87**	<0.84	<10.0	**1.5**	**2.9**	<0.84	<0.84	**6.0**	1.75	-148.5
	9/22/2015	**343**	**68.3**	**38.3**	<1.2	<1.2	<1.0	**1.4**	**1.8**	<1.2	<1.2	**2.2**	1.66	105.5
	12/8/2015	**308**	**62.6**	**50.9**	<1.2	<1.2	<1.0	**1.5**	**1.8**	<1.2	<1.2	**9.9**	1.20	82.8
	3/8/2016	**433**	**100**	**148**	**1.2**	<0.84	<1.0	**2.1**	**7.5**	<0.84	<0.84	**5.1**	1.13	29.5
	6/17/2016	**206**	**67.3**	**125**	**0.97**	<0.50	<10.0	**1.5**	**5.0**	<0.50	<0.50	<1.0	3.71	-8.6
	9/28/2016	**99.4**	**35.5**	**40.5**	<0.50	**3.3**	<10.0	**3.1**	**1.3**	<0.50	<0.50	**2620**	1.32	135.2
	12/13/2016	**2.9**	**1.0**	**209**	**0.55**	**4.3**	<10.0	**0.92**	**0.64**	<0.50	<0.50	**130**	3.57	12.1
	3/30/2017	<0.50	**0.79**	**177**	**6.0**	**186**	**328**	<0.50	**7.5**	<0.50	<0.50	**137**	0.79	-137.7
	6/14/2017	**16.2**	**8.5**	**143**	**1.9**	**29.4**	**83.2**	<0.50	**2.3**	<1.0	<0.50	**38.9**	0.87	-53.2
	9/26/2017	**307**	**65.9**	**83.0**	**0.83**	**2.3**	<10.0	**3.4**	**4.5**	<1.0	<0.50	**4.3**	0.93	80.5
	11/9/2017	**198**	**74.0**	**105**	**0.91**	**2.6**	<10.0	**4.3**	**3.3**	<0.50	<0.50	**3.7**	0.66	-104.8
	3/21/2018	**245**	**64.5**	**151**	**1.02**	**1.63**	<13.0	**4.04**	**3.17**	<0.500	<0.500	**8.3**	0.36	175.8
	6/28/2018	**747**	**140**	**353**	**1.74**	**5.26**	<10.0	**9.34**	**10.2**	<0.500	**0.555**	**8.2**	0.45	159.1
	9/26/2018	**322**	**57**	**60.2**	<8.00	<8.00	<1.0	<8.00	<8.00	<8.00	<8.00	**3.12**	0.99	126.4
	12/4/2018	**355**	**76.7**	**130**	**0.836**	**1.24**	<1.0	**6.59**	<0.400	**2.79**	<0.400	**6.09**	2.28	-22.7
	3/20/2019	**146**	**36.6**	**69.0**	<0.400	**1.55**	<1.0	**3.08**	**1.43**	<0.400	<0.400	**3.34**	5.86	72.6
	6/7/2019	**769**	**111**	**205**	<8.00	<8.00	<1.0	<8.00	<8.00	<8.00	<8.00	**8.2**	0.73	29.2
	9/29/2019	**176**	**26.8**	**37.1**	<0.800	<0.800	<1.0	**1.14**	**1.36**	<0.800	<0.800	**1.94**	0.70	-16.2
	12/3/2019	**306**	**57.8**	**40.6**	<0.800	<0.800	<1.0	**1.80**	**1.57**	<0.800	<0.800	**2.27**	5.01	181.8

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
EX	2/6/2007	**2,810**	**564**	**68.2**	<10.0	<10.0	N/A	<10.0	<10.0	<10.0	**40**	**1.45**	0.24	164.8
	12/16/2008	**4,500**	**830**	**490**	<15.0	<15.0	N/A	<15.0	**54**	<15.0	**71**	**3.30**	0.74	-174.5
	3/23/2009	**1,400**	**420**	**50**	<5.0	<5.0	N/A	<5.0	<5.0	<5.0	**43**	**3.0**	0.47	68.8
	6/18/2009	**24**	**11**	**4.2**	<0.50	<0.50	N/A	<0.50	<0.50	<0.50	**1.1**	N/A	0.37	-9.3
	9/18/2009	**2,100**	**380**	**120**	**0.76**	**1.1**	<1.0	**3.3**	**4.1**	<0.50	**38**	**4.9**	0.60	109.0
	12/18/2009	**700**	**56**	**5.6**	<2.5	<2.5	**55.6**	<2.5	<2.5	<2.5	**3.7**	**1.8**	2.13	170.1
	3/16/2010	**150**	**33**	**20**	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**3.2**	**2.4**	0.88	102.6
	6/17/2010	**150**	**39**	**92**	<0.50	**2.2**	<1.0	<0.50	**0.97**	<0.50	**2.3**	**3.3**	0.84	239.5
	9/23/2010	**2,400**	**220**	**90**	**0.53**	**1.8**	<1.0	**1.6**	**1.5**	<0.50	**20**	**3.6**	0.93	-521.6
	12/21/2010	**900**	**99**	**30**	<0.50	**0.71**	<1.0	**0.59**	**0.83**	<0.50	**6.7**	<0.50	0.91	131.7
	3/31/2011	**6,800**	**910**	**240**	<4.0	**5.1**	**1.91**	**8.1**	**8.2**	<4.0	**110**	**1.9**	--	--
	6/7/2011	**1,400**	**170**	**140**	<4.0	<4.0	<1.0	<4.0	<4.0	<4.0	**15**	**3.5**	0.70	115.2
	9/19/2011	**4,100**	**460**	**290**	<5.0	**14**	N/A	**11**	**7.9**	<5.0	**73**	**560**	0.63	907.9
	12/9/2011	<50	<50	**12,000**	**9.3**	**140**	**11.4**	**19**	**16**	<5.0	**17**	**320**	1.23	-68.3
	3/9/2012	**33**	**10**	**1,400**	**8.6**	**290**	**24.2**	<4.0	**5.0**	<4.0	<4.0	**89**	0.14	-33.6
	6/22/2012	**3.0**	**1.1**	**170**	**1.3**	**120**	**150**	**0.68**	**3.4**	<0.50	**0.59**	**110**	1.23	-68.3
	9/14/2012	**3.0**	<1.5	**320**	<1.5	**42**	**47.2**	<1.5	**1.5**	<1.5	<1.5	**77**	0.15	-29.5
	12/14/2012	**0.87**	<0.50	**26**	<0.50	**12**	**5.92**	<0.50	<0.50	<0.50	<0.50	**59**	0.25	3.3
	3/15/2013	**1.2**	<0.50	<0.50	<0.50	**4.4**	<1.0	<0.50	<0.50	<0.50	<0.50	**64**	0.37	67.0
	6/14/2013	**0.79**	<0.50	**1.6**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	**12**	0.54	158.8
	9/20/2013	**4.1**	**2.6**	**71**	**0.68**	**30**	**35.4**	**0.54**	**1.9**	<0.50	<0.50	**42**	0.43	-175.4
	12/16/2013	**2.0**	**1.4**	**34**	<0.50	**28**	**45.3**	<0.50	**3.8**	<0.50	<0.50	**46**	1.66	11.9
	3/24/2014	**20**	**7.5**	**30**	<0.50	**11**	**91.1**	<0.50	**0.80**	<0.50	<0.50	**35**	0.51	158.7
	6/23/2014	**29**	**15**	**160**	**0.97**	**38**	**81.5**	**1.1**	**2.9**	<0.50	<0.50	**34**	0.41	-50
	9/30/2014	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	12/15/2014	**22**	**2.7**	**10**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	**158**	2.41	-52.2
	3/19/2015	**170**	**56**	**690**	**1.9**	**2.8**	<6.2	**2.1**	**3.5**	<0.50	**2.5**	<5.0	1.05	18.2
	6/18/2015	**186**	**42**	**420**	**1.6**	**3.2**	<10.0	**2.6**	**2.6**	<0.50	**0.88**	**7.5**	2.29	-35.2
	9/22/2015	**302**	**61.9**	**543**	**2.6**	**24.4**	<1.0	**3.7**	**2.9**	<0.50	**0.65**	**22.6**	0.90	23.7
	12/8/2015	**94.4**	**21.3**	**427**	<0.50	**2.1**	<1.0	<0.50	<0.50	<0.50	<0.50	**7.5**	--	--

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride	Ethene	1,1-Dichloroethene	1,1-Dichloroethane	1,2-Dichloroethane	1,1,1-Trichloroethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
EX (continued)	3/8/2016	**274**	**71.1**	**1,160**	**3.6**	**13.3**	<1.0	**2.9**	**4.0**	<1.2	**5.0**	**22**	0.36	113.3
	6/17/2016	**592**	**90.8**	**1,040**	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	**1.2**	2.72	4.8
	9/28/2016	**39.4**	**549**	**2,230**	**3.8**	**128**	N/A	**3.5**	**4.6**	<1.7	**2.5**	N/A	1.61	138.1
	12/12/2016	**4.3**	**0.96**	**8.1**	<0.50	**51.9**	N/A	<0.50	<0.50	<0.50	<0.50	N/A	2.00	-24
	3/28/2017	**6.1**	**1.9**	**5.2**	<0.50	<0.50	**23.5**	<0.50	<0.50	<0.50	<0.50	**347**	1.50	89.9
	6/14/2017	**9.5**	**3.0**	**11.7**	**0.56**	**1.3**	**11.2**	<0.50	**10.7**	<1.0	<0.50	**14.0**	3.48	-12.4
	9/26/2017	**0.82**	**0.63**	**6.9**	<0.50	**10.1**	**17.5**	<0.50	**8.8**	<1.0	<0.50	**25.5**	1.18	-140.5
	3/21/2018	**1.48**	**2.72**	**22.6**	<0.500	**10.8**	**28.3**	<0.500	**1.34**	<0.500	<0.500	**15.4**	0.19	74.4
	6/28/2018	**1.91**	**0.758**	**722**	**8.72**	**424**	**99.2**	**1.11**	**4.55**	<0.500	<0.500	**43.6**	0.39	-62.6
	9/24/2018	**3.07**	**2.42**	**3.38**	**0.751**	**7.56**	**2.9**	<0.400	**1.42**	<0.400	<0.400	**13.2**	1.55	150.7
	12/4/2018	**6.35**	**3.60**	**8.18**	<0.400	**1.88**	<1.0	<0.400	**0.876**	<0.400	<0.400	**11.0**	5.80	-10.0
MW-12	6/7/2011	**53**	**25**	**59**	**1.0**	<0.50	<1.0	<0.50	**1.8**	<0.50	**0.70**	**0.94**	3.16	110.4
	9/19/2011	**860**	**690**	**4,700**	**55**	**63**	NA	**45**	**240**	**2.5**	**65**	**8.3**	0.84	906.3
	12/7/2011	**520**	**380**	**2,900**	**33**	**40**	**6.15**	**28**	**130**	**1.3**	**34**	**59**	1.00	109.0
	3/12/2012	**770**	**540**	**3,800**	**45**	**46**	<1.0	**44**	**210**	<15.0	**48**	**65**	1	45.3
	6/22/2012	**270**	**200**	**1,700**	**39**	**22**	<1.0	**16**	**100**	<5.0	**13**	**56**	0.66	117.1
	9/14/2012	**1,100**	**730**	**5,400**	**73**	**84**	<1.0	**58**	**270**	<15.0	**76**	**100**	0.43	140.7
	12/13/2012	**38**	**23**	**62**	**0.97**	<0.50	<1.0	<0.50	**1.0**	<0.50	**0.53**	**4.9**	1.07	128.6
	3/15/2013	**760**	**540**	**4,300**	**56**	**54**	<1.0	**40**	**200**	**1.8**	**53**	**95**	0.62	117.3
	6/13/2013	**610**	**500**	**4,800**	**53**	**59**	<1.0	**39**	**240**	<15.0	**46**	**62**	0.39	205.2
	9/20/2013	**510**	**400**	**3,400**	**49**	**50**	<1.0	**37**	**170**	**1.6**	**37**	**110**	0.59	-10.7
	12/16/2014	**150**	**110**	**800**	**10**	**9.8**	<1.0	**7.6**	**36**	<2.5	**5.8**	**23**	1.22	40.4
	3/24/2014	**180**	**170**	**1,900**	**25**	**47**	<1.0	**18**	**110**	**0.77**	**8.6**	**41**	1.94	29.1
	6/24/2014	**42**	**34**	**310**	**2.3**	<1.5	<1.0	**1.9**	**14**	<1.5	**1.6**	**13**	3.68	1.5
	9/30/2014	**680**	**480**	**3,500**	**45**	**42**	<1.0	**39**	**190**	<15.0	**36**	**93**	6.09	47.1
	12/11/2014	**25**	**15**	**34**	**0.64**	<0.50	<1.0	<0.50	**0.73**	<0.50	<0.50	**1.9**	0.65	-110.0
	3/20/2015	**580**	**340**	**2,110**	**29**	**37**	<6.2	**25**	**102**	<5.0	**18**	**4**	0.89	75.7
	6/19/2015	**514**	**356**	**2,570**	**25**	**31.1**	<10.0	**28.2**	**151**	<10.0	**23.6**	**4.8**	0.71	10.2
	9/22/2015	**343**	**239**	**2,250**	**23.4**	**22.5**	<1.0	**16.9**	**120**	<8.3	**15.7**	**4.4**	1.06	65.3
	12/8/2015	**44.9**	**22**	**40.1**	**0.72**	<0.50	<10.0	<0.50	**0.84**	<0.50	**0.52**	**16.5**	0.99	28.1

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl chloride	Ethene	1,1-Dichloroethene	1,1-Dichloroethane	1,2-Dichloroethane	1,1,1-Trichloroethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-12 (continued)	3/8/2016	**325**	**209**	**1,380**	**16.2**	**21.3**	<10.0	**15.4**	**79.9**	<3.6	**7.7**	**5.5**	0.71	62.2
	6/16/2016	**314**	**288**	**3,310**	**31.6**	**52.3**	<10.0	**29.9**	**174**	<8.4	**12.8**	**3.7**	2.68	59.7
	9/27/2016	**387**	**163**	**867**	**11.4**	**14.8**	<10.0	**11.5**	**44**	<10.0	**3.9**	**5240**	0.98	252.5
	12/14/2016	**62.3**	**42.2**	**744**	**2.3**	**20.5**	<10.0	**4.7**	**16.5**	<10.0	<10.0	**1930**	0.46	-91.3
	3/30/2017	**55.9**	**29.6**	**1,120**	**6.1**	**28.3**	**75.2**	**3.8**	**11.4**	<2.5	<2.5	**490**	2.92	-17.9
	6/12/2017	**42.4**	**18.1**	**893 J**	**7.6**	**48.4**	**120**	**4.7**	**14.0**	<3.1	<3.1	**530**	0.91	-34.2
	9/28/2017	<1.7	<1.7	**457**	**5.4**	**47.7**	**16.0**	<1.7	**19.5**	<1.7	<1.7	**243**	1.19	-87.4
	11/9/2017	<0.50	<0.50	**22.2**	**1.6**	**49.1**	<10.0	<0.50	**4.5**	<0.50	<0.50	**326 J**	1.61	-119.0
	3/20/2018	<0.500	**0.271 J**	**5.64**	**1.33**	**2.77**	<13.0	<0.500	**0.522**	<0.500	<0.500	**89.1**	8.95	-136.3
	7/1/2018	**0.304 J**	**0.996**	**4.02**	**1.57**	**1.45**	<10.0	<0.500	**0.913**	<0.500	<0.500	**66.0**	1.77	114.3
	9/25/2018	<0.400	<0.400	**1.46**	**0.520**	**1.23**	<1.0	<0.400	**0.730**	<0.400	<0.400	**79.5**	1.27	-174.0
	12/4/2018	**1.29**	**1.29**	**4.30**	**0.415**	**1.69**	<1.0	<0.400	**0.470**	<0.400	<0.400	**36.4**	5.51	-30.5
	3/20/2019	**2.11**	**1.33**	**6.70**	**0.675**	**1.64**	<1.0	<0.400	**0.655**	<0.400	<0.400	**34.4**	2.34	-38.6
	6/5/2019	**3.64**	**3.45**	**9.36**	**0.756**	**2.74**	<1.0	<0.400	**0.719**	<0.400	<0.400	**16.6**	1.72	69.9
	9/26/2019	<0.400	**0.459**	**5.31**	**0.565**	**6.82**	**1.1**	<0.400	**6.26**	<0.400	<0.400	**46.1**	0.29	-227.1
	12/5/2019	**2.37**	**1.41**	**2.61**	<0.400	**0.413**	<1.0	<0.400	<0.400	<0.400	<0.400	**23.8**	9.18	185.3
MW-24i	6/7/2011	**6.6**	**1.4**	**2.0**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	**1.2**	6.40	59.0
	9/16/2011	**27**	**24**	**270**	**1.7**	**19**	NA	**2.5**	**13**	<0.50	**5.6**	**7.0**	0.61	646.9
	12/7/2011	**19**	**14**	**100**	<0.50	**7.5**	**2.29**	**0.84**	**5.0**	<0.50	**2.9**	**290**	3.50	-147.5
	3/12/2012	**30**	**11**	**79**	<0.50	**4.5**	**2.03**	<0.50	**5.9**	<0.50	**2.3**	**33**	2.11	-1.2
	6/22/2012	**0.85**	<0.50	**14**	<0.50	**2.6**	**1.52**	<0.50	**1.8**	<0.50	<0.50	**44**	3.50	-147.5
	9/14/2012	**31**	**20**	**58**	<0.50	<0.50	<1.0	**0.87**	**4.4**	<0.50	**0.79**	**15**	0.40	-54.0
	12/14/2012	**2.1**	**0.65**	**51**	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	**16**	2.11	6.3
	3/15/2013	**23**	**15**	**48**	<0.50	<0.50	<1.0	<0.50	**2.8**	<0.50	**0.57**	**9.5**	0.79	13.1
	6/14/2013	**6.2**	**3.6**	**28**	<0.50	<0.80	<1.0	<0.50	**2.7**	<0.50	<0.50	**11**	0.39	130.2
	9/20/2013	**15**	**5.9**	**15**	<0.50	<0.80	<1.0	<0.50	**1.0**	<0.50	<0.50	**11**	1.92	-31.2
	12/16/2013	**6.7**	**3.4**	**8.4**	<0.50	<0.50	<1.0	<0.50	**1.3**	<0.50	<0.50	**7.9**	3.08	16.9
	3/24/2014	**10**	**5.5**	**16**	<0.50	<0.80	<1.0	<0.50	**1.3**	<0.50	<0.50	**9.4**	3.16	-55.4
	6/23/2014	**1.3**	**5.2**	**13**	<0.50	**2.1**	**29.1**	<0.50	**1.2**	<0.50	<0.50	**8.4**	4.70	-49.7
	9/30/2014	**20**	**10**	**21**	<0.50	<0.50	<1.0	<0.50	**1.8**	<0.50	<0.50	**12.0**	2.01	129.7
	12/15/2014	**2.4**	**1.1**	**12**	<0.50	<0.50	<1.0	<0.50	**0.60**	<0.50	<0.50	<1.0	6.27	-13.9

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-24i (continued)	3/20/2015	**6.1**	**3.1**	**5.9**	<0.50	<0.50	<6.2	<0.50	**0.58**	<0.50	<0.50	<1.0	10.28	38.6
	6/18/2015	<0.50	<0.50	**3.4**	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**1.6**	1.08	-158.7
	9/22/2015	**2.2**	**0.8**	**4.7**	<0.50	<0.50	<1.0	<0.50	**1.9**	<0.50	<0.50	**2.3**	1.85	99.4
	12/8/2015	**189**	**36.4**	**18**	<0.50	<0.50	<1.0	<0.50	**0.74**	<0.50	<0.50	**3.5**	1.36	99.2
	3/8/2016	**4.1**	**1.6**	**3.5**	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**1.0**	1.75	47.8
	6/17/2016	**11.5**	**6.3**	**7.8**	<0.50	<0.50	<10.0	<0.50	0.99	<0.50	<0.50	<1.0	3.12	14.0
	9/28/2016	**5.8**	**3.1**	**5.4**	<0.50	<0.50	<10.0	<0.50	**0.53**	<0.50	<0.50	**5.3**	2.58	123.9
	12/12/2016	**1.1**	<0.50	<0.50	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**1.5**	5.64	2.6
	3/30/2017	**1.0**	<0.50	**0.70**	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**3.4**	5.24	14.3
	6/15/2017	**6.6**	**2.8**	**3.2**	<0.50	<0.50	<10.0	<0.50	<0.50	<1.0	<0.50	**1.2**	3.72	-13.4
	9/26/2017	**30.1**	**16.6**	**24.5**	<0.50	<0.50	<10.0	<0.50	**2.1**	<1.0	<0.50	**1.2**	1.21	-10.7
	11/9/2017	**12.7**	**5.9**	**9.6**	<0.50	<0.50	<10.0	<0.50	**1.1**	<0.50	<0.50	**1.3**	3.11	-100.1
	3/21/2018	**19.1**	**10.2**	**13.5**	<0.500	<0.500	<13.0	<0.500	**1.42**	<0.500	<0.500	**0.734 B J**	0.95	129.6
	6/28/2018	**10.3**	**5.93**	**13.6**	**1.09**	<0.500	<10.0	<0.500	**1.44**	<0.500	<0.500	<1.0	2.69	129.9
	9/27/2018	**24.8**	**14.3**	**25.0**	<0.400	<0.400	N/A	<0.400	**2.18**	<0.400	<0.400	N/A	1.67	106.3
	12/4/2018	**10.2**	**3.76**	**5.13**	<0.400	<0.400	N/A	<0.400	**0.800**	<0.400	<0.400	N/A	5.24	-6.9
	3/25/2019	**11.7**	**5.91**	**8.46**	<0.400	<0.400	<1.0	<0.400	**0.888**	<0.400	<0.400	<1.00	4.52	18.1
	6/7/2019	**7.39**	**3.55**	**4.99**	<0.400	<0.400	<1.0	<0.400	**0.601**	<0.400	<0.400	<1.00	4.39	5.8
	9/27/2019	<0.400	<0.400	<0.400	<0.400	<0.400	**1.6**	<0.400	<0.400	<0.400	<0.400	<1.00	5.30	-252.2
	12/3/2019	**8.78**	**3.72**	**3.82**	<0.400	<0.400	<1.0	<0.400	**0.775**	<0.400	<0.400	<1.00	3.09	1.3
MGMS2-40	6/7/2011	**4,400**	**1,400**	**1,600**	**17**	**48**	<1.0	**30**	**65**	<15.0	**57**	**2.2**	0.86	49.5
	9/12/2011	**790**	**380**	**7,400**	**20**	**58**	NA	**28**	**44**	<15.0	**48**	**110**	2.63	338.9
	12/7/2011	**61**	**39**	**5,300**	<15.0	**460**	**14.5**	<15.0	**35**	<15.0	<15.0	**300**	6.28	-137.9
	3/8/2012	**9.9**	**5.4**	**470**	**2.8**	**260**	**368**	**2.3**	**38**	<2.0	**5.2**	**290**	1.22	-73.6
	6/19/2012	**7.2**	**2.5**	**20**	**1.3**	**63**	**566**	<0.50	**53**	<0.50	<0.50	**500**	6.28	-137.9
	9/12/2012	**89**	**80**	**310**	**3.2**	**440**	**264**	**2.8**	**39**	<1.5	**5.0**	**140**	1.16	-40.1
	12/11/2012	**10**	**3.4**	**33**	**1.3**	**4.0**	**110**	<0.50	**4.8**	<0.50	<0.50	**280**	0.55	-82.3
	3/15/2013	**5.6**	**2.2**	**300**	**2.0**	**270**	**121**	**1.9**	**28**	<0.50	**2.5**	**81**	0.33	-24.3
	6/11/2013	**0.94**	<0.50	**7.9**	<0.50	**4.8**	**55.6**	<0.50	**8.3**	<0.50	<0.50	**110**	0.42	-116.7
	9/17/2013	**16**	**17**	**290**	**1.4**	**330**	**143**	**4.8**	**28**	<0.50	**1.6**	**98**	0.27	-209.9
	12/16/2013	**2.4**	**1.4**	**8.4**	<0.50	**3.4**	**33.3**	<0.50	**9.7**	<0.50	<0.50	**110**	1.19	-41.9
	3/24/2014	**2.6**	**1.8**	**84**	<0.50	**270**	**930**	**2.9**	**45**	<0.50	<0.50	**120**	1.06	-126.1
	6/26/2014	**21**	**22**	**88**	**0.84**	**90**	**207**	**10**	**31**	<0.50	<0.50	**120**	2.22	-23.7
	9/23/2014	**170**	**110**	**590**	**2.4**	**800**	**12.1**	**30**	**30**	<0.50	**3.2**	**94**	1.31	-119.0
	12/12/2014	**3.4**	**2.3**	**10**	<0.50	**18**	**34**	<0.50	**35**	<0.50	<0.50	**7.9**	1.41	-162.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MGMS2-40 (continued)	3/20/2015	**31**	**22**	**47**	<0.50	**17**	**8.1**	**3.9**	**4.3**	<0.50	<0.50	**8**	20.02	-83.7
	6/19/2015	**18.4**	**12.8**	**53.8**	<0.50	**48.3**	**33.7**	**1.3**	**13.8**	<0.50	<0.50	**11**	13.5	-117.5
	9/25/2015	**67.4**	**45.9**	**105**	**0.61**	**57.8**	<10.0	**4.2**	**12.3**	<0.50	**0.92**	**10.9**	9.67	-145.1
	12/8/2015	**4.0**	**2.8**	**7.2**	<0.50	**3.3**	**22.8**	<0.50	**13.5**	<0.50	<0.50	**7.9**	6.14	-96.9
	3/8/2016	**6.5**	**6.2**	**36.0**	<0.50	**36**	**63.7**	**1.6**	**20.6**	<0.50	<0.50	**7.4**	5.52	-161.7
	6/17/2016	**223**	**146**	**744**	**2.8**	**227**	**31**	**26.4**	**24.9**	<0.50	**3.1**	**3.8**	1.60	-72.2
	9/29/2016	**33.3**	**24.8**	**115**	<0.50	**142**	N/A	<0.50	**12.1**	<0.50	<0.50	N/A	5.16	194.5
	12/16/2016	**2.6**	**1.9**	**5.2**	<0.50	**2.0**	N/A	<0.50	**10.3**	<0.50	<0.50	N/A	0.80	-28.1
	3/31/2017	**4.3**	**14.4**	**236**	**0.60**	**235**	N/A	**14.3**	**57.6**	<0.50	<0.50	N/A	0.68	-92.2
	6/15/2017	**5.1**	**4.9**	**46.2**	<0.50	**98.9**	**128**	**3.5**	**38.6**	<0.50	<0.50	**7.0**	1.29	-109.6
	9/29/2017	**41.5**	**31.3**	**195**	**0.74**	**428**	**47.4**	**6.8**	**21.7**	<1.0	**0.67**	**6.4**	1.03	-43.7
	11/9/2017	**13.2**	**9.2**	**61.6**	**0.52**	**170**	**95.7**	**0.86**	**21.3**	<0.50	<0.50	**6.2**	1.24	-113.3
	3/22/2018	**46.0**	**27.3**	**109**	**0.571**	**122**	**32.7**	**4.22**	**25.9**	<0.500	**0.259 J**	**9.58**	6.89	-112.9
	7/1/2018	**62.1**	**48.9**	**151**	**0.971**	**38.2**	<10.0	**5.93**	**12.7**	<0.500	**1.04**	**5.2**	3.15	-50.8
	9/28/2018	**66.9**	**43.3**	**140**	<0.800	**106**	**3.6**	**1.44**	**8.74**	<0.800	<0.800	**5.91**	1.50	97.3
	12/10/2018	**18.7**	**12.0**	**24.9**	<0.400	**123**	**78**	**0.563**	**20.9**	<0.400	<0.400	**5.08**	2.05	-111.4
	3/25/2019	**62.0**	**35.9**	**136**	**0.752**	**155**	**26**	**2.58**	**26.6**	<0.400	<0.400	**4.61**	0.97	151.7
	6/4/2019	**14.6**	**10.4**	**37.8**	<0.400	**145**	**19**	**0.960**	**28.2**	<0.400	<0.400	**4.83**	0.64	104.5
	9/27/2019	**17.0**	**13.1**	**73.8**	<0.400	**101**	**1.4**	**0.729**	**11.2**	<0.400	<0.400	**4.76**	7.37	-133.9
	12/4/2019	**32.3**	**17.9**	**40.5**	<0.400	**65.4**	**4.2**	**0.778**	**20.6**	<0.400	<0.400	**5.01**	4.39	-82.2
MW-13	9/28/2016	**5,090**	**951**	**148**	<2.5	<2.5	<10.0	<2.5	<2.5	<2.5	<2.5	**33,600**	2.71	158.7
	12/16/2016	**1,020**	**394**	**509**	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	**2220**	0.66	-111.4
	3/30/2017	**176**	**57.6**	**101**	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	**341**	4.36	-61.8
	6/15/2017	**97.7**	**56.3**	**272**	**1.6**	**4.1**	NA	**1.2**	<1.0	<1.0	<1.0	N/A	1.41	-105.7
	9/27/2017	**3.3**	**1.3**	**3220**	**7.3**	**25.0**	<10.0	**5.0**	<1.0	<1.0	<1.0	**55.8**	2.16	-103.9
	11/7/2017	<4.2	<4.2	**1,360**	**5.4**	**25.0**	**11.6**	<4.2	<4.2	<4.2	<4.2	**85.5**	2.19	-89.2
	3/20/2018	**0.396 J**	**2.19**	**1,730**	**5.20**	**211**	**191**	**2.55**	**0.879**	<0.500	<0.500	**73.7**	5.79	-114.8
	7/1/2018	<0.500	**0.781**	**1680**	**26.9**	**2030**	**500**	**5.98**	**18.3**	**0.148 J**	<0.500	**52.9**	1.13	-31.0
	9/25/2018	**0.410**	**0.800**	**9.78**	**1.26**	**113**	**61**	<0.400	**1.91**	<0.400	<0.400	**20.8**	1.22	-146.8
	12/5/2018	**0.567**	**0.413**	**6.17**	**0.682**	**55.2**	**7.1**	<0.400	<0.400	<0.400	<0.400	**51.7**	7.71	-130.6
	3/19/2019	<0.400	**0.433**	**2.69**	<0.400	**2.02**	<1.0	<0.400	<0.400	<0.400	<0.400	**48.5**	2.58	-79.2
	6/6/2019	<0.400	**0.673**	**4.62**	<0.400	**2.89**	<1.0	<0.400	<0.400	<0.400	<0.400	**21.2**	0.02	48.4
	9/26/2019	<0.400	<0.400	**1.94**	**0.439**	**2.01**	<1.0	<0.400	**1.07**	<0.400	<0.400	**34.3**	0.50	-261.4
	12/3/2019	<0.400	<0.400	**1.06**	**0.488**	**1.42**	<1.0	<0.400	**1.50**	<0.400	<0.400	**29.1**	2.41	-149.4

Please refer to notes at end of table.

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Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-14	9/27/2016	**100**	**218**	**61.8**	**0.94**	<0.50	<10.0	**2.1**	**7.2**	<0.50	**1.7**	**8.8**	8.1	221.2
	12/13/2016	**0.56**	**0.97**	**1.3**	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**5.1**	3.1	55.0
	3/27/2017	**14.7**	**33.4**	**69.2**	<0.50	**0.62**	<10.0	**0.57**	<0.50	<0.50	<0.50	**5.1**	3.1	55.0
	6/13/2017	**58.3**	**204**	**432**	**2.7**	**2.5**	NA	**5.3**	**10**	<1.0	**2.1**	N/A	0.94	61.3
	9/26/2017	**62.4**	**265**	**279**	**2.8**	<0.84	<10.0	**2.6**	**6.2**	<0.84	**1.1**	**3.8**	1.89	80.6
	11/8/2017	**39.3**	**160**	**306**	**2.2**	**0.91**	<10.0	**2.1**	**4.5**	<0.84	<0.84	**8.5**	1.85	106.9
	3/20/2018	**36.0**	**150**	**500**	**2.56**	**1.35**	<13.0	**3.64**	**5.42**	<0.500	**0.579**	**8.76**	0.58	21.7
	6/28/2018	**34.9**	**247**	**255**	**2.52**	**0.687**	<10.0	**2.54**	**10.5**	<0.500	**1.57**	**6.6**	6.59	203.6
	9/26/2018	**84.3**	**484**	**361**	**4.50**	<4.00	<1.0	**4.40**	**12.1**	<4.00	<4.00	**4.56**	1.55	100.1
	12/5/2018	**83.4**	**260**	**333**	<4.00	<4.00	<1.0	<4.00	**5.43**	<4.00	<4.00	**13.4**	4.40	55.3
	3/19/2019	**31.4**	**178**	**223**	**2.06**	<2.00	<1.0	<2.00	**5.4**	<2.00	<2.00	**4.89**	8.17	88.6
	6/6/2019	**19.1**	**76.4**	**151**	**0.937**	<0.400	<1.0	**1.09**	**1.74**	<0.400	<0.400	**6.64**	2.96	80.3
	9/25/2019	**91.8**	**327**	**264**	**3.60**	**0.482**	<1.0	**4.58**	**12.5**	<0.400	**1.47**	**5.06**	0.77	67.5
	12/4/2019	**107**	**351**	**242**	**2.88**	<0.400	<1.0	**3.17**	**7.81**	<0.400	**0.704**	**50.0**	4.41	110.9
MW-19	9/26/2016	**1,520**	**592**	**235**	<5.0	**10.1**	<10.0	**11.0**	**10.4**	<5.0	**14.5**	**1.9**	3.27	174.4
	12/12/2016	**1,730**	**975**	**1,030**	**11.6**	**31.9**	<10.0	**14.2**	**78.7**	<5.0	**15.5**	**8.1**	9.22	175.2
	3/28/2017	**755**	**896**	**1,990**	**21.5**	**63.2**	<10.0	**26.7**	**214**	<5.0	**19.9**	**4.8**	2.5	35.8
	6/14/2017	**566**	**506**	**486**	**6.2**	**17.2**	NA	**15.8**	**41.8**	<2.5	**8.2**	N/A	1.54	-22.7
	9/26/2017	**3,710**	**1,480**	**1160**	**5.4**	**111**	**44.3**	**28.9**	**11.1**	<2.5	**40.4**	**8.1**	1.92	185.2
	11/9/2017	**1,530**	**1,020**	**1,660**	**24.0**	**115**	**11.8**	**24.9**	**104**	**0.75 J**	**20.2**	**6.9**	2.26	-75.2
	3/21/2018	**1,250**	**1,340**	**2,430**	**11.2**	**413**	**32.3**	**31.4**	**59.0**	**0.225 J**	**17.0**	**29.9**	1.43	135.6
	6/28/2018	**177**	**191**	**4190**	**18.4**	**799**	**271**	**36.3**	**81.6**	<0.500	**11.7**	**58.2**	2.18	-30.8
	9/25/2018	**3,830**	**2,270**	**1,960**	<0.400	**116**	**9.8**	<0.400	<0.400	<0.400	<0.400	**16.8**	1.30	57.4
	12/5/2018	**3,090**	**1,490**	**1,750**	**18.4**	**79.0**	**2.1**	**39.3**	**91.8**	**0.453**	**21.8**	**10.5**	5.11	-29.9
	3/20/2019	**2,970**	**2,090**	**1,910**	**13.9**	**75.8**	**2.1**	**39.5**	**49.7**	<8.00	**23.7**	**19.1**	4.26	108.6
	6/7/2019	**894**	**793**	**1,910**	**20.4**	**80.8**	**2.9**	**52.6**	**108**	<10.0	<10.0	**9.34**	0.72	61
	9/26/2019	**4,340**	**1,620**	**1,160**	**12.1**	**39.1**	**3.1**	**40.2**	**41.9**	<4.00	**30.6**	**5.38**	1.73	-172.4
	12/3/2019	**1,670**	**1,200**	**1,250**	<20.0	**25.6**	<1.0	**28.6**	**57.4**	<20.0	<20.0	**6.88**	6.52	205.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MW-26	9/26/2016	**160**	**288**	**61.1**	**1.6**	<0.50	N/A	**1.1**	**3.9**	<0.50	**2.4**	N/A	1.64	236.7
	12/13/2016	**167**	**410**	**85.9**	**2.0**	<0.50	<10.0	**2.4**	**8.9**	<0.50	**3.3**	**2.4**	0.88	102.4
	3/29/2017	**214**	**452**	**170**	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	**1.3**	1.34	165.2
	6/13/2017	**160**	**311 E, J**	**113**	**2.0**	**0.65**	NA	**1.9**	**6.7**	<1.0	**2.1**	N/A	3.80	74.6
	9/26/2017	**68.4**	**192**	**192**	**2.1**	**0.98**	<10.0	**1.0**	**5.1**	<1.0	**0.83**	**7.1**	5.56	77.3
	11/8/2017	**88.1**	**170**	**204**	**2.3**	**1.8**	<10.0	**1.5**	**4.8**	<0.50	**1.0**	**5.9**	1.75	99.8
	3/20/2018	**108**	**190**	**157**	**1.85**	**1.75**	<13.0	**1.35**	**4.85**	<0.500	**1.20**	**5.84**	7.28	156.4
	6/29/2018	**138**	**221**	**114**	**1.88**	**1.02**	<10.0	**1.46**	**5.05**	<0.500	**1.94**	**3.9**	0.88	224.6
	9/24/2018	**117**	**233**	**141**	**2.14**	**1.18**	<1.0	**1.24**	**4.24**	<0.400	**1.19**	**5.13**	4.17	152.8
	12/5/2018	**139**	**210**	**147**	**1.89**	**0.85**	<1.0	**1.09**	**3.02**	<0.400	**0.846**	<1.00	4.16	36.5
	3/22/2019	**139**	**383**	**142**	**3.18**	<0.800	<1.0	**2.18**	**7.74**	<0.800	**2.09**	**3.48**	1.12	100.2
	6/3/2019	**148**	**336**	**92.2**	**2.35**	<2.00	<1.0	<2.00	**5.75**	<2.00	**2.10**	**2.76**	5.68	69.1
	9/26/2019	**133**	**272**	**104**	**2.6**	<2.00	<1.0	<2.00	**5.14**	<2.00	<2.00	**4.38**	0.40	-6.1
	12/3/2019	**137**	**216**	**95.0**	<2.00	<2.00	<1.0	<2.00	**2.63**	<2.00	<2.00	**5.56**	3.12	49.2
MGMS1-43	9/26/2016	**230**	**366**	**1,980**	**24.2**	**52**	<10.0	**13.5**	**81.9**	<8.3	<8.3	**9.0**	5.09	184.2
	12/16/2016	**64.1**	**171**	**1,810**	**20.1**	**239**	<10.0	**9.5**	**92.6**	<8.4	<8.4	**6.2**	6.06	-17.5
	3/31/2017	**45.8**	**119**	**1,430**	**15.2**	**348**	**14.8**	**12.5**	**90.8**	<8.4	<8.4	**7.0**	3.02	-40.7
	6/12/2017	**24.4**	**116**	**2,620**	**18.7**	**681**	NA	**16.7**	**173**	<8.3	<8.3	N/A	1.17	-109.8
	9/29/2017	**70.7**	**126**	**901**	**12.9**	**117**	<10.0	**6.9**	**60.1**	<2.5	<2.5	**6.1**	8.73	90.7
	11/7/2017	**108**	**211**	**2,350 J**	**26.6**	**181**	<10.0	**13.7**	**153**	<2.5	<2.5	**5.6**	2.04	74.5
	3/22/2018	**80.1**	**278**	**2,450**	**34.9**	**236**	<13.0	**18.0**	**192**	<0.500	**0.780**	**13.8**	10.71	-11.7
	7/1/2018	**107**	**246**	**1,880**	**32.8**	**118**	<10.0	**13.8**	**116**	<0.500	**0.588**	**7.5**	3.48	-1.6
	9/28/2018	**252**	**528**	**3,150**	**47.4**	**134**	<1.0	**27.8**	**141**	<8.00	<8.00	**5.52**	1.98	97.4
	12/4/2018	**146**	**388**	**2,750**	**48.1**	**129**	<1.0	**22.5**	**148**	<0.400	**1.08**	**6.06**	8.31	-2.0
	3/26/2019	**145**	**372**	**3,210**	**42.2**	**105**	<1.0	**22.3**	**160**	<8.00	<8.00	**5.58**	0.96	-10.1
	6/7/2019	**115**	**315**	**3,090**	**40.8**	**145**	<1.0	**26.5**	**169**	<8.00	<8.00	**6.73**	1.24	-12.5
	9/27/2019	**212**	**434**	**3,240**	**53.9**	**113**	<1.0	**30.5**	**156**	<8.00	<8.00	**6.32**	0.42	-295.7
	12/4/2019	**162**	**398**	**2860**	**40.9**	**11.8**	<1.0	**17.5**	**124**	<8.00	<8.00	**5.60**	6.76	-32.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
		Concentrations in µg/L										(mg/L)	(mg/L)	(mV)
MGMS3-40	9/26/2016	**1.7**	**1.4**	**226**	**2.0**	**52.1**	<10.0	**0.60**	**4.5**	<0.50	<0.50	**36.2**	2.7	165.3
	12/16/2016	**0.63**	<0.50	**1.3**	**0.97**	**0.88**	**55.2**	<0.50	**1.0**	<0.50	<0.50	**86.9**	5.95	-9.20
	3/28/2017	**1.4**	**0.60**	**1,050**	**6.0**	**323**	**68.1**	**3.3**	**22.5**	**0.68**	<0.50	**5.0**	1.57	-125.8
	6/12/2017	**0.97**	<0.50	**1.7**	<0.50	<0.50	NA	<0.50	**3.3**	<0.50	<0.50	N/A	5.22	-94.1
	9/26/2017	**0.79**	<0.50	**0.69**	<0.50	<0.50	**22.8**	<0.50	**1.1**	<1.0	<0.50	**3.8**	10.02	-82.8
	11/10/2017	**0.85**	<0.50	**8.0**	<0.50	**15.8**	**54.8**	<0.50	**4.3**	<0.50	<0.50	**6.5**	0.93	-111.6
	3/22/2018	**1.45**	**0.528**	**9.81**	**0.179 J**	**39.8**	**242**	<0.500	**8.57**	<0.500	<0.500	**8.74**	6.95	-130.8
	7/1/2018	**0.498 J**	**0.169 J**	**7.58**	<0.500	**8.98**	**27.4**	<0.500	**1.39**	<0.500	<0.500	**4.6**	3.18	-28.6
	9/28/2018	**0.970**	<0.400	**143**	<0.400	**129**	**33**	**0.560**	**9.08**	<0.400	<0.400	**4.38**	6.62	-61.7
	12/10/2018	**0.603**	<0.400	**1.77**	<0.400	**5.44**	**4.9**	<0.400	**1.54**	<0.400	<0.400	**3.42**	1.05	-122.9
	3/26/2019	**0.680**	<0.400	**117**	<0.400	**151**	**38**	**0.709**	**8.36**	<0.400	<0.400	**4.00**	0.74	92.6
	6/3/2019	**0.530**	<0.400	**74.7**	<0.400	**157**	**45**	**0.440**	**7.22**	<0.400	<0.400	**3.66**	0.89	-24.3
	9/27/2019	**0.578**	<0.400	**80.5**	<0.400	**106**	**8.4**	**0.413**	**5.09**	<0.400	<0.400	**2.86**	0.35	-182.8
	12/4/2019	**1.35**	<0.400	**2.66**	<0.400	**5.79**	<1.0	<0.400	**1.67**	<0.400	<0.400	**2.69**	2.92	-91.1

Notes:
1. µg/L (ppb) = Micrograms per liter (parts per billion).
2. N/A = Not analyzed.
3. B = The anlayte was found in the associated method blank.
4. J = Value is estimated.
5. Ethene is analyzed by EPA Method RSK-175M. All other VOCs were analyzed by EPA Method 8260.
6. **Bold value r**epresents detected concentration of listed analyte.
7. < = Not detected at or above the specified laboratory method reporting limit (MRL).
8. E = Analyte concentration exceeded the calibration range. Reported result is estimated.

Cascadia Associates, LLC

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
10/12/2011	0.0	-13.0	0.0	-12.0	7.2	0.1	--
11/2/2011	--*	-25.0	6.7	-25.0	--	--	--
11/17/2011	0.8	-16.0	6.9	-16.0	7.0	0.1	PID complications; Routinely reported error code. Potential moisture issues.
12/5/2011	--	--	--	--	--	--	System off on arrival and would not restart. Contractor identified electrical issues. Blower removed for replacement.
12/14/2011	--	--	--	--	--	--	System not operating, pending blower replacement. Blower reinstalled January 10, 2012.
1/23/2012	--	-15.0	6.5	-15.0	3.9	0.1	Water in sample port of Branch 4, could not get PID reading.
2/17/2012	0.1	-11.0	0.9	-11.0	2.9	1.0	--
3/22/2012	6.8	-12.0	5.4	-12.0	1.3	0.05	--
4/26/2012	1.3	-4.2	6.4	-4.0	1.0	0.05	--
5/23/2012	0.1	-3.4	3.2	-3.4	0.4	--	--
6/20/2012	0.0	-2.8	0.0	-2.7	0.1	0.2	--
7/24/2012	3.2	-3.2	9.2	-3.2	0.2	0.4	Used Rental PID.
8/22/2012	0.4	-2.4	1.0	-2.4	0.0	0.2	--
9/25/2012	0.1	-1.7	0.5	-1.7	0.0	0.2	Used ACA PID #3.
10/29/2012	--	--	--	--	--	--	System not operating.
11/26/2012	8.4	-4.0	9.2	-4.0	3.0	0.05	Used ACA PID #3.
12/21/2012	0.1	-0.63	0.0	-0.62	0.0	0.1	Used ACA PID #3.
1/24/2013	10.4	-0.45	0.0	-0.15	0.5	0.1	Used ACA PID #3.
2/28/2013	37.1	-0.22	2.1	-0.15	1.3	0.1	Used ACA PID #3.
3/25/2013	--	--	--	--	--	--	System not operating.
4/29/2013	--	--	--	--	--	--	System not operating.
5/24/2013	0.4	-23.0	0.1	-23.0	7.9	0.1	Used APEX PID #3.
6/25/2013	--	-20.0	--	-20.0	--	0.1	--
7/25/2013	6.6	-20.0	13.3	-20.0	6.1	0.1	Used APEX PID #3.
8/27/2013	1.9	-18.0	16.9	-18.0	6.8	0.1	Used APEX PID #3.
9/30/2013	0.0	-20.0	0.0	-20.0	2.1	0.1	Used APEX PID #3.
10/24/2013	1.3	-20.0	1.2	-20.0	2.3	0.1	Used APEX PID #3.
11/25/2013	0.3	-23.0	0.2	-23.0	1.1	0.1	Used APEX PID #3.
12/27/2013	1.0	-21.0	0.6	-21.0	2.6	0.1	Used APEX PID #1

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
1/29/2014	0.2	-20.0	0.1	-20.0	0.0	3.0	--
2/24/2014	2.4	-20.0	2.6	-20.0	2.6	9.0	Used APEX PID #3.
3/31/2014	0.3	-20.0	1.0	-20.0	0.2	1.0	Used APEX PID #4
4/29/2014	2.0	-20.0	1.4	-20.0	0.0	2.0	--
5/27/2014	2.0	-20.0	1.3	-20.0	0.9	2.0	--
7/3/2014	0.5	-20.0	0.3	-18.0	0.4	4.0	--
7/28/2014	4.0	-20.0	2.6	-19.0	0.1	3.0	Used APEX PID #3.
8/25/2014	--	-20.0	--	-19.0	3.7	3.5	Used APEX PID #3.
9/30/2014	2.1	-17.0	0.6	-17.0	1.7	--	--
10/27/2014	0.4	-26.0	1.4	-26.0	2.3	2.0	Used APEX PID #3.
11/25/2014	0.3	-21.0	1.5	-20.0	0.5	--	Used APEX PID #3.
12/29/2014	20.2	-25.0	32.1	-25.0	--	2.0	Used APEX PID #3.
1/26/2015	2.0	-25.0	3.2	-25.0	0.7	3.0	Used APEX PID #3. Knockout drum emptied.
2/26/2015	0.0	-22.0	0.0	-25.0	0.0	0.1	--
3/30/2015	0.0	-23.0	0.2	-27.0	0.0	0.4	Used APEX PID #3.
4/24/2015	0.0	-23.0	0.2	-27.0	0.0	0.4	--
5/28/2015	5.5	-26.0	4.8	-26.0	5.5	0.05	--
7/29/2015	7.5	-17.0	0.3	-17.0	0.5	0.10	Used APEX PID #3.
8/31/2015	0.0	-11.0	0.0	-10.0	0.9	0.05	Used APEX PID #3.
9/28/2015	0.6	-12.0	2.4	-12.0	1.8	0.00	Used APEX PID #3.
10/29/2015	0.5	-12.0	0.3	-13.0	2.9	1.00	Used APEX PID #3.
11/30/2015	0.0	-13.0	0.2	-13.0	0.0	2.00	Used APEX PID #3.
12/28/2015	0.0	-17.0	9.0	-18.0	0.0	0.10	Used APEX PID #3.
2/1/2016	30.4	-28.0	0.0	-25.0	2.6	3.00	Used APEX PID #3.
2/29/2016	0.0	-13.0	0.0.	-13.0	0.0	0.10	Used APEX PID #3.
3/29/2016	0.0	-12.0	0.0	-12.0	0.0	0.20	Used APEX PID #3.
4/27/2016	0.2	-11.0	0.0	-5.0	0.0	1.00	Used APEX PID #3. North SVE system turned off.
5/25/2016	--	--	--	--	--	--	North SVE system intentionally turned off for approx . 60 days to evaluate system efficiency.
6/28/2016	20.4	-23.0	14.3	-23.0	0.9	0.10	Used APEX PID #3.

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
7/26/2016	0.0	-20.0	0.4	-20.0	0.6	1.20	Used APEX PID #3.
9/29/2016	1.0	-16.0	0.0	-15.0	0.0	0.10	Used APEX PID #3.
10/25/2016	0.4	-14.0	0.0	-14.0	0.0	0.10	Used APEX PID #3.
11/28/2016	0.0	-12.0	0.0	-12.0	0.0	0.10	Used APEX PID #3.
12/28/2016	0.0	-12.0	0.0	-12.0	0.0	0.10	Used APEX PID #3.
1/30/2017	0.0	-5.0	0.0	-5.0	0.0	0.10	Used APEX PID #3.
2/28/2017	12.5	-15.0	8.7	-14.0	1.0	0.10	--
3/28/2017	0.0	-20.0	0.0	-20.0	0.1	0.00	Used Mini Rae 3000.
4/24/2017	0.8	-20.0	0.0	-20.0	2.0	0.10	Used APEX PID #3.

Notes:

1. PID readings in parts per million (ppm), calibrated to 100 ppm isobutylene.
2. Pressure readings in inches of water, measured with magnehelic gauge.
3. -- = Not available; branch not in use or no measurement collected during the site visit.
4. * = During the 11/2/2011 monitoring event, PID malfunctioned while monitoring Branch 4. Instrument readings would not stabilize.

Cascadia Associates, LLC

Table 7
North SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1,1-Trichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	Methylene Chloride	Tetrachloro-ethene	Toluene	Trichloro-ethene	Vinyl Chloride
			Concentrations in µg/m3								
System Effluent	North_EFF-20111012	10/12/2011	**69**	<16	**160**	<16	<14	**9,500**	**16**	**700**	<10
System Effluent	Post Blower_North_012312	1/23/2012	<170	<120	<120	<120	<110	**16,000**	<120	**530**	<79
System Effluent	North_Effluent_0121712	2/17/2012	<140	<100	<100	<100	<91	**11,000**	<99	**300**	<67
System Effluent	North Effluent-032212	3/22/2012	<28	<54	<27	<27	<23	**6,600**	<25	**140**	<8.6
System Effluent	North_Effluent_062012	6/20/2012	<1.6	<3.2	<1.6	<1.6	**5.3**	**250**	<1.5	**15**	<0.51
System Effluent	North_Effluent_082212	8/22/2012	<1.6	<3.2	<1.6	<1.6	<1.4	**140**	<1.5	**11**	<0.51
System Effluent	North_Effluent_112612	11/26/2012	**39**	<14	**52**	<7.1	<6.2	**22,000**	<6.8	**510**	<4.6
System Effluent	North_Effluent_122112	12/21/2012	<31	<59	<30	<30	<26	**3,500**	<28	**61**	<19
System Effluent	North_Effluent_022813	2/28/2013	<36	<70	<35	<35	<31	**4,400**	<33	**160**	<22
System Effluent	SVE North	5/24/2013	<240	<170	**280**	<170	<380	**23,000**	<160	**1,100**	<110
System Effluent	SVE North	6/25/2013	**76**	<51	**88**	<51	<110	**13,000**	<49	**730**	<33
System Effluent	SVE North	8/27/2013	<150	<110	<110	<110	<230	**17,000**	<100	**800**	<69
System Effluent	SVE North Effluent	10/24/2013	<82	<60	<60	<60	<130	**10,000**	<57	**570**	<39
System Effluent	SVE North Effluent	12/27/2013	<44	<32	<32	<32	<69	**7,000**	<30	**470**	<20
System Effluent	SVE North Effluent	1/29/2014	<10	<40	**22**	<40	<87	**1,300**	<38	**110**	<26
System Effluent	SVE_North_Post Carbon	2/24/2014	**55**	<83	**68**	<41	<36	**8,700**	<39	**760**	<27
System Effluent	SVE North Post Carbon	3/5/2014	**25**	<39	**29**	<20	<17	**4,600**	<19	**300**	<13
System Effluent	VCP_North_Effluent	3/31/2014	**19**	<13	**18**	<13	<28	**3,500**	<12	**200**	<8.2
System Effluent	North_SVE_Effluent_042914	4/29/2014	**22**	<15	**17**	<15	<33	**3,500**	<14	**220**	<9.8
System Effluent	North_SVE_Effluent_052714	5/27/2014	<31	<23	<23	<23	<50	**4,100**	<22	**280**	<15
System Effluent	North_VCP_Effluent	7/3/2014	<23	<17	**20**	<17	<37	**4,500**	<16	**290**	<11
System Effluent	SVE North	7/28/2014	<120	<88	**<88**	<88	<190	**7,200**	<84	**460**	<22
System Effluent	North SVE	9/30/2014	<48	<35	**48**	<35	<76	**7,300**	<33	**480**	<22
System Effluent	SVE North Effluent	10/27/2014	<110	<80	<80	<80	<180	**15,000**	<76	**410**	<52
System Effluent	SVE North 11.25.14	11/25/2014	<39	<28	<28	<28	<62	**7,100**	<27	**390**	<18
System Effluent	SVENorth122914	12/29/2014	<140	<99	<99	<99	<220	**15,000**	<94	**290**	<64
System Effluent	SVE North	1/26/2015	**16**	<31	<16	<16	<14	**1,500**	<15	**130**	<10
System Effluent	SVE North	2/26/2015	<1.6	<3.2	<1.6	<1.6	<1.5	**32**	<1.5	<2.1	<1.0
System Effluent	SVE North	3/30/2015	**15**	<9.6	**9.5**	<4.8	<4.2	**1,700**	<4.6	**130**	<3.1
System Effluent	SVE N	4/24/2015	<8.5	<16	<8.2	<8.2	<7.2	**550**	<7.8	**50**	<5.3

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 7
North SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1,1-Trichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	Methylene Chloride	Tetrachloro-ethene	Toluene	Trichloro-ethene	Vinyl Chloride
			Concentrations in µg/m3								
System Effluent	SVE North	5/14/2015	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	<1.5	<2.1	<1.0
System Effluent	SVE North	5/28/2015	<3.8	<7.3	<3.6	<3.6	<3.2	**360**	**3.6**	**8.0**	<2.4
System Effluent	SVE North	7/29/2015	**19**	<33	**21**	<16	<14	**2,000**	<16	**210**	<11
System Effluent	SVE North	8/31/2015	**65**	<65	**62**	<33	<28	**7,100**	<31	**600**	<21
System Effluent	SVE North	9/28/2015	**21**	<22	<11	<11	<9.7	**1,400**	<11	**190**	<7.1
System Effluent	SVE North	10/29/2015	<56	<110	**59**	<55	<48	**6,300**	<52	**550**	<35
System Effluent	SVE_North_Effluent_113015	11/30/2015	<54	<140	<72	<72	<72	**2,300**	<72	**86**	<72
System Effluent	SVE_North_Effluent_122815	12/28/2015	<32	<62	<31	<31	<27	**5,600**	<30	**110**	<20
System Effluent	North_Effluent_020116	2/1/2016	<53	<100	<51	<51	<45	**11,000**	<48	**150**	<33
System Effluent	SVE_North_Effluent_022916	2/29/2016	**30**	<33	**29**	<16	<14	**7,800**	<16	**160**	<11
System Effluent	SVE_North_Effluent_032916	3/29/2016	**19**	<14	<7.2	<7.2	<6.3	**920**	<6.9	**19**	<4.7
System Effluent	North_Effluent	4/27/2016	<15	<29	<14	<14	<13	**1,500**	<14	**75**	<9.2
System Effluent	North_Effluent_62816	6/28/2016	<11	<22	<11	<13	<9.6	**1,800**	<10	**83**	<7.1
System Effluent	SVE-North-Effluent 72616	7/26/2016	<1.6	<3.2	<1.6	<1.6	<1.4	**84**	**2.0**	**6**	<1.0
System Effluent	SVE-North-Effluent 83016	8/30/2016	<0.30	<0.80	<0.40	<0.40	<0.40	**54**	<0.40	**2**	<0.40
System Effluent	SVE_North_Effluent_092916	9/29/2016	<1.6	<3.2	<1.6	<1.6	<1.4	**15**	<1.5	<2.1	<1.0
System Effluent	SVE_North_Effluent_102516	10/25/2016	<1.6	<3.2	<1.6	<1.6	<1.4	**7.9**	**3.0**	<2.1	<1.0
System Effluent	SVE_North_Effluent_112816	11/28/2016	<1.6	<3.2	<1.6	<1.6	<1.4	**2.8**	**3.9**	<2.1	<1.0
System Effluent	SVE_North_Effluent_122816	12/28/2016	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	**1.7**	<2.1	<1.0
System Effluent	SVE_North_Effluent_013017	1/30/2017	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	**4.6**	<2.1	<1.0
System Effluent	SVE_North_Effluent_022817	2/28/2017	<1.6	<3.2	<1.6	<1.6	<1.4	**5.9**	<1.5	<2.1	<1.0
System Effluent	SVE_North_Effluent_032817	3/28/2017	<1.6	<3.2	<1.6	<1.6	<1.4	**3.2**	**2.9**	<2.1	<1.0
System Effluent	SVE_North_Effluent	4/24/2017	<1.6	<3.2	<1.6	<1.6	<1.4	**3.9**	**3.7**	<2.1	<1.0

Notes:

1. µg/m^3 = Micrograms per cubic meter.
2. Samples analyzed by Modified EPA Method TO-15.
3. Only analytes detected in at least one sample are presented in this table.
4. **Bold** value represents detected concentration of listed analyte.
5. < = Not detected at or above the specified laboratory method reporting limit (MRL).

Cascadia Associates, LLC

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
10/12/2011	--	-14.0	17.1	24.0	0	12.0	0.2	4.0	--
10/18/2011	--	-14.0	15.5	--	15.5	14.0	0.5	3.0	Pre-carbon, post blower tap is now covered by noise suppression panels.
11/2/2011	--	-15.0	18.2	26.0	0.0	26.0	2.0	7.0	--
11/17/2011	--	-18.0	8.9	27.0	--*	15.0	--*	6.8	--
12/5/2011	8.3	-18.0	10.7	39.0	0.0	19.0	2.2	6.1	System switch off upon arrival. System restarted. Monitoring event conducted approximately 3 hours after restart.
12/14/2011	11.8	-19.0	21.0	28.0	0.0	18.0	0.7	6.2	--
1/9/2012	7.3	-17.0	8.3	29.0	0.0	18.0	0.0	6.2	--
1/23/2012	7.0	-17.0	8.9	29.0	0.0	17.0	0.0	6.9	--
2/17/2012	6.0	-18.0	11.2	29.0	0.0	18.0	0.0	6.0	--
3/22/2012	13.3	-16.0	10.7	27.0	0.0	15.0	0.0	6.5	--
4/26/2012	10.3	-17.0	11.6	27.0	0.0	16.0	0.0	6.4	--
5/23/2012	10.4	-20.0	10.6	31.0	0.0	19.0	0.0	6.6	--
6/20/2012	7.3	-21.0	7.5	33.0	0.5	20.0	0.0	6.3	--
7/24/2012	19.8	-20.0	41.5	32.0	226.3	20.0	98.8	6.2	Used rental PID.
8/22/2012	8.0	-48.0	10.1	29.0	5.5	18.0	1.1	4.6	--
9/25/2012	10.0	-46.0	13.7	29.0	9.5	15.0	12.8	4.3	Used ACA PID #3.
10/29/2012	8.4	-34.0	18.6	47.0	0.3	28.0	12.9	4.3	Used ACA PID #3; Carbon change-out on 10/29/2012
11/26/2012	13.7	<-100	1.6	18.0	0.1	6.6	3.1	0.66	Used ACA PID #3.
12/21/2012	0.5	-107	0.5	17.0	0.0	6.1	0.0	0.49	Used ACA PID #3.
1/24/2013	5.1	-105	0.5	10.0	0.0	6.5	0.0	0.61	Used ACA PID #3.
2/28/2013	2.8	-105	0.1	18.0	0.0	7.0	0.0	0.60	Used ACA PID #3.
3/25/2013	8.4	-102	0.9	16.0	0.1	7.0	0.0	0.58	Used Apex PID #3
4/29/2013	0.2	-98	0.4	15.0	0.0	6.3	0.1	0.49	Used Apex PID #3
5/24/2013	41.0	-18	49.7	47.0	0.2	26	0.7	5.0	Used Apex PID #3
6/25/2013	--	-15	--	51.0	--	31	--	5.1	--
7/25/2013	12.3	-16	13.9	50.0	0.7	32	0.5	6.0	Used Apex PID #3
8/27/2013	13.2	-16	12.1	52.0	3.8	31	1.2	5.2	Used Apex PID #3
9/30/2013	5.2	-15	15.4	45.0	27.4	30	0.4	5.2	Used Apex PID #3
10/24/2013	3.1	-14	13.2	50.0	6.8	32	1.5	5.2	Used Apex PID #3
11/25/2013	1.4	-19	19.3	51.0	12.4	35	2.8	5.3	Used Apex PID #3
12/27/2013	0.3	-19	7.7	55.0	3.1	32	0.0	5.4	Used Apex PID #1
1/29/2014	2.4	-19	6.7	50.0	5.7	30	0.2	10.0	--
2/24/2014	7.7	-19	19.7	50.0	2.4	30	1.4	10.0	Used Apex PID #3
3/31/2014	2.6	-15	4.6	46.0	5.4	30	0.0	8.0	Used APEX PID #4
4/29/2014	2.0	-14	3.4	48.8	9.7	30	0.0	8.0	--
5/27/2014	3.5	-14	5.0	49.0	10.2	28	0.1	7.0	--

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
7/3/2014	1.6	-18	2.4	50.0	1.4	30	0.1	10.0	--
7/28/2014	8.5	-19	9.0	50.0	11.0	30	8.7	8.0	Used Apex PID #3
8/25/2014	4.6	-17	7.5	49.0	15.8	26	11.0	7.0	Used Apex PID #3
9/30/2014	0.5	-14	5.2	40.0	4.0	28	2.7	5.0	--
10/27/2014	--	--	--	--	--	--	--	--	System off upon arrival. Unable to turn back on.
11/3/2014	5.0	-20	23.0	50.0	13.1	20	14.6	8.0	Used Apex PID #3
11/25/2014	--	--	--	--	--	--	--	--	System off for drum replacement.
12/29/2014	--	--	--	--	--	--	--	--	System off.
1/26/2015	27.1	-25	34.6	20.0	1.0	17	0.0	10.0	Used Apex PID #3
2/26/2015	0.8	-20	12.9	30.0	0.2	19	0.1	8.0	--
3/30/2015	0.4	-20	14.2	29.0	0.1	20	0.1	8.0	Used Apex PID #3
4/24/2015	0.4	-20	14.2	29.0	0.1	20	0.1	8.0	
5/28/2015	1.0	-20	57.5	28.0	63.6	17	33.0	7.0	--
7/29/2015	0.0	-16	14.1	25.0	9.6	14	1.2	5.0	Used Apex PID #3
8/31/2015	0.0	-20	1.2	26.0	6.9	14	1.8	6.0	Used Apex PID #3
9/28/2015	3.0	-20	7.4	26.0	3.8	16	1.1	6.0	Used Apex PID #3
10/29/2015	9.0	-22	11.2	27.0	7.6	16	0.2	8.0	Used Apex PID #3
11/30/2015	--	-18	7.0	30.0	33.6	18	0.4	6.0	Used Apex PID #3
12/28/2015	--	-18	12.5	29.0	1.3	18	0.4	8.0	Used Apex PID #3
2/1/2016	0.1	-24	0.3	19.0	9.2	16	0.0	7.0	Used Apex PID #3
2/29/2016	0.2	-18	25.2	30.0	8.5	17	2.3	6.0	Used Apex PID #3
3/29/2016	0.0	-19	54.0	28.0	13.2	16	3.4	7.0	Used Apex PID #3
4/27/2016	5.0	-28	32.0	50.0	21.3	0.2	22.3	1.0	Used Apex PID #3
5/25/2016	0.2	-100	0.3	3.0	23.2	2	9.7	0.6	Used Apex PID #3
6/28/2016	--	--	--	--	--	--	--	--	System shut down
7/26/2016	8.1	-20	30.4	30.0	26.2	20	18.1	10.0	Used Apex PID #3
9/29/2016	26.3	-18	27.4	28.0	36.7	16	35.7	6.0	Used Apex PID #3
10/25/2016	0.8	-18	13.3	30.0	58.0	18	7.7	8.0	Used Apex PID #3
11/28/2016	0.0	-22	70.1	30.0	78.0	18	54.2	8.0	Used Apex PID #3
12/28/2016	0.0	-100	0.0	2.0	0.4	1.0	1.0	1.0	departure.
1/30/2017	0.0	-22	52.3	33.0	0.0	20.0	0.0	10.0	Used Apex PID #3
2/28/2017	--	--	--	--	--	--	--	--	No sample collected.
3/28/2017	--	--	--	--	--	--	--	--	System not working properly. Knock out drum valve was pulled down and sucking in ambient air. No sample collected.
4/24/2017	--	--	--	--	--	--	--	--	Could not get valve to operate properly. System pulling in ambient air.
7/31/2017	0.0	-18	31.8	31.0	31.2	18.0	27.2	8.0	Used Apex PID #3
8/28/2017	0.0	-18	75.0	32.0	60.0	18.0	50.1	9.0	
9/25/2017	39.2	-18	32.7	30.0	19.7	18.0	20.6	7.5	Used Apex PID #3
10/26/2017	2.8	-22	27.7	30.0	19.0	18.0	17.4	7.0	Used Apex PID #3
11/29/2017	5.2	-20	68.0	30.0	54.0	18.0	56.0	7.0	
12/21/2017	0.3	-20	12.4	30.0	6.7	18.0	5.6	8.0	Pre-Carbon was not sampled due to sampling canister malfunction.

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
1/22/2018	0.0	-20	13.6	30.0	10.2	18.0	7.2	7.0	Used Apex PID #3
2/28/2018	--	-20	--	30.0	--	18.0	--	7.0	PID was not within calibration and readings were not recorded.
3/29/2018	--	-20	19.0	31.0	28.0	19.0	19.0	8.0	Used Apex PID #3
4/24/2018	2.2	-20	26.8	31.0	29.2	19.0	18.8	8.0	Used Apex PID #3
5/16/2018	13.8	-20	26.6	30.0	40.2	18.0	26.8	8.0	
7/23/2018	30.0	-18	34.5	29.0	37.5	17.0	37.3	7.0	
11/7/2018	3.0	-18	22.9	30.0	20.7	17.0	19.3	6.0	
1/4/2019	0.5	-24	27.3	28.0	23.4	16.0	22.4	6.0	
3/8/2019	0.7	-24	19.2	28.0	12.1	16.0	12.4	6.0	
5/7/2019	4.0	-20	33.0	29.0	25.4	17.0	25.8	7.0	
7/8/2019	0.6	-21	33.6	29.0	26.1	17.0	27.1	7.0	
9/9/2019	1.0	-21	29.7	29.0	27.1	17.0	22.8	6.0	
11/4/2019	0.9	-21	31.6	29.0	18.1	12.0	16.2	6.0	

Notes:
1. PID readings in parts per million (ppm), calibrated to 100 ppm isobutylene.
2. Pressure readings in inches of water, measured with magnehelic gauge.
3. -- = Not available or not applicable.

Cascadia Associates, LLC

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m^3										
Pre Carbon	INF 1006	10/6/2011	<330	<320	**470**	<320	<280	**40,000**	<300	**520**	**5,100**	<210	<350
Post Carbon	EFF 1006	10/6/2011	<16	<16	**390**	<16	<14	<27	<15	**140**	**50**	<10	<17
Pre Carbon	Post Blower 110211	11/2/2011	<290	<280	**430**	<280	<250	**26,000**	<270	<390	**2,100**	<180	<310
Pre Carbon	SOUTHSVE_PRECARBON_121411	12/14/2011	<580	<570	**620**	<570	<500	**54,000**	<540	<780	**2,800**	<360	<620
Post Carbon	SOUTHSVE_POSTCARBON_121411	12/14/2011	<16	**35**	**23**	<16	**17**	**1,600**	<15	**78**	**1,300**	**12**	<17
Post Carbon	POST CARBON_SOUTH_012312	1/23/2012	<16	<16	<16	<16	<14	<27	<15	<22	<21	<10	<17
Pre Carbon	South_PreCarbon_021712	2/17/2012	<300	<300	**460**	<300	<260	**28,000**	<280	<410	**1,200**	<190	<330
Post Carbon	South_PostCarbon_021712	2/17/2102	<16	<16	<16	<16	<14	<27	<15	<22	<21	<17	<10
Pre Carbon	South Influent - 032212	3/22/2012	<190	<190	**310**	<95	<84	**30,000**	<91	**99**	**960**	<31	<100
Post Carbon	South Effluent - 032212	3/22/2012	<1.2	<3.2	<1.6	<1.6	**4**	<2.7	<1.5	<1.6	<2.1	**6.4**	<3.5
Pre Carbon	South_SVE_PRECARBON	4/26/2012	<210	<560	<280	<280	<240	**32,000 S**	<270	<290	**640 S**	<90	<610
Post Carbon	South-SVE_POSTCARBON	4/26/2012	<1.2	<3.2	<1.6	<1.6	**4**	<2.7	<1.5	<1.6	<2.1	**2.4**	<3.5
Pre Carbon	SOUTH_SVE_PRECARBON	5/23/2012	<100	<260	**200**	<130	<120	**19,000**	<130	<140	**780**	<43	<290
Post Carbon	South_SVE_PRECARBON	5/23/2012	<1.2	<3.2	<1.6	<1.6	**3**	<2.7	<1.5	<1.6	<2.1	**3.7**	<3.5
Pre Carbon	South_PreCarbon_062012	6/20/2012	<240	<630	**360**	<320	<280	**35,000**	<300	<330	**1,400**	<100	<1040
Post Carbon	South_PostCarbon_062012	6/20/2012	<0.30	<0.80	<0.40	<0.40	**1.0**	<0.40	<0.40	<0.30	<0.40	**1.2**	<1.2
Pre Carbon	South_PreCarbon_072412	7/24/2012	<150	<390	**240**	<200	<170	**33,000**	<190	<200	**1,100**	<63	<640
Post Carbon	South_PostCarbon_072412	7/24/2012	<1.2	**11**	<1.6	<1.6	**3.0**	<2.7	**2.2**	<1.6	<2.1	**3.9**	<5.2
Pre Carbon	South_PreCarbon_082212	8/22/2012	<250	<660	**760**	<330	<290	**47,000**	<310	<340	**2,000**	<110	**1,080**
Post Carbon	South_PostCarbon_082212	8/22/2012	<21	<55	<27	<27	<24	<47	<26	<28	<37	<8.8	<90
Pre Carbon	South_PreCarbon_092512	9/25/2012	<270	<700	**500**	<400	<310	**50,000**	<330	<360	**1,900**	<230	<770
Post Carbon	South_PostCarbon_092512	9/25/2012	**13**	**18**	**1,200**	**11**	**5.7**	<2.7	<1.5	<1.6	<2.1	**6.2**	<3.5
Pre Carbon	South_PreCarbon_102912	10/29/2012	<320	<850	**440**	<480	<370	**60,000**	<400	<440	**2,200**	<270	<930
Post Carbon	South_PostCarbon_102912	10/29/2012	<5.3	<14	<7	<7	<7	<7	<7	<7	<7	<7	<14
Pre Carbon	South_PreCarbon_112612	11/26/2012	<95	<250	<120	<120	<110	**10,000**	<120	<130	**530**	<80	<410
Post Carbon	South_PostCarbon_112612	11/26/2012	<2.7	<7.2	<3.6	<3.6	<3.6	<3.6	<3.6	<2.7	<3.6	<3.6	<10.8
Pre Carbon	South_PreCarbon_122112	12/21/2012	<71	<190	**110**	<93	<82	**14,000**	<89	<96	**600**	<60	<300
Post Carbon	South_PostCarbon_122112	12/21/2012	<1.2	<3.2	<1.6	<1.6	**1.6**	<2.7	<1.5	<1.6	<2.1	**3.0**	<5.2
Pre Carbon	South_PreCarbon_012413	1/24/2013	<9.2	<24	**14**	<12	<11	**1,700**	<11	<12	**100**	<7.8	<39
Post Carbon	South_PostCarbon_012413	1/24/2013	<1.2	<3.2	<1.6	<1.6	**3.3**	<2.7	<1.5	<1.6	<2.1	**3.7**	<5.2
Pre Carbon	South_PreCarbon_022813	2/28/2013	<5.9	<15	**8.5**	<7.7	<6.7	**940**	<7.3	<7.9	**84**	<5.0	<25.4
Post Carbon	South_PostCarbon_022813	2/28/2013	<1.2	<3.2	<1.6	<1.6	**8.1**	<2.7	<1.5	<1.6	<2.1	<1.0	<5.2
Pre Carbon	South_PreCarbon_032513	3/25/2013	<29	<75	<38	<38	<33	**3,700**	<36	<39	**160**	<24	<123
Post Carbon	South_PostCarbon_032513	3/25/2013	<1.2	<3.2	<1.6	<1.6	**2.0**	<2.7	<1.5	<1.6	<2.1	**2.0**	<5.2
Pre Carbon	SVE South Pre Carbon	4/29/2013	<6.3	<16	**10**	<8.2	<7.2	**950**	<7.8	<8.4	**48**	<5.3	<26.9
Post Carbon	SVE South Post Carbon	4/29/2013	<0.30	<0.80	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	**0.93**	<1.2
Pre Carbon	SVE South Pre Carbon	5/24/2013	<1,100	<1,100	**2,400**	<1,100	<2,400	**240,000**	<1,100	<1,500	**8,400**	<720	<4,300
Post Carbon	SVE South Post Carbon	5/24/2013	<0.81	<0.79	<0.79	<0.79	<1.7	<1.4	<0.75	<1.1	<1.1	<0.51	<3.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m^3										
Pre Carbon	SVE South Pre Carbon	6/25/2013	<150	<150	**630**	<150	<330	**39,000**	<140	<210	**1,800**	<97	<570
Post Carbon	SVE South Post Carbon	6/25/2013	<0.81	**8.1**	**3.8**	<0.79	**5.6**	<1.4	<0.75	<1.1	<1.1	**3.1**	<3.1
Pre Carbon	SVE South Pre Carbon	7/25/2013	<120	<120	**380**	<120	<260	**22,000**	<110	<160	**1,200**	<77	<460
Post Carbon	SVE South Post Carbon	7/25/2013	<0.81	**17**	**65**	**2.1**	**3.4**	<1.4	**1.2**	<1.1	<1.1	**2.6**	**1.4**
Pre Carbon	SVE South Pre Carbon	8/27/2013	<150	<150	**520**	<150	<330	**28,000**	<140	<210	**1,500**	<97	<580
Post Carbon	SVE South Post Carbon	8/27/2013	**3.3**	**13**	**270**	**7.0**	**4.7**	<2.7	<1.5	<2.2	<2.1	**3.7**	<6.0
Pre Carbon	SVE South Precarbon	9/30/2013	<110	<110	**450**	<110	<240	**26,000**	<110	<150	**1,400**	<72	<420
Pre Carbon	SVE South Pre Carbon	10/24/2013	<140	<140	**430**	<140	<310	**27,000**	<130	<190	**1,100**	<90	<530
Post Carbon	SVE South Post Carbon	10/24/2013	**3.8**	**4.9**	**390**	**3.3**	<5.2	**4.3**	<2.3	**5.4**	<3.2	**2.6**	<5.1
Pre Carbon	SVE South Pre Carbon	11/25/2013	<100	<98	**250**	<98	<220	**21,000**	<93	<140	**840**	<63	<380
Post Carbon	SVE South Post Carbon	11/25/2013	<2.8	**4.1**	**250**	<2.8	**7.3**	<4.8	<2.6	**17**	**56**	<1.8	<10.6
Pre Carbon	SVE South Pre Carbon	12/27/2013	<110	<110	**270**	<110	<240	**20,000**	<100	<150	**900**	<70	<420
Post Carbon	SVE South Post Carbon	12/27/2013	**2.5**	**4.5**	**220**	**2.4**	**3.8**	**3.5**	<1.1	**6.8**	**62**	<0.77	<4.6
Pre Carbon	SVE South Pre-Carbon	1/29/2014	<80	<79	**260**	<79	<170	**20,000**	<75	<110	**800**	<51	<306
Post Carbon	SVE South Post-Carbon	1/29/2014	**4.5**	**7.2**	**330**	**4.8**	<8.7	**7.9**	<3.8	**13**	**98**	**3.1**	<15.3
Pre Carbon	SVE_South_Pre_Carbon	2/24/2014	<190	<490	**430**	<240	**240.0**	**34,000**	**600**	<250	**1,500**	<160	<800
Post Carbon	SVE_South_Effluent	2/24/2014	<1.2	<3.2	**41**	<1.6	<1.4	<2.7	<1.5	<1.6	<2.1	<1.0	<5.2
Pre Carbon	SVE South Pre Carbon	3/5/2014	<110	<280	**270**	<140	<120	**16,000**	**660**	<140	**660**	<90	**1,090**
Post Carbon	SVE South Effluent	3/5/2014	**3.7**	<8.3	**310**	**4.2**	**4.4**	<7.1	<4.0	<4.3	**21**	<2.7	<13.7
Pre Carbon	VCP_South_Post_Blower	3/31/2014	<83	<82	**260**	<82	<180	**20,000**	<78	<110	**630**	<53	<309
Post Carbon	VCP_South_Effluent	3/31/2014	**3.3**	**4.9**	**290**	**4.2**	<4.3	<3.4	<1.9	**3.3**	**21**	**1.4**	<7.6
Pre Carbon	South_SVE_Postblower_042914	4/29/2014	<47	<46	**180**	<46	<100	**13,000**	<44	<63	**550**	<30	<180
Post Carbon	South_SVE_Effluent_042914	4/29/2014	**5.1**	**5.0**	**540**	<4.8	<11	<8.2	<4.6	<6.6	**37**	<3.1	<18.3
Pre Carbon	South_SVE_Postblower_052714	5/27/2014	<57	<55	**160**	<55	<120	**12,000**	<53	<76	**490**	<36	<201
Post Carbon	South_SVE_PostCarbon_052714	5/27/2014	**5.0**	<4.8	**530**	<4.8	<11	<8.2	<4.6	**14**	**8.1**	<3.1	<18.3
Pre Carbon	South_VCP_Post Blower	7/3/2014	<18	<18	**56**	<18	<45	**2,800**	<18	<18	**150**	<18	<63
Post Carbon	South_VCP_Post Carbon	7/3/2014	<16	<16	**760**	<16	<35	**55**	<15	**430**	**3,200**	<10	<60
Pre Carbon	SVE Pre Carbon	7/28/2014	<69	<67	**200**	<67	<150	**15,000**	<64	<93	**750**	<43	<254
Post Carbon	SVE Post Carbon	7/28/2014	<68	<67	**270**	<67	<150	**13,000**	<63	**530**	**12,000**	<43	<253
Pre Carbon	South SVE Pre Carbon	8/25/2014	<140	<130	**340**	<130	<290	**20,000**	<130	<180	**1,100**	<86	<520
Post Carbon	South SVE Post Carbon	8/25/2014	<140	<130	**270**	<130	<290	**9,600**	<130	<180	**2,700**	<86	<520
Pre Carbon	South SVE_Pre Carbon	9/30/2014	<110	<110	**250**	<110	<230	**17,000**	<100	<150	**930**	<69	<410
Post Carbon	South SVE_Post Carbon	9/30/2014	<130	<120	**280**	<120	<270	**23,000**	<120	<170	**620**	<80	<480
Pre Carbon	SVE South Post Blower	11/3/2014	<130	<130	**320**	<130	<280	**24,000**	<120	<170	**1,100**	<81	<490
Post Carbon	SVE South Post Carbon	11/3/2014	<81	<81	**130**	<81	<180	**12,000**	<77	<110	**290**	<52	<309
Pre Carbon	SVE South Pre Carbon	1/26/2015	<190	<500	**420**	<250	<220	**21,000**	**240**	<260	**860**	<160	<820
Post Carbon	SVE South Post Carbon	1/26/2015	<78	<200	<100	<100	<90	<170	**190**	<110	<140	<66	<330

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m^3										
Pre Carbon	SVE South Pre Carbon	2/26/2015	<150	<390	**260**	<200	<170	**18,000**	**280**	<200	**660**	<130	<650
Post Carbon	SVE South Post Carbon	2/26/2015	<1.2	<3.2	<1.6	<1.6	**3.2**	<2.7	<1.5	<1.6	<2.1	**2.5**	<5.2
Pre Carbon	SVE South Pre Carbon	3/30/2015	<61	<160	**200**	<79	**160**	**17,000**	**180**	<82	**570**	<51	<257
Post Carbon	SVE South Post Carbon	3/30/2015	<1.2	<3.2	<1.6	<1.6	**2.8**	<2.7	**2.7**	<1.6	**51**	**2.5**	<5.2
Pre Carbon	SVE S Pre Carbon	4/24/2015	<37	<97	**170**	<49	<43	**5,400**	<46	<50	**410**	<31	<163
Post Carbon	SVE S Post Carbon	4/24/2015	<6.2	<16	<8.1	<8.1	<7.1	**660**	<7.7	<8.3	**19**	<5.2	**18**
Pre Carbon	SVE South Pre Carbon	5/28/2015	<60	<160	**140**	<79	**92**	**8,000**	**240**	<81	**460**	<51	<256
Post Carbon	SVE South Post Carbon	5/28/2015	<4.9	<13	<6.3	<6.3	<5.6	**650**	<6.0	<6.5	**16**	<4.1	**22.1**
Pre Carbon	SVE South Pre Carbon	7/29/2015	<65	<170	**190**	<85	<75	**12,000**	<81	<88	**790**	<55	<183
Post Carbon	SVE South Post Carbon	7/29/2015	**10**	<27	**960**	**16**	<12	**440**	<13	<14	<18	<8.7	<45
Pre Carbon	SVE South Pre Carbon	8/31/2015	<64	<170	**160**	<83	<73	**12,000**	<79	<86	**780**	<54	<171
Post Carbon	SVE South Post Carbon	8/31/2015	<21	<55	**530**	<27	<24	**3,400**	<26	<28	**94**	<18	<90
Pre Carbon	SVE South Pre Carbon	9/28/2015	<83	<220	**170**	<110	<94	**9,900**	<100	<110	**660**	<70	<360
Post Carbon	SVE South Post Carbon	9/28/2015	**3.4**	<6.0	**340**	**3.6**	<2.6	**300**	<2.8	**39**	**59**	<1.9	<9.8
Pre Carbon	SVE South Pre Carbon	10/29/2015	<130	<350	**230**	<170	<150	**18,000**	<170	<180	**790**	<110	<570
Post Carbon	SVE South Post Carbon	10/29/2015	**4.2**	**5.2**	**340**	**4.5**	**2.6**	**26**	<1.5	**67**	**310**	**1.7**	<5.2
Pre Carbon	SVE_South_Precarbon_113015	11/30/2015	<29	<77	**54**	<38	<38	**3,000**	<38	<29	**300**	<38	<77
Post Carbon	SVE_South_Postcarbon_113015	11/30/2015	<0.80	<0.80	**27**	**0.60**	<0.40	<0.40	<0.40	**6**	**11**	<0.40	<0.80
Pre Carbon	SVE_SOUTH_PRE CARBON_12/28/15	12/28/2015	<120	<320	**180**	<160	<140	**35,000**	<150	<170	**1,200**	<100	<530
Post Carbon	SVE_SOUTH_POST CARBON_12/28/15	12/28/2015	<1.2	<3.2	**28**	<1.6	<1.4	<2.7	**1.5**	**2**	**6.5**	<1.0	<4.2
Pre Carbon	SVE_SOUTH_PRE CARBON	2/1/2016	<8.6	<22	**20**	<11	<9.8	**2,900**	<11	**14**	**120**	<7.2	<37
Post Carbon	SVE_SOUTH_POST CARBON	2/1/2016	**2.2**	<3.2	**160**	**2.90**	<1.4	<2.7	<1.5	**92**	**260**	<1.0	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON	3/29/2016	<230	<610	**710**	<300	<270	**71,000**	<290	**520**	**2,800**	<200	<670
Post Carbon	SVE_SOUTH_POST CARBON	3/29/2016	<69	<180	**490**	<23	<79	**9,300**	<86	**1500**	**9,300**	<58	<200
Pre Carbon	SVE_SOUTH_PRE CARBON	4/27/2016	<6.4	<17	**12**	<8.4	<7.4	**910**	<8.0	<8.7	**23**	<5.4	<18
Post Carbon	SVE_SOUTH_POST CARBON	4/27/2016	<63	<160	**180**	<82	<72	**11,000**	<78	**110**	**2,200**	<53	<180
Pre Carbon	SVE_SOUTH_PRE CARBON	5/25/2016	<1.2	<3.2	**4**	<1.6	<1.4	**550**	**2.9**	**3**	**22**	<1.0	**3.9**
Post Carbon	SVE_SOUTH_POST CARBON	5/25/2016	<16	<41	**2300**	**30.00**	<18	**14,000**	<19	**130**	**3,300**	<13	<45
Pre Carbon	SVE_SOUTH_PRE CARBON	7/26/2016	<98	<260	**340**	<130	<110	**18,000**	<120	<130	**970**	<83	<420
Post Carbon	SVE_SOUTH_POST CARBON	7/26/2016	<78	<200	**760**	<120	<89	**15,000**	<97	**220**	**1,400**	<66	<330

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m^3										
Pre Carbon	SVE_SOUTH_PRE CARBON	8/30/2016	<86	<230	**340**	<110	<99	**28,000**	<110	<120	**1,400**	<73	<370
Post Carbon	SVE_SOUTH_POST CARBON	8/30/2016	<81	<210	**370**	<110	<93	**19,000**	<100	**210**	**910**	<68	<350
Pre Carbon	SVE_SOUTH_PRE CARBON	9/29/2016	<73	<190	**340**	<95	<83	**25,000**	<90	**110**	**1,300**	<61	<310
Post Carbon	SVE_SOUTH_POST CARBON	9/29/2016	<46	<120	**410**	<60	<53	**14,000**	<57	**140**	**1,900**	<39	<196
Pre Carbon	SVE-SOUTH_PRE CARBON_102516	10/25/2016	<150	<390	**380**	<190	<170	**32,000**	<180	<200	**1,500**	<120	<630
Post Carbon	SVE-SOUTH_POST CARBON_102516	10/25/2016	<100	<260	**530**	<130	<120	**19,000**	<130	**180**	**2,700**	<85	<430
Pre Carbon	SVE_SOUTH_PRE CARBON_112816	11/28/2016	<260	<670	**420**	<340	<290	**52,000**	<320	<350	**2,100**	<220	<1110
Post Carbon	SVE_SOUTH_POST CARBON_112816	11/28/2016	<79	<210	<100	<100	<90	**18,000**	<98	**360**	**3,200**	<66	<340
Pre Carbon	SVE_SOUTH_PRE CARBON_013017	1/30/2017	<260	<690	**660**	<340	<300	**61,000**	<330	**400**	**2,400**	<220	<1130
Post Carbon	SVE_SOUTH_POST CARBON_013017	1/30/2017	<1.2	<3.2	<1.6	<1.6	<1.4	**24**	**1.8**	<1.6	<2.1	<1.0	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_073117	7/31/2017	<100	<260	**400**	<130	<110	**17,000**	**340**	<130	**1,000**	<84	<430
Post Carbon	SVE_SOUTH_POST CARBON_073117	7/31/2017	<1.2	<3.2	<1.6	<1.6	**2.4**	**6.5**	**8.2**	<1.6	**3.9**	**2.4**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_082817	8/28/2017	<60	<160	**320**	<79	<69	**32,000**	<75	**90**	**1,100**	<51	<256
Post Carbon	SVE_SOUTH_POST CARBON_082817	8/28/2017	<1.2	**5.8**	**2**	<1.6	**2.4**	**160**	**2.3**	<1.6	**3.9**	**2.2**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_092517	9/25/2017	<21	<55	**200**	<27	<24	**23,000**	<26	**45**	**460**	<18	<90
Post Carbon	SVE_SOUTH_POST CARBON_092517	9/25/2017	<1.2	**8.0**	**16**	<1.6	**5.3**	**6.8**	<1.5	<1.6	<2.1	**2.2**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_102617	10/26/2017	<40	<100	**230**	<52	<45	**13,000**	<49	**64**	**700**	<33	<167
Post Carbon	SVE_SOUTH_POST CARBON_102617	10/26/2017	**2.0**	**15**	**98**	**2.1**	**1.6**	**9.7**	<1.5	**3.9**	<2.1	**1.5**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_112917	11/29/2017	<140	<370	**280**	<180	<160	**22,000**	<170	<190	**820**	<120	<600
Post Carbon	SVE_SOUTH_POST CARBON_112917	11/29/2017	**3.8**	**8.5**	**220**	**4.0**	<2.0	<4.0	<2.2	**12**	<3.2	**2.5**	<5.7
Pre Carbon	SVE_SOUTH_PRE CARBON_122117	12/21/2017	--	--	--	--	--	--	--	--	--	--	--
Post Carbon	SVE_SOUTH_POST CARBON_122117	12/21/2017	**4.6**	**4.9**	**300**	**5.2**	**1.7**	<2.7	<1.5	**20**	**7.2**	**1.8**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_012218	1/22/2018	<110	<290	**150**	<150	<130	**13,000**	<140	<150	**390**	<95	<480
Post Carbon	SVE_SOUTH_POST CARBON_012218	1/22/2018	**4.3**	<6.5	**380**	<3.2	<2.8	**8.1**	<3.1	**11**	**16**	**2.1**	<10.6
Pre Carbon	SVE_SOUTH_PRE CARBON_022818	2/28/2018	<19	<49	**200**	<25	<22	**13,000**	<23	**52**	**440**	<16	<81
Post Carbon	SVE_SOUTH_POST CARBON_022818	2/28/2018	**2.8**	<3.2	**300**	**4.0**	<1.4	<2.7	<1.5	**14**	**51**	**5.1**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_032918	3/29/2018	<23	<60	**180**	<30	<26	**13,000**	<28	**46**	**470**	<19	<98
Post Carbon	SVE_SOUTH_POST CARBON_032918	3/29/2018	**4.2**	**5.2**	**500**	**7.4**	**1.5**	**7.8**	<1.5	**15**	**110**	**1.7**	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_042418	4/24/2018	<69	<180	**140**	<90	<79	**12,000**	<86	<58	**350**	<58	<299
Post Carbon	SVE_SOUTH_POST CARBON_042418	4/24/2018	**3.4**	**4.2**	**470**	**7.6**	**1.5**	**6.6**	**3.1**	**8.4**	**76**	**1.4**	**17.9**
Pre Carbon	SVE_SOUTH_PRE CARBON_051618	5/16/2018	<50	<130	**160**	<65	<57	**7,800**	<62	<68	**370**	<42	<212
Post Carbon	SVE_SOUTH_POST CARBON_051618	5/16/2018	<4.7	<12	**480**	**6.6**	<0.97	<1.3	<0.75	**7.1**	**33**	<4	<19.7
Pre Carbon	SVE_South_72318-Pre Carbon	7/23/2018	<63	<170	**170**	<83	<73	**18,000**	<79	<85	**770**	<53	<271
Post Carbon	SVE_South_Post Carbon-72318	7/23/2018	<25	<65	**230**	<33	<29	**8,300**	<31	**520**	**6,400**	<21	<108

Please refer to notes at end of table.

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Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m^3										
Pre Carbon	SVE_South_PreCarbon_110718	11/7/2018	<64	<170	**310**	<84	<74	**31,000**	<80	**91**	**1,300**	<54	<180
Post Carbon	SVE_South_PostCarbon_110718	11/7/2018	<1.2	<3.2	<1.6	<1.6	<1.4	**15**	<1.5	<1.6	<2.1	**1.6**	<3.5
Pre Carbon	SVE_South_PreCarbon_010419	1/4/2019	<64	<160	**280**	<82	<71	**32,000**	<77	**84**	**920**	<53	<180
Post Carbon	SVE_South_PostCarbon_010419	1/4/2019	<1.2	<3.2	<1.6	<1.6	**2.1**	<2.7	**2.3**	<1.6	<2.1	**1.5**	**7.3**
Pre Carbon	SVE_South_PreCarbon_030819	3/8/2019	<69	<180	**180**	<90	<79	**21,000**	<86	<93	**570**	<58	<200
Post Carbon	SVE_South_PostCarbon_030819	3/8/2019	<1.2	<3.2	<1.6	<1.6	**1.8**	**5.5**	<1.5	<1.6	<2.1	**1.3**	<3.5
Pre Carbon	SVE_South_PreCarbon_050719	5/7/2019	<69	<180	**140**	<90	<79	**17,000**	<85	<93	**450**	<58	<200
Post Carbon	SVE_South_PostCarbon_050719	5/7/2019	<1.2	<3.2	**9.9**	<1.6	<1.4	**1,300**	**13**	**3.0**	**31**	<1.0	**11.7**
Pre Carbon	SVE_South_PreCarbon_070819	7/8/2019	<64	<170	**100**	<83	<73	**16,000**	<79	<86	**530**	<54	<180
Post Carbon	SVE_South_PostCarbon_070819	7/8/2019	<1.2	**6.3**	<1.6	<1.6	**1.6**	**7.9**	<1.5	<1.6	<2.1	<1.0	**1.7**
Pre Carbon	SVE_South_PreCarbon_090919	9/9/2019	<28	<74	**120**	<37	<32	**15,000**	<35	**48**	**590**	<24	<81
Post Carbon	SVE_South_PostCarbon_090919	9/9/2019	**2.8**	**3.6**	**160**	**9.1**	<1.4	<2.7	<1.5	<1.6	<2.1	<1.0	<3.5
Pre Carbon	SVE_South_PreCarbon_110419	11/4/2019	<33	<87	**300**	<43	<38	**38,000**	<41	**87**	**990**	<28	<95
Post Carbon	SVE_South_PostCarbon_110419	11/4/2019	**2.2**	<5.2	**160**	**5.6**	<2.3	<4.4	<2.5	<2.7	<3.5	**3.2**	<5.7

Notes:

1. µg/m^3 = Micrograms per cubic meter.
2. Samples analyzed by Modified EPA Method TO-15.
3. Only analytes detected in at least one sample are presented in this table.
4. S= Surrogate recoveries were above acceptable recovery limits. Results may be biased high.
5. **Bold** values represents detected concentration of listed analyte.
6. -- = Not sampled.

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Table 10
North SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)
10/12/2011	0.1	250	10.5	0.2
1/23/2012	0.1	361	16.5	0.5
2/17/2012	0.05	215	11.3	0.2
3/22/2012	--	210	6.7	0.1
6/20/2012	0.2	217.8	0.3	0.005
8/22/2012	0.2	216	0.2	0.003
11/26/2012	0.05	215	22.6	0.436
12/21/2012	0.1	215	3.6	0.069
2/28/2013	0.1	215	4.6	0.088
5/24/2013	0.1	215	24.4	0.471
6/25/2013	0.1	215	13.8	0.267
8/27/2013	0.1	215	17.8	0.344
10/24/2013	0.1	215	10.6	0.204
12/27/2013	0.1	215	7.5	0.144
1/29/2014	3.0	215	1.4	0.028
2/24/2014	9.0	215	9.5	0.184
3/31/2014	1.0	215	3.7	0.072
4/29/2014	2.0	215	3.7	0.072
5/27/2014	2.0	215	4.4	0.085
7/3/2014	4.0	215	4.8	0.093
7/28/2014	3.0	215	7.7	0.148
9/30/2014	--	215	7.8	0.151
10/27/2014	2.0	215	15.4	0.298
11/25/2014	--	215	7.5	0.145
12/29/2014	2.0	215	15.3	0.296
1/26/2015	3.0	215	1.6	0.032
2/26/2015	0.1	215	0.0	0.001
3/30/2015	0.4	215	1.8	0.036
4/24/2015	0.4	215	0.6	0.012
5/14/2015	--	215	0.0	0.000
5/28/2015	0.05	215	0.4	0.007
7/29/2015	0.10	215	2.2	0.043
8/31/2015	0.05	215	7.8	0.150
9/28/2015	0.00	215	1.6	0.031
10/29/2015	1.00	215	6.9	0.134
11/30/2015	2.00	215	2.4	0.046
12/28/2015	0.10	215	5.7	0.110
2/1/2016	3.00	215	11.2	0.215
2/29/2016	0.10	215	8.0	0.154
3/29/2016	0.20	215	0.9	0.018
4/27/2016	1.00	215	1.6	0.030
5/25/2016	--*	--*	--*	--*

Please refer to notes at end of table.

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Table 10
North SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)
6/28/2016	0.10	215	1.8830	0.036
7/26/2016	1.20	215	0.0916	0.00177
9/29/2016	0.10	215	0.0150	0.00029
10/25/2016	0.10	215	0.0109	0.000211
11/28/2016	0.10	215	0.0067	0.000129
12/28/2016	0.10	215	0.0017	0.0000329
1/30/2017	0.10	215	0.0046	0.0000889
2/28/2017	0.10	215	0.0059	0.000114
3/28/2017	0.10	215	0.0061	0.000118
4/24/2017	0.10	215	0.0076	0.000147

Date	Activity	VOC Removal Rate (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
10/10/2011	Startup	--	--	--	--
10/12/2011	Sample	0.2	37	9	9
1/23/2012	Sample	0.5	31	17	26
2/17/2012	Sample	0.2	25	6	32
3/22/2012	Sample	0.1	34	5	37
6/20/2012	Sample	0.005	90	1	38
8/22/2012	Sample	0.003	63	1	39
11/26/2012	Sample	0.436	66	29	68
12/21/2012	Sample	0.069	25	2	70
2/28/2013	Sample	0.088	69	7	77
5/24/2013	Sample	0.471	--	--	77
6/25/2013	Sample	0.267	32	9	86
8/27/2013	Sample	0.344	63	22	108
10/24/2013	Sample	0.204	58	12	120
12/27/2013	Sample	0.144	64	10	130
1/29/2014	Sample	0.028	33	1	131
2/24/2014	Sample	0.184	--	--	131
3/31/2014	Sample	0.072	35	3	134
4/29/2014	Sample	0.072	29	3	137
5/27/2014	Sample	0.085	28	3	140
7/3/2014	Sample	0.093	37	4	144
7/28/2014	Sample	0.148	25	4	148
9/30/2014	Sample	0.151	64	10	158
10/27/2014	Sample	0.298	27	9	167
11/25/2014	Sample	0.145	29	5	172
12/29/2014	Sample	0.296	34	11	183

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 10
North SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Date	Activity	VOC Removal Rate (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
1/26/2015	Sample	0.032	28	1	184
2/26/2015	Sample	0.001	31	1	185
3/30/2015	Sample	0.036	32	2	187
4/24/2015	Sample	0.012	25	1	188
5/14/2015	Sample	0.000	20	0	188
5/28/2015	Sample	0.007	14	1	189
6/30/2015	Estimate	0.007	33	1	190
6/30/2015	Estimate	0.000	0	0	190
7/29/2015	Sample	0.043	29	2	192
8/31/2015	Sample	0.150	33	5	197
9/28/2015	Sample	0.031	28	1	198
10/29/2015	Sample	0.134	31	5	203
11/30/2015	Sample	0.046	32	2	205
12/28/2015	Sample	0.110	28	4	209
2/1/2016	Sample	0.215	35	8	217
2/29/2016	Sample	0.154	28	5	222
3/29/2016	Sample	0.018	29	1	223
4/27/2016	Sample	0.030	29	1	224
5/25/2016	Sample	--*	28	--*	221
6/28/2016	Sample	0.0364	34	2	223
7/26/2016	Sample	0.00177	28	1	224
9/29/2016	Sample	0.00029	65	1	225
10/25/2016	Sample	0.000211	26	1	226
11/28/2016	Sample	0.000129	34	1	227
12/28/2016	Sample	0.0000329	30	1	228
1/30/2017	Sample	0.0000889	33	1	229
2/28/2017	Sample	0.000114	29	1	230
3/28/2017	Sample	0.000118	28	1	231
4/24/2017	Sample	0.000147	27	1	232

Notes:

1. Air flow rate read from system gauge.
2. cfm = Cubic feet per minute.
3. mg/m^3 = Milligrams per cubic meter.
4. lb/day = Pounds per day.
5. lbs = Pounds.
6. * = Not measured/sampled; system intentionally shut down to evaluate system efficiency.
7. -- = not measured/sampled.

Cascadia Associates, LLC

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Activity	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
10/6/2011	Startup	33.0	590	46	2.4	0.5	2	2
11/2/2011	Sample	27.0	590	29	1.5	27	41	43
12/14/2011	Sample	27.0	590	57	3.0	42	96	139
2/17/2012	Sample	29.0	--[6]	30	1.6	65	151	290
3/22/2012	Sample	27.0	658	31	1.9	34	59	349
4/26/2012	Sample	27.0	--	0	0.0	35	33	382
5/23/2012	Sample	31.0	--	20	1.2	29	18	400
6/20/2012	Sample	33.0	--	37	2.2	28	47	447
7/24/2012	Sample	32.0	--	34	2.0	34	72	519
8/22/2012	Sample	29.0	--	51	3.0	29	74	593
9/25/2012	Sample	29.0	--	52	3.1	34	104	697
10/29/2012	Sample	47.0	--	63	3.7	34	116	813
11/26/2012	Sample	18.0	--	11	0.6	28	61	874
12/21/2012	Sample	17.0	--	15	0.9	25	19	893
1/24/2013	Sample	10.0	--	2	0.1	34	17	910
2/28/2013	Sample	18.0	--	1	0.1	35	3	913
3/25/2013	Sample	16.0	--	4	0.2	25	4	917
4/29/2013	Sample	15.0	--	1	0.1	35	6	923
5/24/2013	Sample	47.0	--	251	14.8	--	--	996
6/25/2013	Sample	51.0	--	41	2.5	32	277	1,273
7/25/2013	Sample	50.0	--	24	1.4	30	58	1,331
8/27/2013	Sample	52.0	--	30	1.8	33	53	1,384
9/30/2013	Sample	45.0	--	28	1.6	34	59	1,443
10/24/2013	Sample	50.0	--	29	1.7	24	41	1,484
11/25/2013	Sample	51.0	--	22	1.3	32	48	1,532
12/27/2013	Sample	55.0	--	21	1.3	32	41	1,573

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Activity	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
1/29/2014	Sample	50.0	--	21	1.2	33	41	1,614
2/24/2014	Sample	50.0	--	37	2.2	--	--	1,614
3/31/2014	Sample	46.0	--	21	1.2	35	60	1,674
4/29/2014	Sample	48.8	--	14	0.8	29	30	1,704
5/27/2014	Sample	49.0	--	13	0.7	28	22	1,726
7/3/2014	Sample	50.0	--	3	0.2	37	18	1,744
7/28/2014	Sample	50.0	--	16	0.9	25	15	1,759
8/25/2014	Sample	49.0	--	21	1.2	28	31	1,790
9/30/2014	Sample	40.0	--	18	1.1	36	42	1,832
11/3/2014	Sample	50.0	--	25	1.5	30	39	1,871
12/31/2014	Estimated	--	--	--	--	22	33	1,904
1/26/2015	Sample	20.0	--	23	1.3	26	37	1,941
2/26/2015	Sample	30.0	--	19	1.1	31	39	1,980
3/30/2015	Sample	29.0	--	18	1.1	32	36	2,016
4/24/2015	Sample	29.0	--	6	0.4	25	18	2,034
5/28/2015	Sample	28.0	--	9	0.5	34	15	2,049
7/29/2015	Sample	25.0	--	13	0.8	62	41	2,090
8/31/2015	Sample	26.0	--	13	0.8	33	26	2,116
9/28/2015	Sample	26.0	--	11	0.6	28	20	2,136
10/29/2015	Sample	27.0	--	19	1.1	31	28	2,164
11/30/2015	Sample	30.0	--	3	0.2	32	22	2,186
12/28/2015	Sample	29.0	--	36	2.2	28	33	2,219

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Activity	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
2/1/2016	Sample	19.0	--	3	0.2	35	41	2,260
2/29/2016	Sample	30.0	--	3	0.2	28	6	2,266
3/29/2016	Sample	28.0	--	75	4.4	29	67	2,333
4/27/2016	Sample	5.0	--	1	0.1	29	66	2,399
5/25/2016	Sample	3.0	--	1	0.03	28	2	2,401
6/28/2016	Sample	-- *	-- *	-- *	-- *	-- *	-- *	2,401
7/26/2016	Sample	30.0	--	19	1.1	62	36	2,437
9/29/2016	Sample	28.0	--	27	1.6	65	89	2,526
10/25/2016	Sample	30.0	--	34	2.0	26	47	2,573
11/28/2016	Sample	30.0	--	55	3.3	34	90	2,663
12/28/2016	No sample collected	2.0	--	--	--	--	--	2,663
1/30/2017	Sample	33.0	--	64	3.8	63	223	2,886
3/28/2017	**System Not Working Properly -- No Data or Samples**	--	--	--	--	--	--	2,886
9/25/2017	Sample	30.0	--	24	1.4	28	48	3,427
10/26/2017	Sample	30.0	--	14	0.8	31	35	3,462
11/29/2017	Sample	30.0	--	23	1.4	34	38	3,500
12/21/2017	Estimated (using November effluent data)	30.0	--	23	1.4	22	30	3,530
1/22/2018	Sample	30.0	--	14	0.8	32	36	3,566
2/28/2018	Sample	30.0	--	14	0.8	37	31	3,597
3/29/2018	Sample	31.0	--	14	0.8	29	24	3,621
4/24/2018	Sample	31.0	--	12	0.7	26	21	3,642
5/16/2018	Sample	30.0	--	8	0.5	22	14	3,656
7/23/2018	Sample	29.0	--	19	1.1	68	55	3,711
11/7/2018	Sample	30.0	--	33	1.9	107	164	3,875

Please refer to notes at end of table.

Cascadia Associates, LLC

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

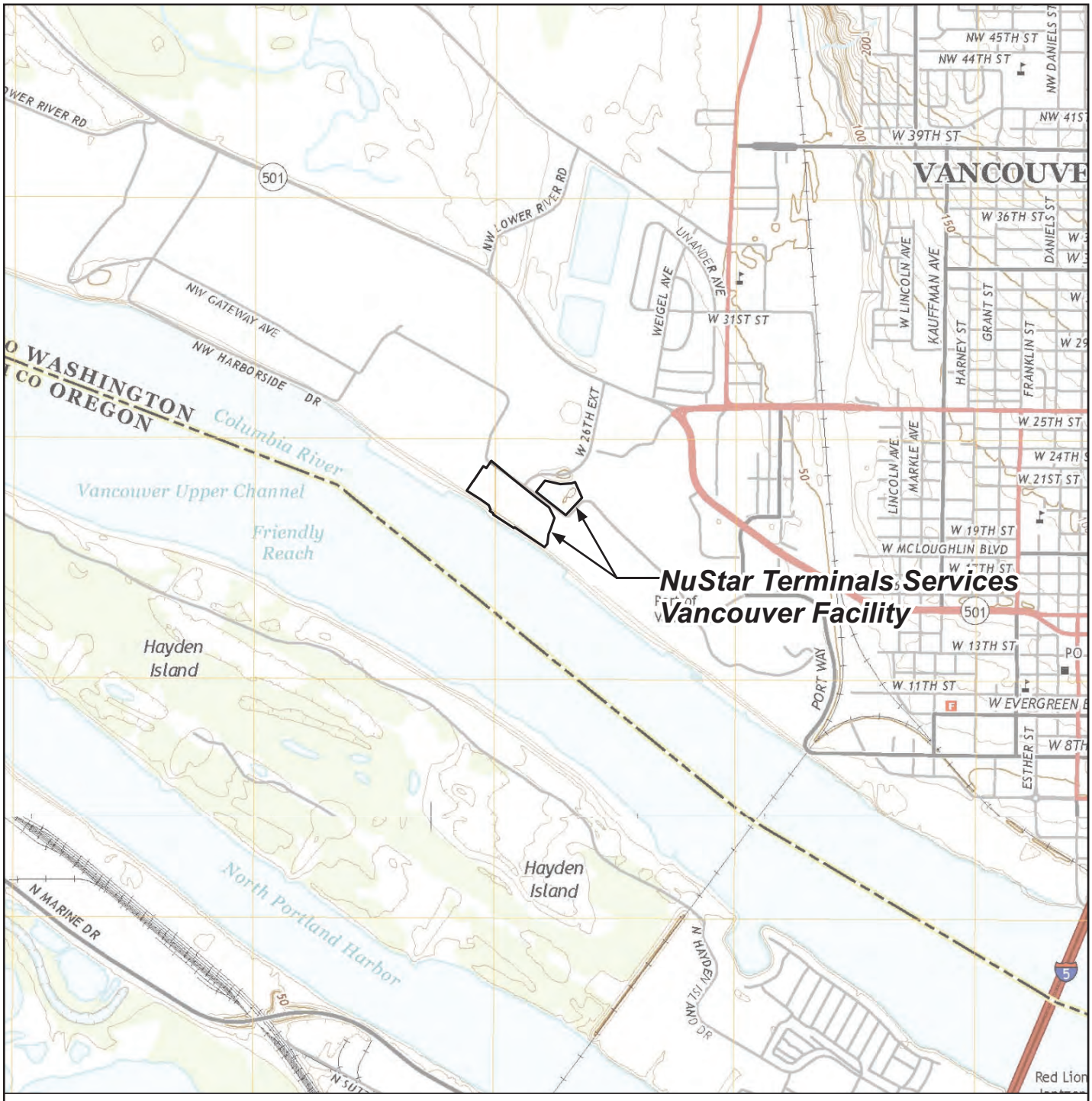
Sample Date	Activity	Post-Blower Pressure (in H_20)	Air Flow Rate [(1)] (cfm)	Total VOCs (mg/m^3)	VOC Removal (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
1/4/2019	Sample	28.0	--	33	2.0	58	114	3,989
3/8/2019	Sample	28.0	--	22	1.3	63	103	4,092
5/7/2019	Sample	29.0	--	18	1.0	60	70	4,162
7/8/2019	Sample	29.0	--	17	1.0	62	63	4,225
9/9/2019	Sample	29.0	--	16	0.9	63	61	4,286
11/4/2019	Sample	29.0	468	39	1.7	56	73	4,359

Notes:

1. Air flow rate read from system gauge.
2. cfm = cubic feet per minute.
3. mg/m^3 = Milligrams per cubic meter.
4. lb/day = Pounds per day.
5. lbs = Pounds.
6. Flow rate was not measured on dates with dashes (--). For calculations, rate is assumed to be the same as measured the date before.
7. System was down during the October 27, 2014 monitoring event and was restarted on October 29, 2014. It is assumed that the system was down for a total of four days, although the exact duration of shutdown is unknown.
8. * = system was off for part replacement.

Cascadia Associates, LLC

FIGURES



Note: Base map prepared from USGS 7.5-minute quadrangles of Vancouver, WA and Portland, OR-WA, dated 2014 as provided by USGS.gov.

0 2,000 4,000

Approximate Scale in Feet

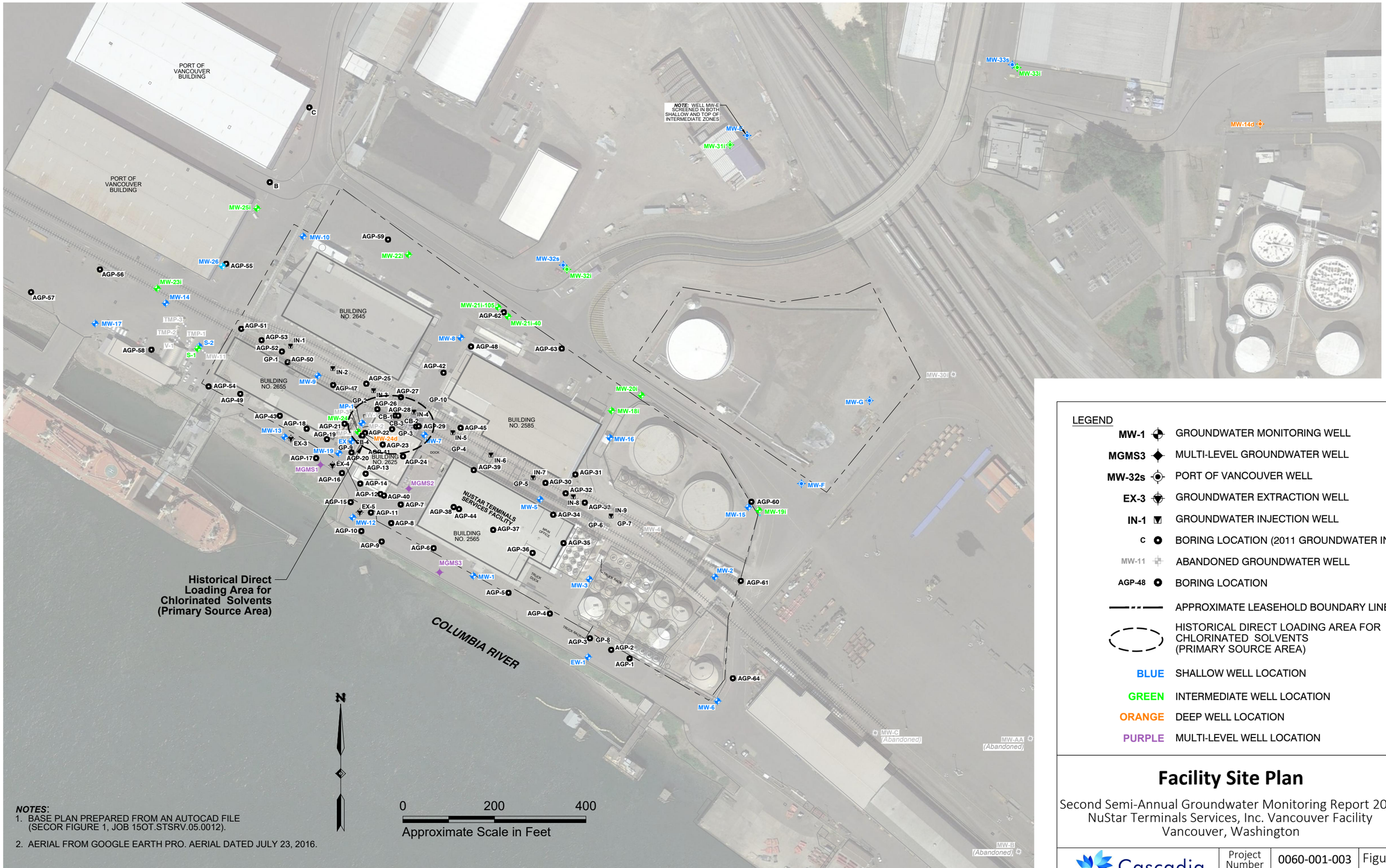
N

Facility Location Map

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-002-004	Figure
February 2020		1



LEGEND

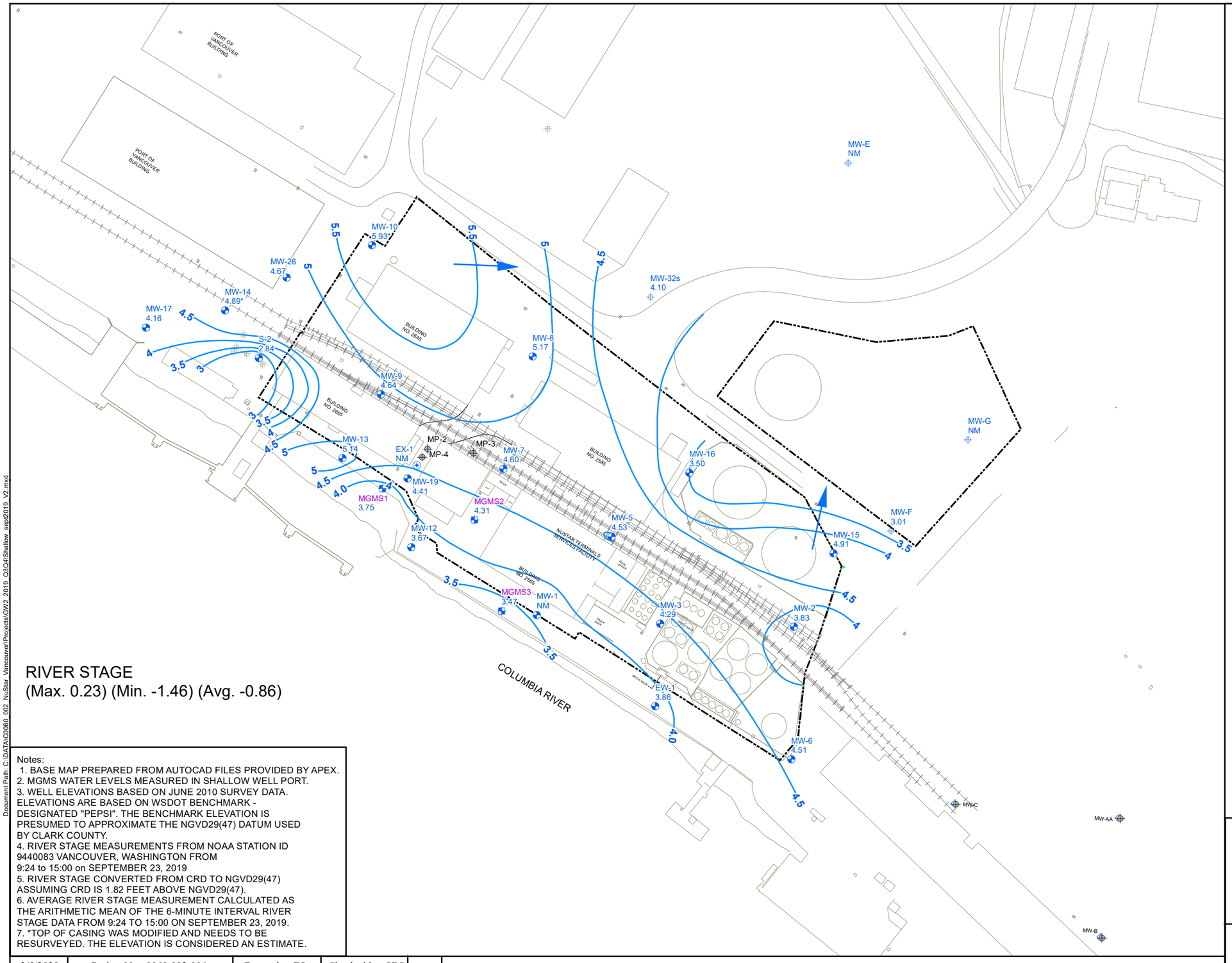
MW-1	GROUNDWATER MONITORING WELL
MGMS3	MULTI-LEVEL GROUNDWATER WELL
MW-32s	PORT OF VANCOUVER WELL
EX-3	GROUNDWATER EXTRACTION WELL
IN-1	GROUNDWATER INJECTION WELL
C	BORING LOCATION (2011 GROUNDWATER INV.)
MW-11	ABANDONED GROUNDWATER WELL
AGP-48	BORING LOCATION
	APPROXIMATE LEASEHOLD BOUNDARY LINE
	HISTORICAL DIRECT LOADING AREA FOR CHLORINATED SOLVENTS (PRIMARY SOURCE AREA)
BLUE	SHALLOW WELL LOCATION
GREEN	INTERMEDIATE WELL LOCATION
ORANGE	DEEP WELL LOCATION
PURPLE	MULTI-LEVEL WELL LOCATION

Facility Site Plan

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-001-003	Figure
February 2020		2



RIVER STAGE
(Max. 0.23) (Min. -1.46) (Avg. -0.86)

Notes:
1. BASE MAP PREPARED FROM AUTOCAD FILES PROVIDED BY APEX.
2. MGMS WATER LEVELS MEASURED IN SHALLOW WELL PORT.
3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 9:24 to 15:00 on SEPTEMBER 23, 2019
5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6-MINUTE INTERVAL RIVER STAGE DATA FROM 9:24 TO 15:00 ON SEPTEMBER 23, 2019.
7. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Groundwater Elevation Contour (Feet)
- Approximate Property Line

NM - Not Measured

BLUE - Shallow Well Location

PURPLE - Multi Level Well Location

Groundwater Flow Direction

0 50 100 200 Feet

Third Quarter- Shallow Groundwater (September 23, 2019)

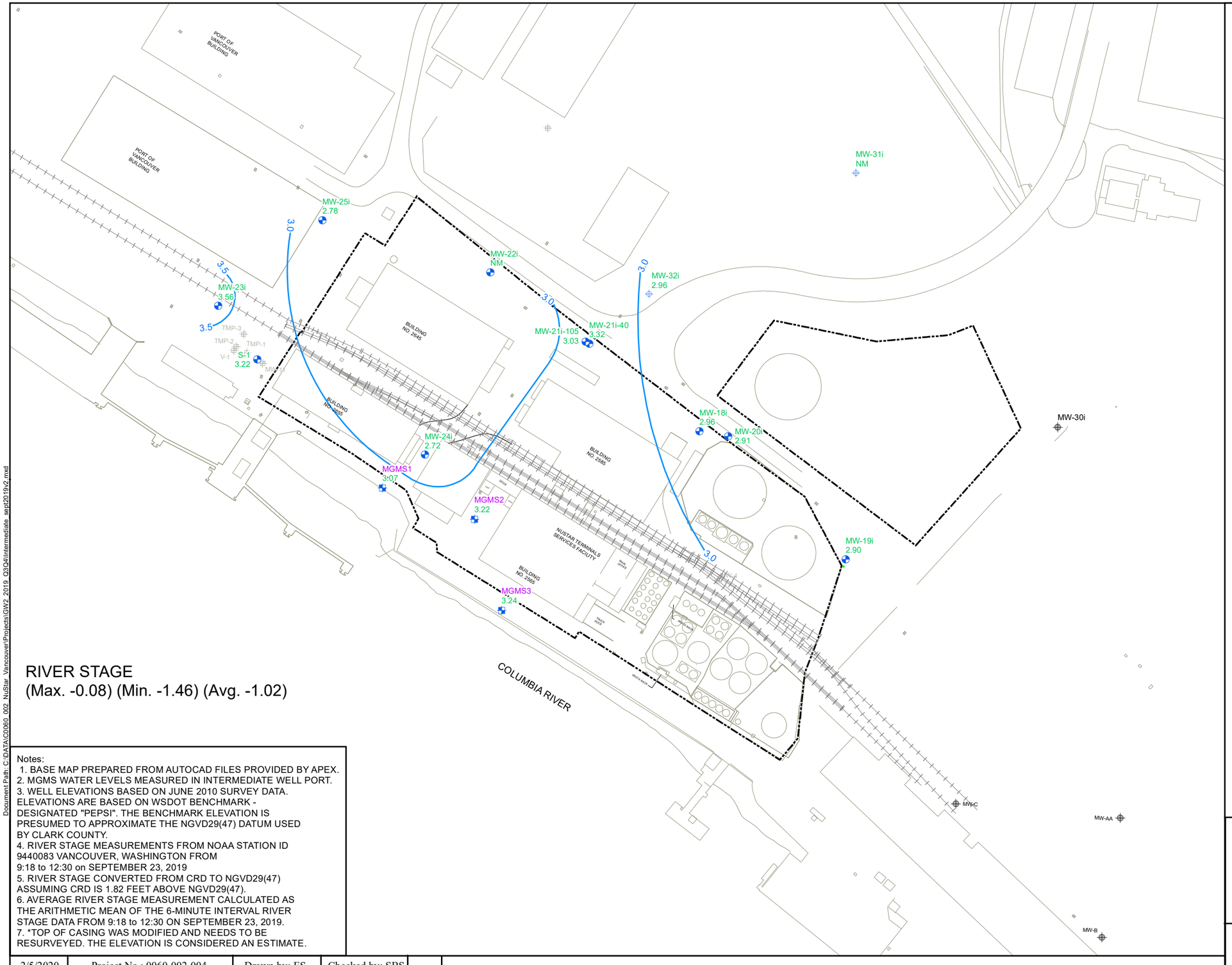
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 3

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Shallow_sept2019_V2.mxd



RIVER STAGE
(Max. -0.08) (Min. -1.46) (Avg. -1.02)

Notes:
1. BASE MAP PREPARED FROM AUTOCAD FILES PROVIDED BY APEX.
2. MGMS WATER LEVELS MEASURED IN INTERMEDIATE WELL PORT.
3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 9:18 to 12:30 on SEPTEMBER 23, 2019
5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6-MINUTE INTERVAL RIVER STAGE DATA FROM 9:18 to 12:30 ON SEPTEMBER 23, 2019.
7. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Groundwater Elevation Contour (Feet)
- Approximate Property Line

NM - Not Measured

GREEN - Intermediate Well Location

PURPLE - Multi Level Well Location

0 50 100 200 Feet

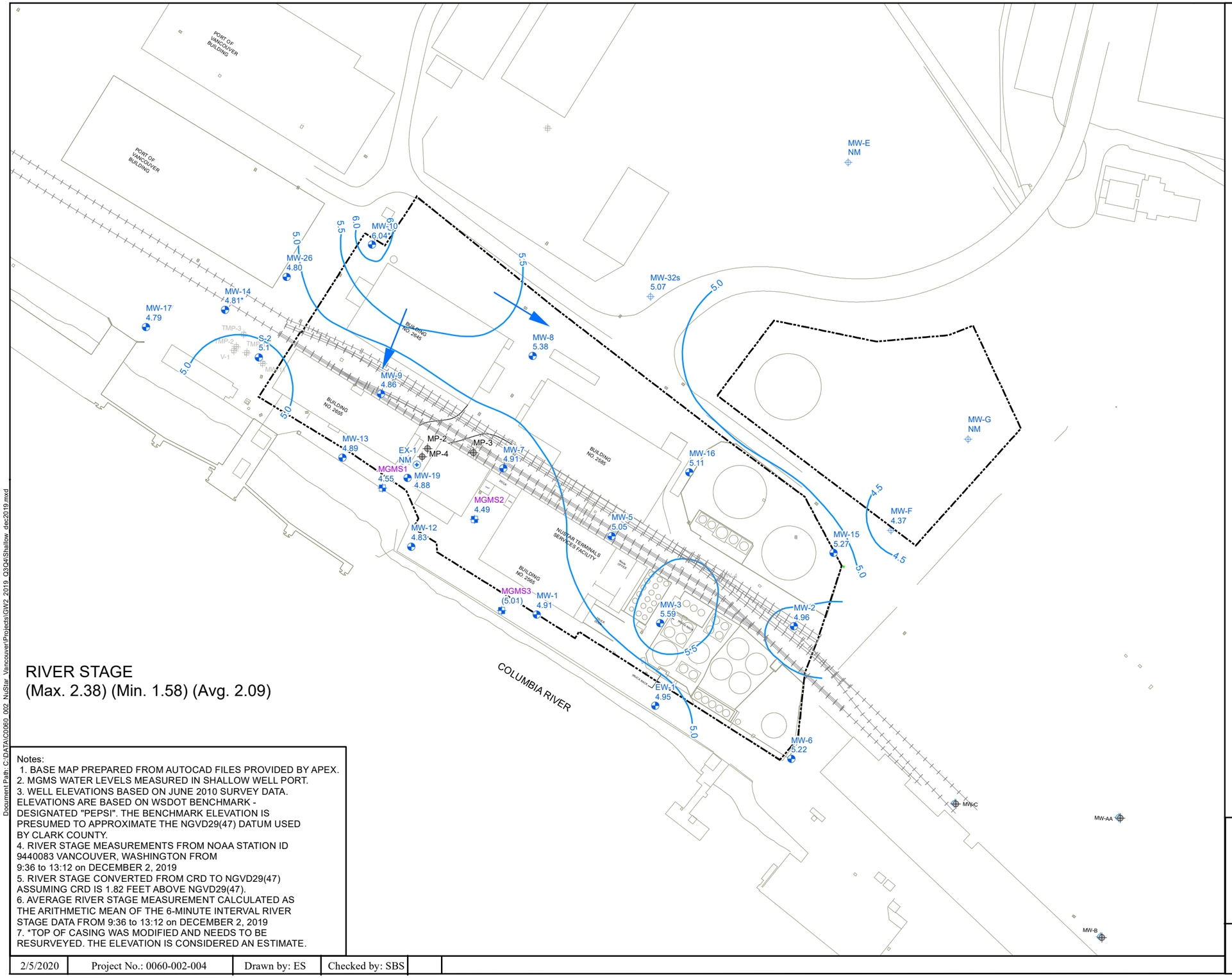
Third Quarter- Intermediate Groundwater (September 23, 2019)

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 4

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Intermediate_sept2019v2.mxd



RIVER STAGE
(Max. 2.38) (Min. 1.58) (Avg. 2.09)

Notes:
1. BASE MAP PREPARED FROM AUTOCAD FILES PROVIDED BY APEX.
2. MGMS WATER LEVELS MEASURED IN SHALLOW WELL PORT.
3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 9:36 to 13:12 on DECEMBER 2, 2019
5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6-MINUTE INTERVAL RIVER STAGE DATA FROM 9:36 to 13:12 on DECEMBER 2, 2019
7. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Groundwater Elevation Contour (Feet)
- Approximate Property Line
- (5.01) - Not used for contouring

NM - Not Measured

BLUE - Shallow Well Location

PURPLE - Multi Level Well Location

Groundwater Flow Direction

0 50 100 200 Feet

Fourth Quarter- Shallow Groundwater (December 2, 2019)

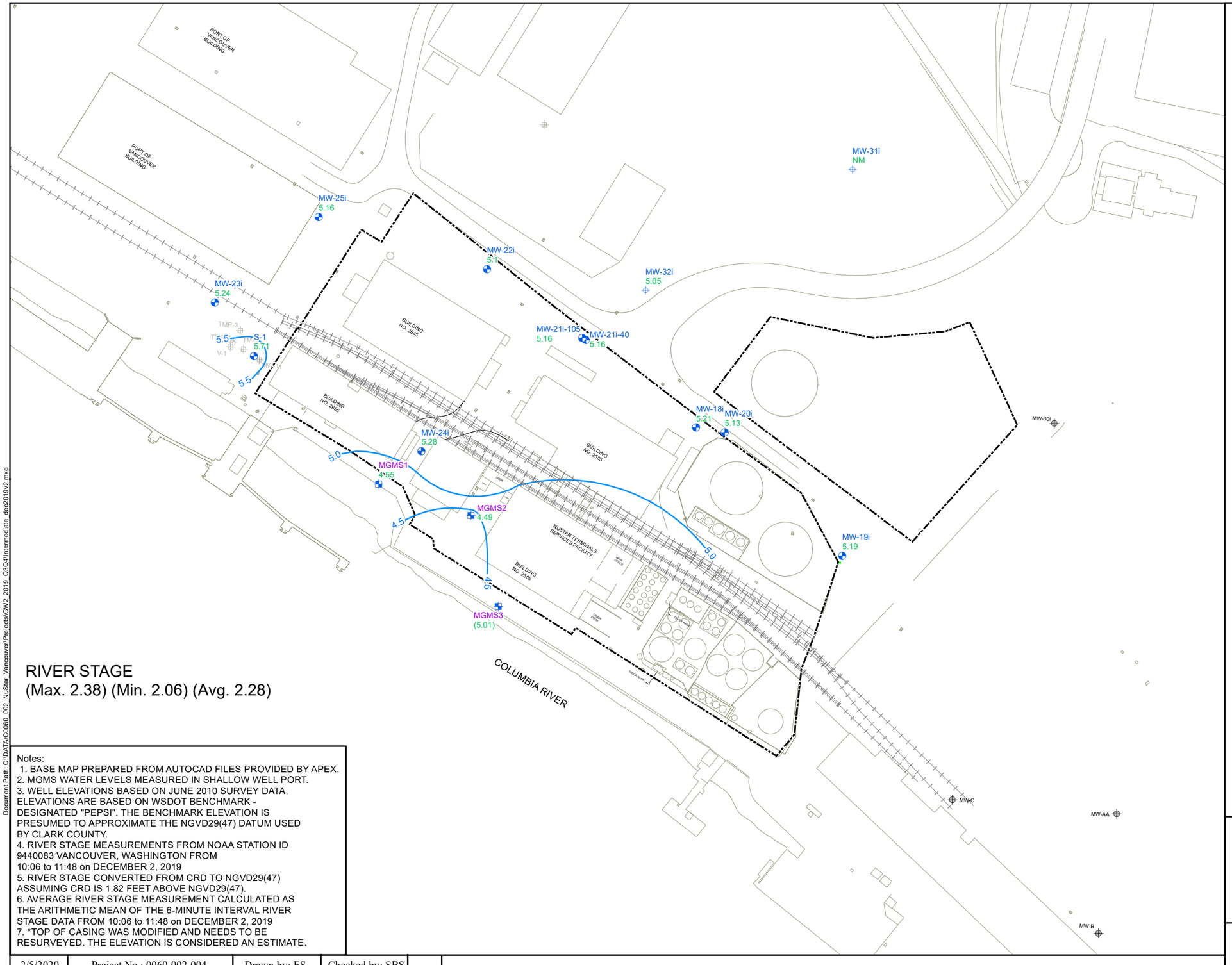
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Cascadia Associates, LLC

Figure 5

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Shallow_dec2019.mxd



RIVER STAGE
(Max. 2.38) (Min. 2.06) (Avg. 2.28)

Notes:
1. BASE MAP PREPARED FROM AUTOCAD FILES PROVIDED BY APEX.
2. MGMS WATER LEVELS MEASURED IN SHALLOW WELL PORT.
3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 10:06 to 11:48 on DECEMBER 2, 2019
5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6-MINUTE INTERVAL RIVER STAGE DATA FROM 10:06 to 11:48 on DECEMBER 2, 2019
7. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Groundwater Elevation Contour (Feet)
- Approximate Property Line
- (5.01) - Not used for contouring

NM - Not Measured

GREEN - Intermediate Well Location

PURPLE - Multi Level Well Location

0 50 100 200 Feet

Fourth Quarter- Intermediate Groundwater (December 2, 2019)

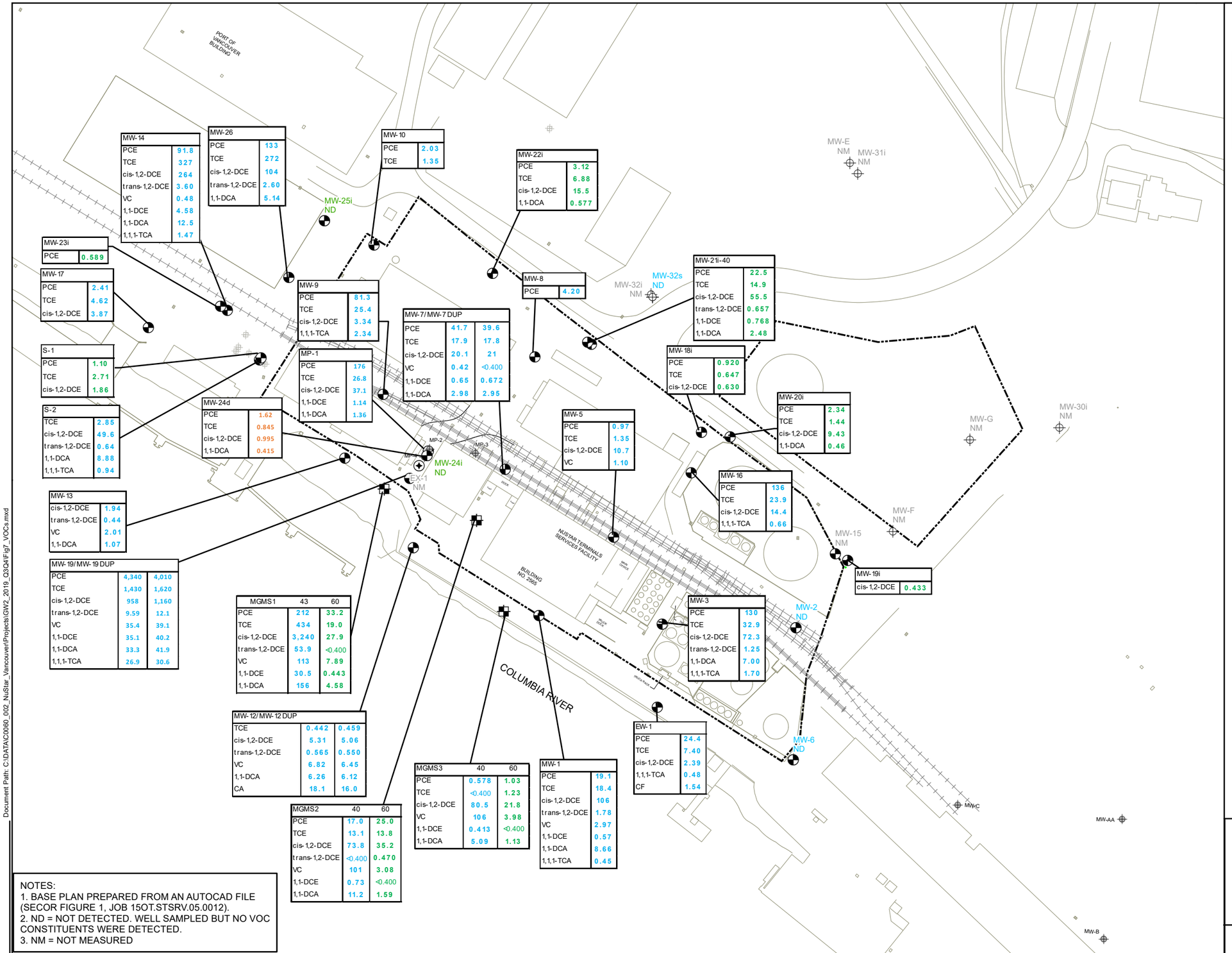
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 6

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Intermediate_dec2019v2.mxd



NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. ND = NOT DETECTED. WELL SAMPLED BUT NO VOC CONSTITUENTS WERE DETECTED.
3. NM = NOT MEASURED

WELL IDENTIFICATION — DEPTH OF PORT SAMPLED (IF NOT SPECIFIED - SINGLE PORT WELL)

MGMS1	43	60
PCE	212	33.2
TCE	434	19.0
cis-1,2-DCE	3,240	27.9
trans-1,2-DCE	53.9	<0.400
VC	113	7.89
1,1-DCE	30.5	0.443
1,1-DCA	156	4.58

CHEMICAL CONCENTRATION IN µg/L (ONLY DETECTED COMPOUNDS ARE SHOWN)

ANALYTE SAMPLED

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Approximate Property Line

BLUE - Shallow zone concentration data (depths 0- 45 feet)

GREEN - Intermediate zone concentration data (depths 45-100 feet)

ORANGE - Deep zone concentration data (depths over 100 feet)

PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
cis-1,2-DCE	CIS-1,2-DICHLOROETHENE
trans-1,2-DCE	TRANS-1,2-DICHLOROETHENE
VC	VINYL CHLORIDE
1,1-DCE	1,1-DICHLOROETHENE
1,1-DCA	1,1-DICHLOROETHANE
CF	CHLOROFORM
1,1,1-TCA	1,1,1-TRICHLOROETHANE
CA	CHLOROETHANE

0 50 100 200 Feet

VOC Concentrations in Groundwater (September 2019)

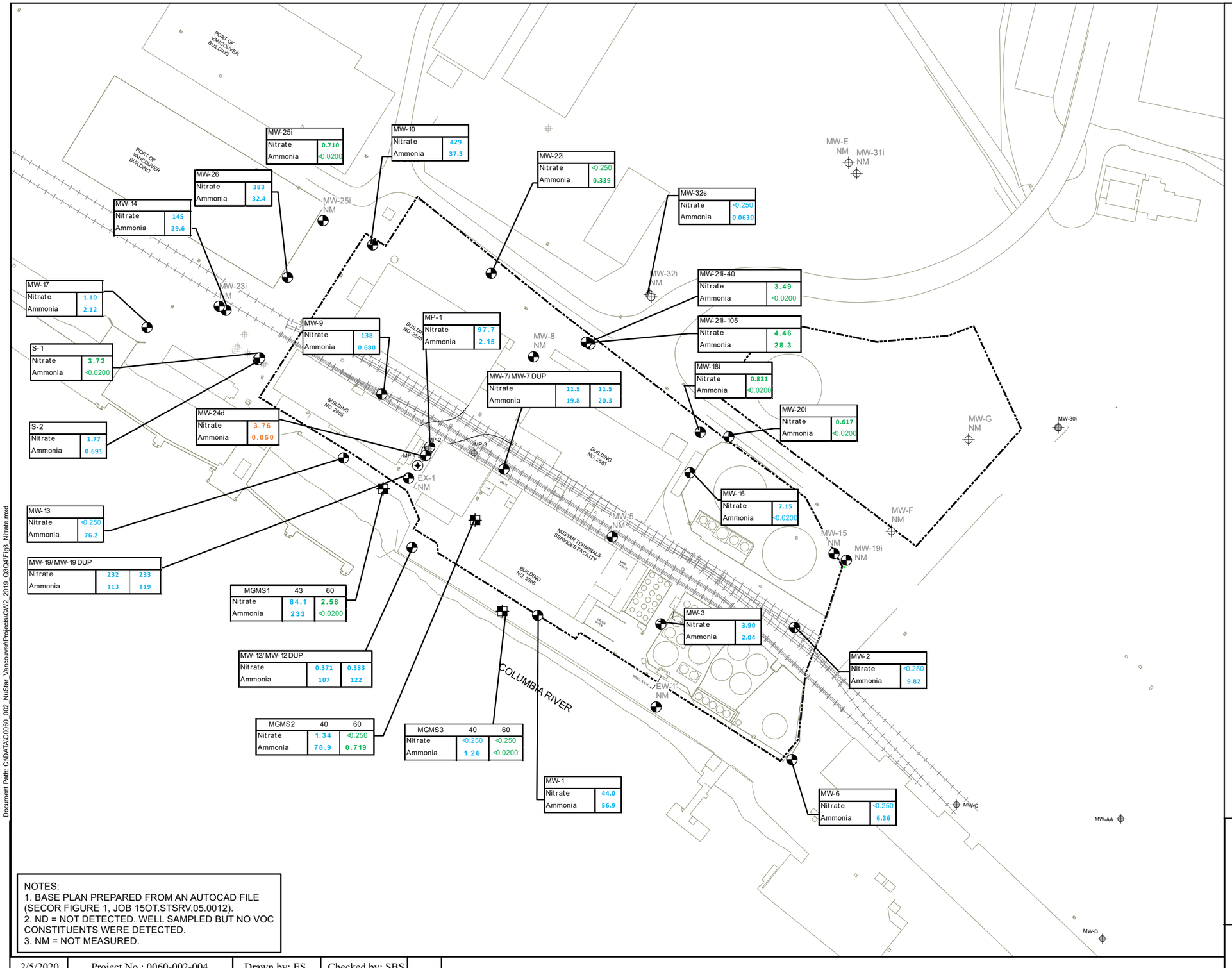
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 7

1/13/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Fig7_VOCs.mxd



WELL IDENTIFICATION

MW-22i
Nitrate <0.250 — NITRATE IN mg/L (AS NITROGEN METHOD 300.0)
Ammonia 0.339 — AMMONIA IN mg/L (AS NITROGEN METHOD 350.1)

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Approximate Property Line

BLUE - Shallow zone concentration data

GREEN - Intermediate zone concentration

ORANGE - Deep zone concentration data

0 50 100 200 Feet

NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. ND = NOT DETECTED. WELL SAMPLED BUT NO VOC CONSTITUENTS WERE DETECTED.
3. NM = NOT MEASURED.

Nitrate and Ammonia Concentrations in Groundwater (September 2019)

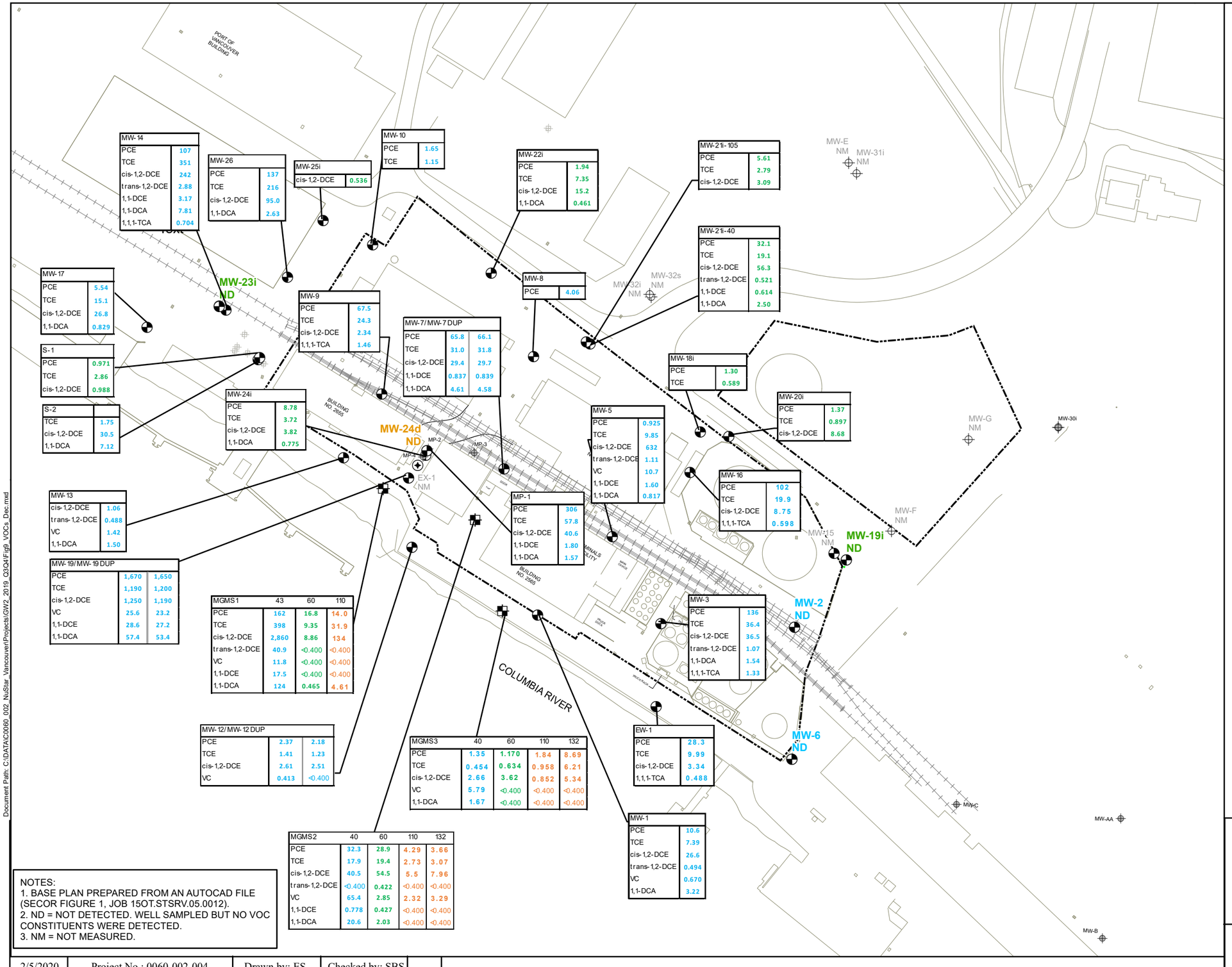
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 8

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3\Q4\Fig8_Nitrate.mxd



NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. ND = NOT DETECTED. WELL SAMPLED BUT NO VOC CONSTITUENTS WERE DETECTED.
3. NM = NOT MEASURED.

WELL IDENTIFICATION — DEPTH OF PORT SAMPLED (IF NOT SPECIFIED - SINGLE PORT WELL)

MGMS1	43	60
PCE	212	33.2
TCE	434	19.0
cis-1,2-DCE	3,240	27.9
trans-1,2-DCE	53.9	<0.400
VC	113	7.89
1,1-DCE	30.5	0.443
1,1-DCA	156	4.58

CHEMICAL CONCENTRATION IN µg/L (ONLY DETECTED COMPOUNDS ARE SHOWN)

ANALYTE SAMPLED

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Approximate Property Line

BLUE - Shallow zone concentration data

GREEN - Intermediate zone concentration data

ORANGE - Deep zone concentration data

PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
cis-1,2-DCE	CIS-1,2-DICHLOROETHENE
trans-1,2-DCE	TRANS-1,2-DICHLOROETHENE
VC	VINYL CHLORIDE
1,1-DCE	1,1-DICHLOROETHENE
1,1-DCA	1,1-DICHLOROETHANE
CF	CHLOROFORM
1,1,1-TCA	1,1,1-TRICHLOROETHANE
CA	CHLOROETHANE

0 50 100 200 Feet

VOC Concentrations in Groundwater (December 2019)

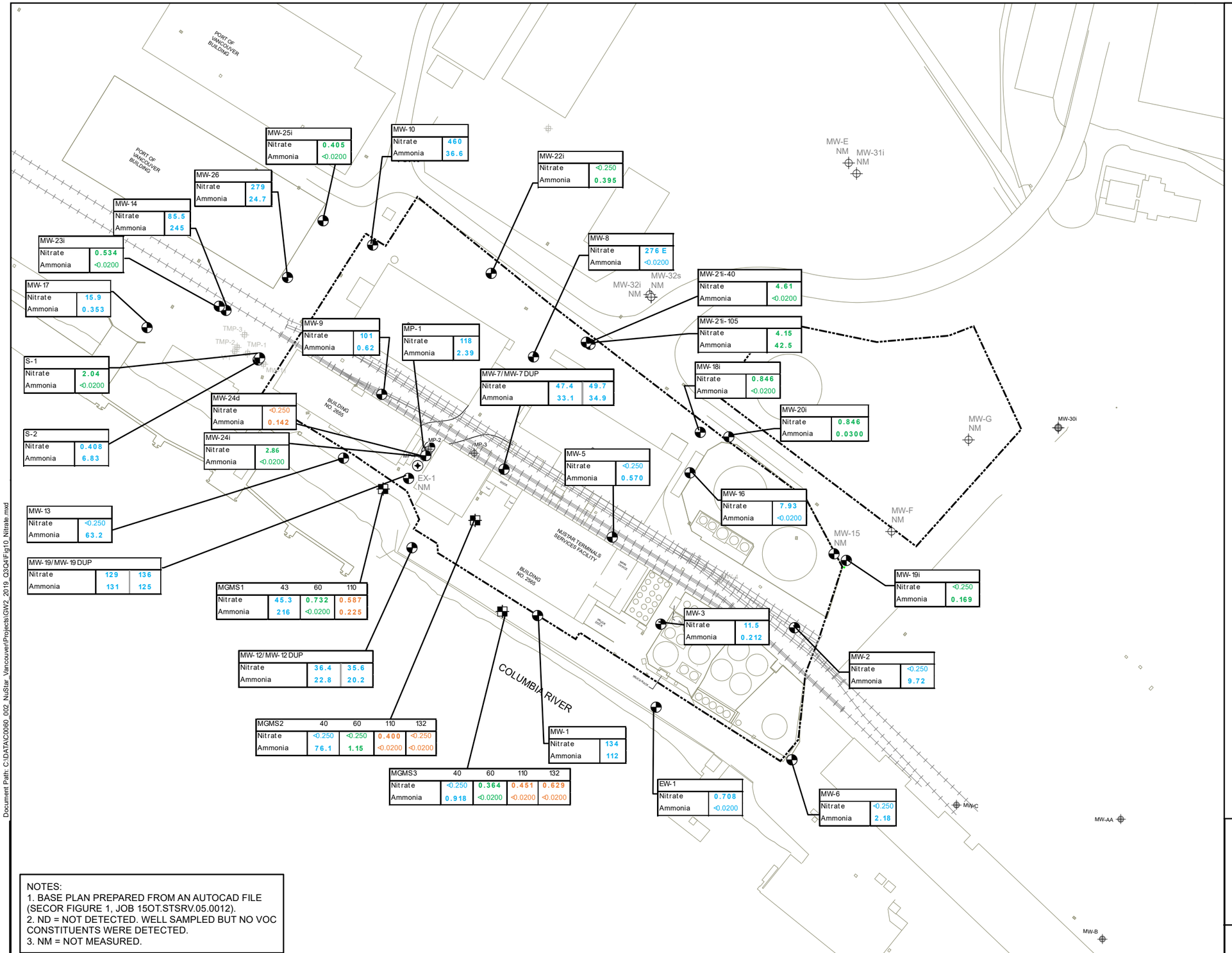
Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 9

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

Document Path: C:\DATA\C0060_002_NuStar_Vancouver\Projects\GW2_2019_Q3Q4\Fig9_VOCs_Dec.mxd



WELL IDENTIFICATION

MW-22i
Nitrate <0.250 — NITRATE IN mg/L (AS NITROGEN METHOD 300.0)
Ammonia 0.339 — AMMONIA IN mg/L (AS NITROGEN METHOD 350.1)

Legend

- Port of Vancouver Well
- Multi-Level Groundwater Well
- Monitoring Well
- Historical Groundwater Extraction Well
- Abandonded Groundwater Well
- Approximate Property Line

BLUE - Shallow zone concentration data

GREEN - Intermediate zone concentration data

ORANGE - Deep zone concentration data

0 50 100 200 Feet

NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. ND = NOT DETECTED. WELL SAMPLED BUT NO VOC CONSTITUENTS WERE DETECTED.
3. NM = NOT MEASURED.

Nitrate and Ammonia Concentrations in Groundwater (December 2019)

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure 10

2/5/2020	Project No.: 0060-002-004	Drawn by: ES	Checked by: SBS	

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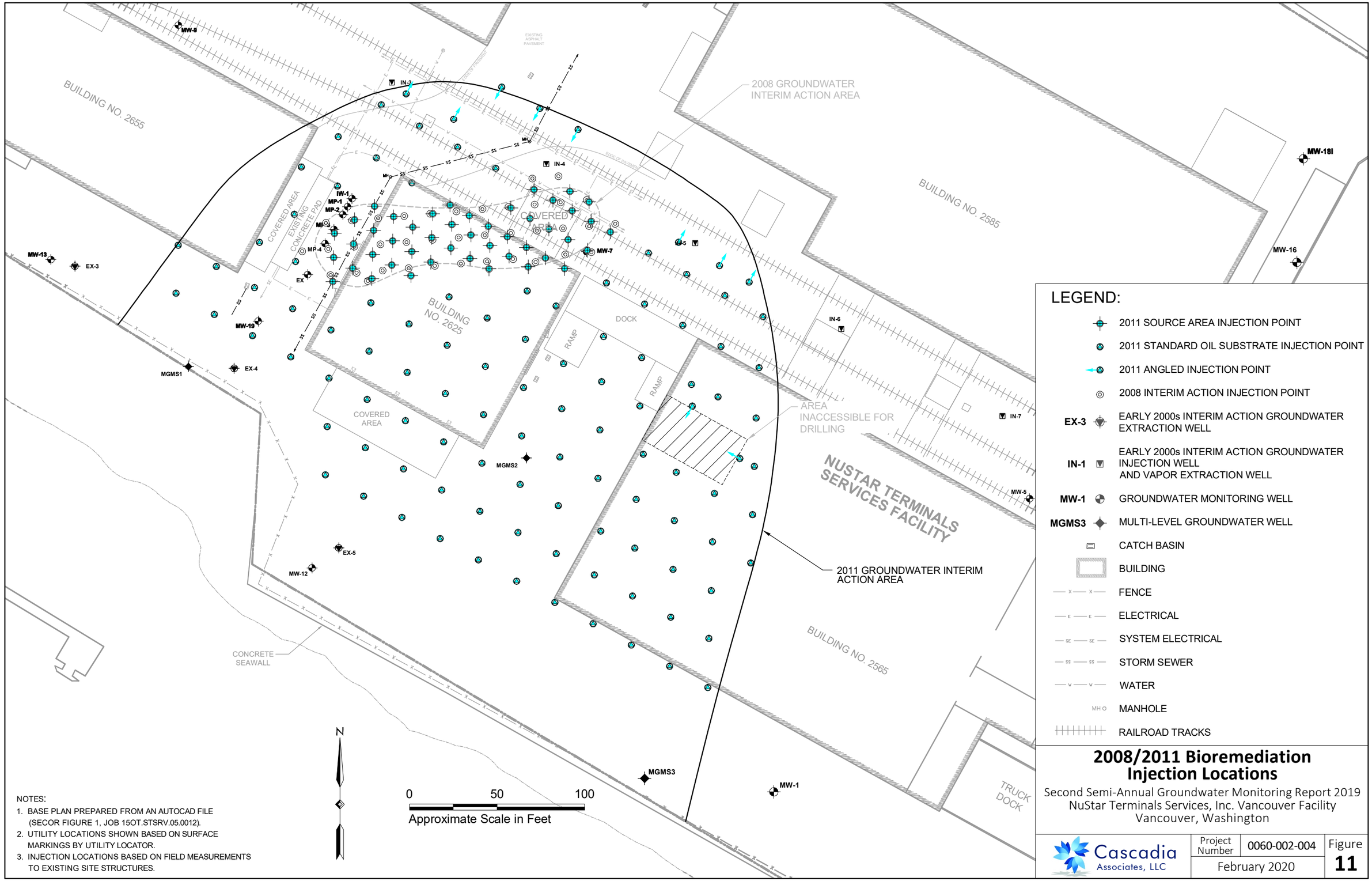


LEGEND:

- 2011 SOURCE AREA INJECTION POINT
- 2011 STANDARD OIL SUBSTRATE INJECTION POINT
- 2011 ANGLED INJECTION POINT
- 2008 INTERIM ACTION INJECTION POINT
- **EX-3** EARLY 2000s INTERIM ACTION GROUNDWATER EXTRACTION WELL
- **IN-1** EARLY 2000s INTERIM ACTION GROUNDWATER INJECTION WELL AND VAPOR EXTRACTION WELL
- **MW-1** GROUNDWATER MONITORING WELL
- **MGMS3** MULTI-LEVEL GROUNDWATER WELL
- CATCH BASIN
- BUILDING
- FENCE
- ELECTRICAL
- SYSTEM ELECTRICAL
- STORM SEWER
- WATER
- MANHOLE
- RAILROAD TRACKS

NOTES:

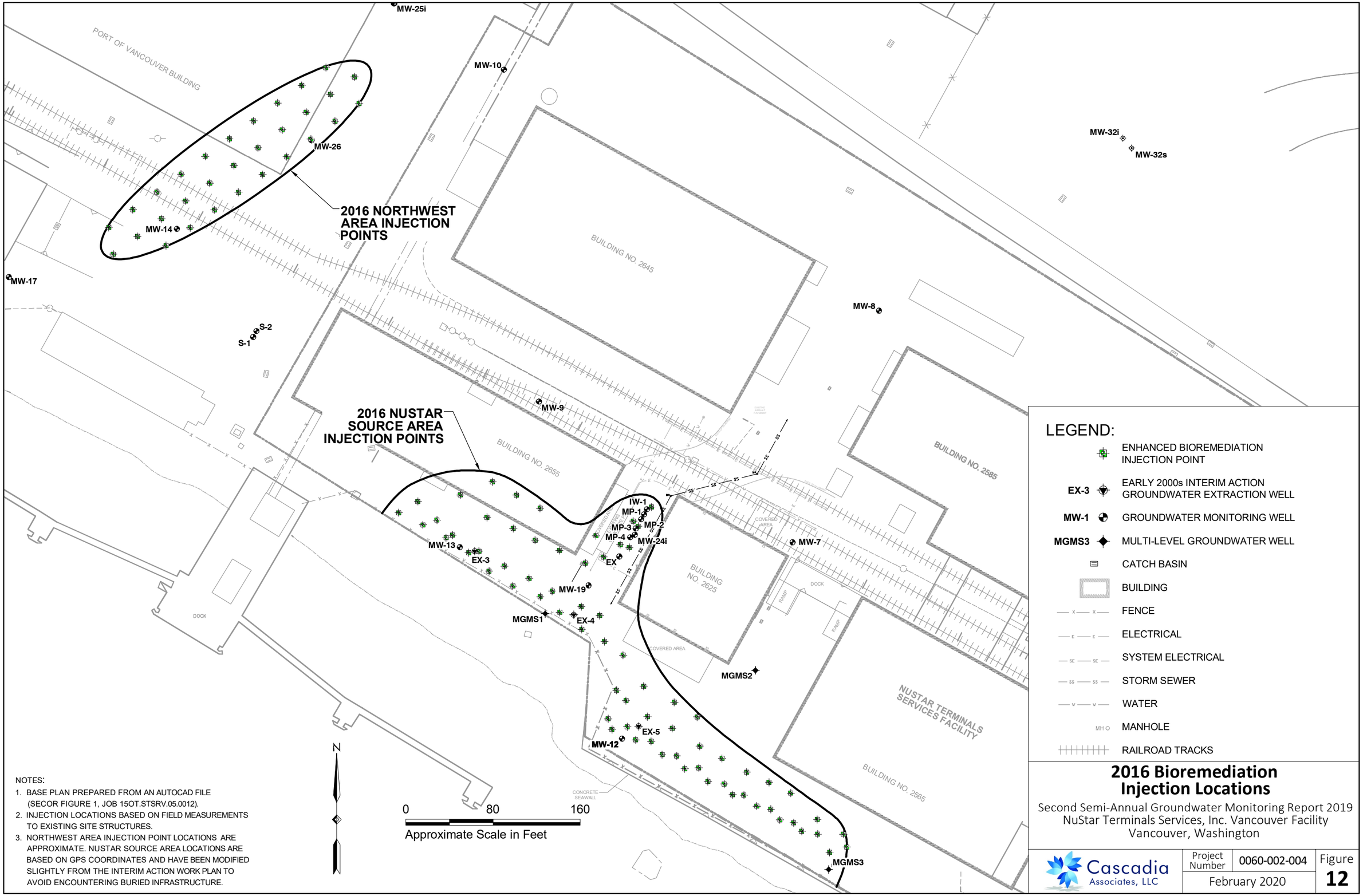
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.
3. INJECTION LOCATIONS BASED ON FIELD MEASUREMENTS TO EXISTING SITE STRUCTURES.

2008/2011 Bioremediation Injection Locations

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-002-004	Figure
February 2020		11



NOTES:

1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. INJECTION LOCATIONS BASED ON FIELD MEASUREMENTS TO EXISTING SITE STRUCTURES.
3. NORTHWEST AREA INJECTION POINT LOCATIONS ARE APPROXIMATE. NUSTAR SOURCE AREA LOCATIONS ARE BASED ON GPS COORDINATES AND HAVE BEEN MODIFIED SLIGHTLY FROM THE INTERIM ACTION WORK PLAN TO AVOID ENCOUNTERING BURIED INFRASTRUCTURE.

LEGEND:

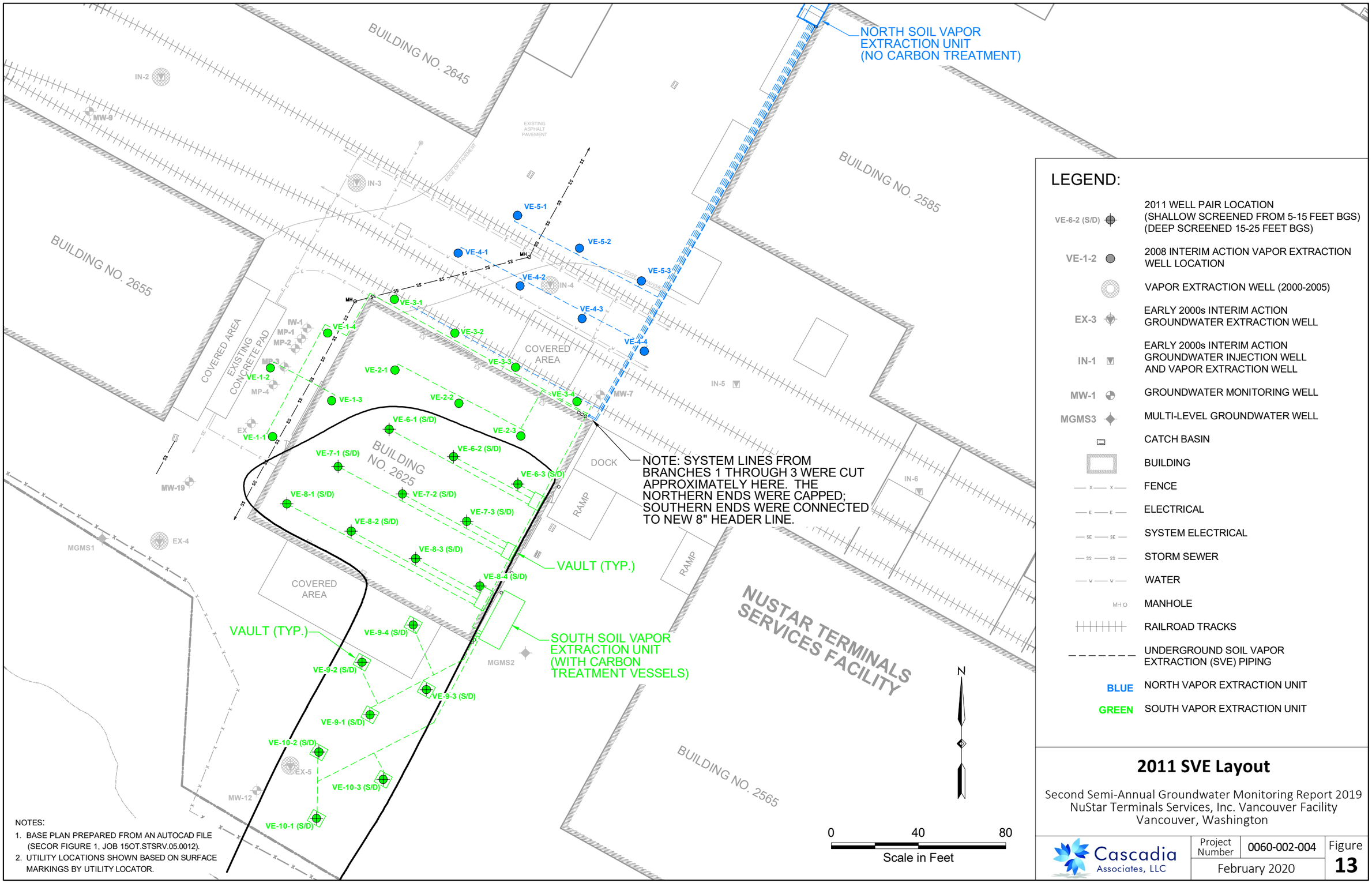
- ENHANCED BIOREMEDIATION INJECTION POINT
- EX-3 — EARLY 2000s INTERIM ACTION GROUNDWATER EXTRACTION WELL
- MW-1 — GROUNDWATER MONITORING WELL
- MGMS3 — MULTI-LEVEL GROUNDWATER WELL
- CATCH BASIN
- BUILDING
- FENCE
- ELECTRICAL
- SYSTEM ELECTRICAL
- STORM SEWER
- WATER
- MH — MANHOLE
- RAILROAD TRACKS

2016 Bioremediation Injection Locations

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-002-004	Figure
February 2020		12



NOTES:

1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 15OT.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.

LEGEND:

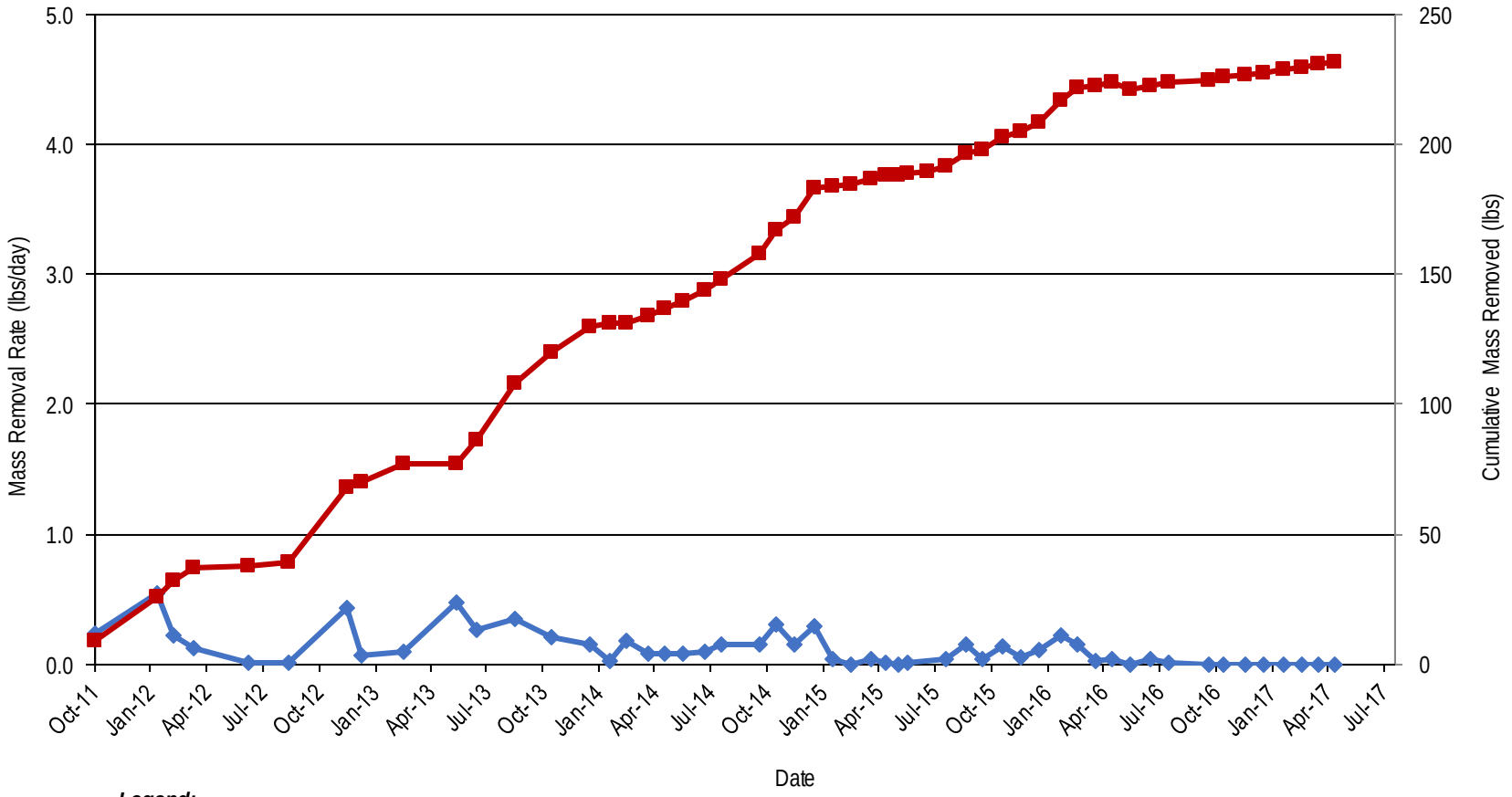
- VE-6-2 (S/D) — 2011 WELL PAIR LOCATION (SHALLOW SCREENED FROM 5-15 FEET BGS) (DEEP SCREENED 15-25 FEET BGS)
- VE-1-2 — 2008 INTERIM ACTION VAPOR EXTRACTION WELL LOCATION
- VAPOR EXTRACTION WELL (2000-2005)
- EX-3 — EARLY 2000s INTERIM ACTION GROUNDWATER EXTRACTION WELL
- IN-1 — EARLY 2000s INTERIM ACTION GROUNDWATER INJECTION WELL AND VAPOR EXTRACTION WELL
- MW-1 — GROUNDWATER MONITORING WELL
- MGMS3 — MULTI-LEVEL GROUNDWATER WELL
- CATCH BASIN
- BUILDING
- FENCE
- ELECTRICAL
- SYSTEM ELECTRICAL
- STORM SEWER
- WATER
- MH — MANHOLE
- RAILROAD TRACKS
- UNDERGROUND SOIL VAPOR EXTRACTION (SVE) PIPING
- BLUE — NORTH VAPOR EXTRACTION UNIT
- GREEN — SOUTH VAPOR EXTRACTION UNIT

2011 SVE Layout

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Project Number	0060-002-004	Figure
February 2020		13



Legend:

Volatile Organic Compound (VOC) Removal Rate (lbs/day)

Approximate Cumulative VOCs Removed (lbs)

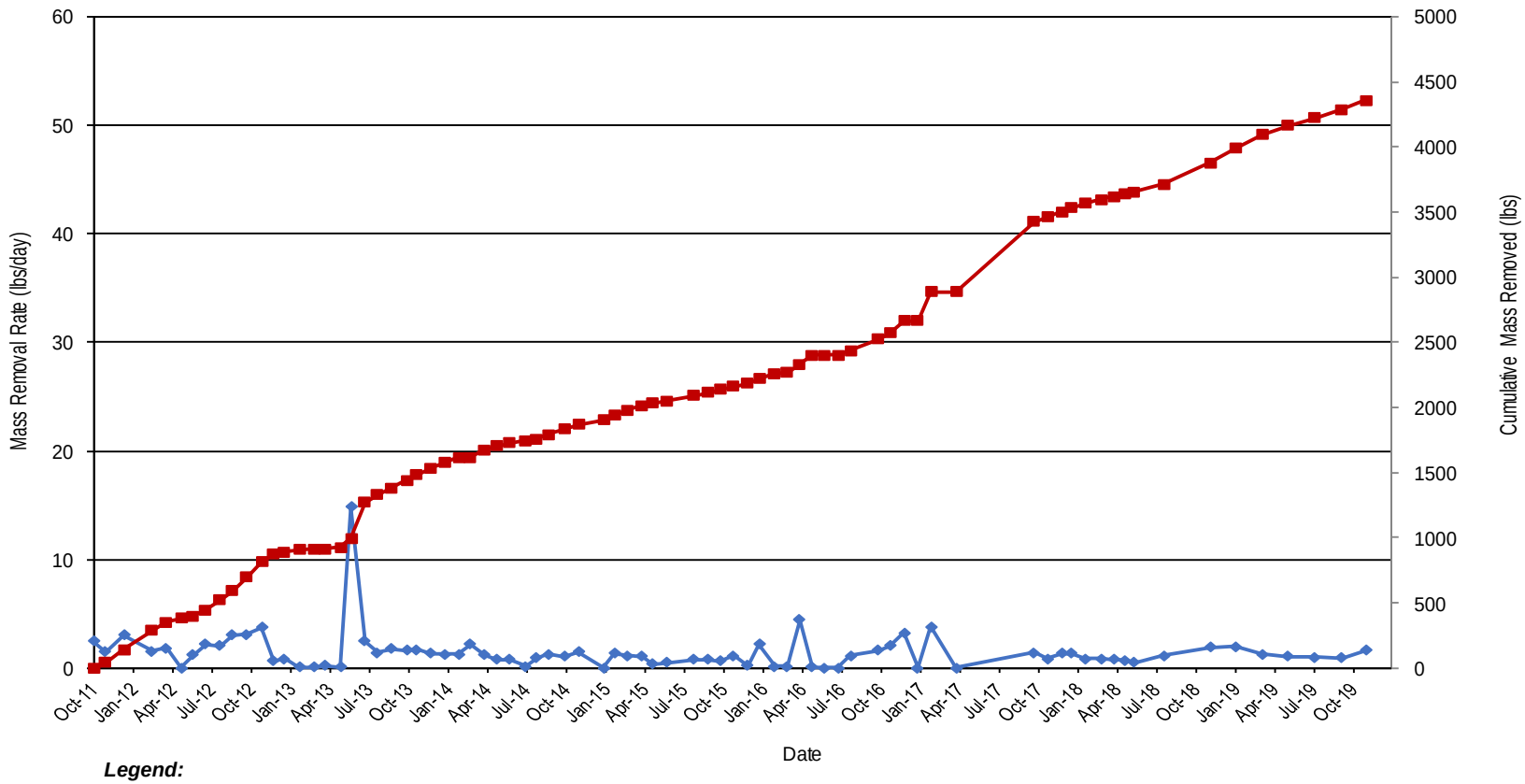
North SVE System – VOC Mass Removal

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure **14**

2/5/2020 | Project No.: 0060-002-004



Legend:

Volatile Organic Compound (VOC) Removal Rate (lbs/day)

Approximate Cumulative VOCs Removed (lbs)

South SVE System – VOC Mass Removal

Second Semi-Annual Groundwater Monitoring Report 2019
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Cascadia Associates, LLC

Figure **15**

2/5/2020 | Project No.: 0060-002-004

APPENDIX A

FIELD SAMPLING DATA SHEETS

Project: 3Q19 GWM
Client: Nustar VAN
Sampler: LW

Date: 9/23/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MGMS3-132	1226	—	28.45	—	
MGMS3-110	1227	—	28.39	—	
MGMS3-60	1229	—	28.41	—	
MGMS3-40	1231	—	28.18	—	
MW-16	1237	—	29.55	—	
MW-10	1249	—	28.90	—	
MW-9	1302	—	29.22	—	crack in riser (coupler)
MW-7	1309	—	29.14	—	
MW-5	1315	—	29.33	—	
MP-1	1344		29.30		
MW-24d	1335		29.74		
MW-F	1500		30.47		
MW-15	1402		34.22		
MW-2	1418		30.21		

Project: Vanc Main GWM
Client: Nustar
Sampler: GW

Date: 9/23/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-21i-40	1215		30.78		Bolts stripped / stuck
MW-21i-105	1219		30.66		
MW-23i	1249		30.24		B.
MW-17	1255		28.49		
MW-14	1305		29.22		
MW-26	1324		29.06		

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-21i-40	Job Number:	—
Client:	NuStar Vanc.	Date:	9/25
Project:	GWM 3Q 19	Sampler:	[illegible]
Weather:	Pt. Cloudy	Time In/Out:	0930-1030

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:	31.09	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:	Bladder	Pump Intake Depth:	MS
Sampling Method:	lf	Tubing Material & Type:	[illegible] SB — 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	
0943			31.09		7.91	15.40	364	3.78	-129.1	clear
0946			↓		7.30	14.39	368	3.79	-126.9	↓
0949			31.13		7.25	14.70	369	3.81	-126.0	
0957			↓		7.09	15.35	364	4.16	-91.9	
1000					7.04	15.20	362	2.93	-177.0	
1003					7.02	15.15	362	1.64	-163.1	
1006					7.00	15.23	361	1.19	-171.9	
1009			31.21		6.96	15.30	357	1.15	-175.6	

PURGING DATA

Sample ID:	MW-21i-40	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex
Sample Time:	1009	Final Depth to Water:	31.21	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	HSO4	NH3 / TOC	N	—	—	—
1 x 250	—	NO3 / NO2	N	—	—	—
3 x 40	HCl	VOC	N	—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-20i	Job Number:	
Client:	NuStar Van	Date:	9/25
Project:	GWM 3Q19	Sampler:	JW
Weather:	Pt Cloud	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:	30.40	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:	LL	Tubing Material & Type:	SB

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	
1105			30.40	.15	7.00	16.52	179	5.93	91.6	clear
1108			↓	↓	6.93	17.30	270	4.27	-13.6	↓
1111			↓	↓	6.94	17.05	296	3.05	-71.7	
1114			30.47	.15	6.97	15.31	304	1.16	-181.2	↓
1117			↓	↓	7.01	15.21	302	.94	-190.3	
1120			↓	.15	7.03	15.15	306	.85	-187.8	↓

PURGING DATA

Sample ID:	MW-20i	Sampling Flow Rate:	.15		Analytical Laboratory:	Apex
Sample Time:	1120	Final Depth to Water:	30.48		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x 250	—	NO3/NO2				
1x 250	H2SO4	NH3/TOC				
3x 40	HCl	VOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-16	Job Number:	
Client:	NuStar Vault	Date:	9/25
Project:	GWM 3Q19	Sampler:	AW
Weather:	Sunny	Time In/Out:	1150 - 1240

WELL DATA

Monument Type:	Flush-mount / Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	30.18	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:	BP	Pump Intake Depth:	MS
Sampling Method:	BP	Tubing Material & Type:	SB

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	
1159			30.18	.25	7.15	17.42	551	7.74	-86.4	clear
1202			↓	↓	6.81	16.03	612	2.46	-81.2	↓
1205			30.21		6.72	15.01	614	1.07	-85.1	↓
1208			↓		6.64	15.22	621	.99	-173.7	cloudy
1211			↓		6.67	15.25	619	.97	-174.2	↓
1214			30.25	↓	6.63	15.14	610	.96	-177.4	cloudy (brown)

PURGING DATA

Sample ID:	MW-16	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1214	Final Depth to Water:	30.24		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1x 250	—	NO3/NO2	—		—		—
1x 250	H2SO4	NH3/TOC	—		—		—
3x 40	HCl	VO	—		—		—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-18i	Job Number:	
Client:	NuStar Van	Date:	9/25/20
Project:	GWM 3Q19	Sampler:	
Weather:	Sunny	Time In/Out:	1360 - 1345

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Cracked	Depth to Water:	30.54	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:	NA
Sampling Method:	BP	Tubing Material & Type:	SB 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	
1310			30.54	.25	6.83	21.10	349	6.29	-12.6	clear
1313			"		7.14	19.60	238	6.85	33.2	
1316			"		7.22	17.81	233	6.14	37.3	
1319			30.53	.25	7.26	16.45	232	6.04	45.1	
1322			"		7.27	16.40	233	6.11	48.4	
1325			30.55	.25	7.24	16.39	231	6.02	49.3	"

PURGING DATA

Sample ID:	MW-18i	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1325	Final Depth to Water:	30.56		Did Well Dewater:		N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1x 250	—	NO3/NO2	N	—	—	—	—
1x 250	H2SO4	NH3/TOC	—	—	—	—	—
3x 40	HCl	VOC	—	—	—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-25i	Job Number:	
Client:	NuStar Vancouver	Date:	9/25
Project:	GWM 3Q19	Sampler:	JA
Weather:	Sunny	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:	30.44		—
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:	SB

NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Ra (L/min	pH	Temp (°C)	Cond (µS/cm)			Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm		
1356			30.44	.2	7.74	23.60	254	9.21	15	clear
1359			1	↓	7.65	21.68	267	8.39	5	↓
1402			30.44		7.59	18.60	308	2.5		
1405			↓		7.15	17.40	306	2.14	-44.7	
1408			↓	↓	7.16	15.90	311	2.02	-41.6	
1411					7.16	15.91	312	1.93	-58.3	
1414			↓	↓	7.09	15.55	315	2.14	-62.4	↓

PURGING DATA

Sample ID:	MW-25i	Sampling Flow Rate:	.2			Apex
Sample Time:	1414	Final Depth to Water:	30.42			
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	Duplicate ID	
1 x 250	—	NO3/NO2	—			
1 x 250	H2SO4	NH3/TOC	—			
3 x 40	HCl	VOC	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-26	Job Number:	—
Client:	Nu Star Vance	Date:	9/6
Project:	GWM 3Q19	Sampler:	JW
Weather:	Clouds	Time In/Out:	0755 - 0845

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:	29.28	Water	—
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

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	
Sampling Method:	LG	Tubing Material & Typ	SB MS NEW

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)			Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
807			29.28	.2	6.38	17.43	4437	1.18	-8.0	clear
810			↓	↓	6.50	16.75	4628	1.29	2	↓
813			↓	.2	6.39	16.50	4603	.5	23	cl lg
816			↓	↓	6.37	15.90	4592	.4	4	↓
819			29.27	↓	6.39	15.80	4431	.41	-5.7	↓
822			↓	↓	6.39	15.81	4426	.40	6.1	↓

PURGING DATA

Sample ID:	MW-26	Sampling Flow Rate:	.2	Analytical Laboratory:	Apex
Sample Time:	0822	Final Depth to Water:	29.30	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2	—				
1 x 250	H2SO4	NH3/TOC	—				
3 x 40	HCl	VOC	—				
2 x 40	HCl		—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-23i	Job Number:	
Client:	NuStar Van C	Date:	9/26
Project:	GWM 3Q19	Sampler:	JW
Weather:	Cloudy		0800 to 0940

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"		—
	Other:	Well Depth:	—		—
Monument Condition:	good	Depth to Water:	30.32	TW	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—
Comments:					
Purge Volume = (Water Height) X (Multiplier) X (# Casing Volume					
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653		

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LL	Tubing Material & Type:	SB NEW /

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)		
						+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV
902			30.32	.2	7.82	16.25	744	7.21	6
905					7.68	16.50	411	8.66	10.0
908					7.63	16.50	407	7.79	1
911			30.35	.2	7.50	16.61	352	6.64	1
914					7.46	16.73	33	5.14	15.1
917					7.41	16.79	326	4.07	1
920			30.35		7.39	16.75	327	4.04	5

PURGING DATA

Sample ID:	MW-23i	Sampling Flow Rate:	.2		Analytical Laboratory:		Apex
Sample Time:	0920	Final Depth to Water:	30.39		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2	—				
1 x 250	H2SO4	NH3/TOC	—				
3 x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	
Client:	NuStar Van	Date:	9/26
Project:	GWM 3Q19	Sampler:	TW
Weather:	Cloudy	Time In/Out:	955-1035

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	29	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.74	Water Column Length:	—
Well Cap Lock Present:	Yes / No	Screened Interval:	2	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:	SB

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			29.74	.2	6.72	16.30	940	4.64	-18.1	clear
1003			↓	↓	6.60	16.40	892	5.35	-12.4	↓
1006			29.77	.2	6.58	16.40	911	6.08	-15.0	cloudy
1009			↓	↓	6.59	16.31	923	5.13	-25.2	↓
1012			↓	↓	6.61	16.20	944	4.92	-31.6	↓
1015			29.70	↓	6.62	16.18	951	4.86	-40.1	↓

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	.2	Analytical Laboratory:	Apex
Sample Time:	1015	Final Depth to Water:	29.65	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	—	NO3/NO2	—			
1x250	H2SO4	NH3/TOC	—			
3x40	HCl	VOC	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	NuStarVen	Date:	9/25
Project:	GWM Q1		
Weather:	Cloudy		1040 1140

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—		
Monument Condition:	cracks	Depth to Water:	28.86	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

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	
Sampling Method:	LO	Tubing Material & Type	SB NYS NEW

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	p (C)	(µS/cm)			
					+/-0.1	+/-0.5 °C		+/-0.5 ppm		
1046			28.86	.25	6.57	17.10	97	3	-41.5	clear
1049			〃	〃	6.35	1 25	2171	2.64	6 9	〃
1052			28.89		6.25	16.00	2194	2.14	1.9	〃
1055			〃	.25	6.23	15.96	2199	2.10	12.9	〃
1058			28.94	〃	6 21	15.89	219	2 7	13 1	〃
1101			〃	.2	6 23	15.87	2210	2.0	12 4	〃

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	.2				Approx
Sample Time:	1101	Final Depth to Water:	29.09				No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2					
1 x 250	H2SO4	NH3/TO					
3 x 40	HCl	VOC					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-19i	Job Number:	—
Client:	Nu Stem Van	Date:	9/26
Project:	GWM 3Q19	Sampler:	JW
Weather:	Cloudy	Time In/Out:	1145 - 1230

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:	30.77	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 / LL	Pump Intake Depth:	MS
Sampling Method:	LL	Tubing Material & Type:	SST — 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	
1154			30.77	.15	7.14	18.40	565	8.61	-16.8	clear
1157			↓		7.15	18.00	514	7.37	-32.1	
1200			30.75		7.14	17.52	436	7.17	-39.2	
1203			↓		7.12	17.40	409	6.57	-42.3	
1205			↓		7.12	17.21	350	6.45	-43.3	
1208			30.77		7.12	17.20	346	6.63	-42.0	
1211			↓		7.12	17.18	351	6.52	-42.3	

PURGING DATA

Sample ID:	MW-19i	Sampling Flow Rate:	.15	Analytical Laboratory:	Apex
Sample Time:	1211	Final Depth to Water:	30.77	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	—	NO3/NO2	—			
1 x 250	H2SO4	NH3/TOC	—			
3 x 40	HCl	VOC	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	EW-1	Job Number:	—
Client:	Nu Star Vam	Date:	9/26
Project:	GWM 3Q19	Sampler:	AW
Weather:	Cloudy	Time In/Out:	1245 - 215

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:	27.65	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:	LS
Sampling Method:	BP	Tubing Material & Type:	SB — 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	
1441 ~~1254~~			27.65	~~.25~~	6.95	18.75	330	~~4~~.20	-29.1	—
1444 ~~1257~~			↓	.1	6.81	18.43	328	2.11	-13.5	clear
1447 ~~1300~~			↓	.1	6.78	18.36	328	1.92	-18.6	↓
1450 ~~1303~~ →			↓	↓	6.77	16.40	326	1.75	-18.2	↓
1453 →			↓	.1	6.79	16.35	326	1.49	-19.1	↓
1456 →			↓	↓	6.77	16.41	325	1.40	-19.5	↓
			↓	↓	6.77	16.39	325	1.41	-19.9	↓

PURGING DATA

Sample ID:	EW	Sampling Flow Rate:	.1	Analytical Laboratory:	Apex	
Sample Time:	1456	Final Depth to Water:	27.65	Did Well Dewater:	No	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	—	NO3/NO2				
1x250	H2SO4	NH3/TDC				
3x40	HCl	VOC				

NOTES/ADDITIONAL COMMENTS

1255 - Pump found to be stuck in bottom of well. Removed, resume purging at 1440

DTB 29.21 Water Column = 1.86

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-24i	Job Number:	
Client:	Nustar Van	Date:	9/27
Project:	GWM 3Q19	Sampler:	JW
Weather:	Clear	Time In/Out:	0815 - 910

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	ok	Depth to Water:	29.91	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:	LF	Tubing Material & Type:	SB

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	
0831			29.91	.2	8.39	14.50	401	5.75	-206.4	clear
0834			↓	↑	8.26	14.38	413	5.37	-237.1	↓
0837			↓	↑	8.22	14.30	417	5.34	-247.0	↓
0840			29.92	.2	8.20	14.28	416	5.30	-252.2	↓

PURGING DATA

Sample ID:	MW-24i	Sampling Flow Rate:	.2			Analytical Laboratory:	Apex
Sample Time:	0840	Final Depth to Water:	29.92			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2	—				—
1 x 250	H2SO4	NH3/TOC	—				—
3 x 40	HCl	VOC	—				—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-24d	Job Number:	
Client:	Nu Star Var	Date:	9/27/19
Project:	GWM 3Q19	Sampler:	TW
Weather:	Sun	Time In/Out:	915

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:	29.98	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/Z6	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SB — 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	
1012			— 29.98		8.26	14.40	213	6.24	-163.1	clear
1015			.1 — .1		8.02	14.30	214	5.50	-147.1	
1018					7.63	14.30	216	4.21	-131.2	
1021			— 30.01		7.59	14.29	215	4.16	-130.7	
1024			.1 — .1		7.58	14.30	215	4.11	-129.6	

PURGING DATA

Sample ID:	MW-24d	Sampling Flow Rate:	.1		Analytical Laboratory:	Apex
Sample Time:	1024	Final Depth to Water:	30.09		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x 250	—	NO3/NO2				
1x 250	H2SO4	NH3/TOC				
3x 40	HCl	VOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 1-40	Job Number:	—
Client:	Nustar Van	Date:	9/27
Project:	GWM 3Q19	Sampler:	JW
Weather:	Cloudy	Time In/Out:	1100 -

WELL DATA

Monument Type:	Flush-mount/Stick-up MGMS	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.94	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/LL	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	
1112			28.94	.1	7.02	16.60	2596	.82	-222.2	clear
1115				.1	6.96	16.30	2720	.72	-248.1	"
1118			28.96	"	6.95	16.11	2810	.52	-276.4	"
1121				"	6.94	16.10	2839	.43	-294.2	"
1124			28.96	.1	6.92	16.08	2842	.42	-295.7	"

PURGING DATA

Sample ID:	MGMS1-43	Sampling Flow Rate:	.1	Analytical Laboratory:	Apex	
Sample Time:	1124	Final Depth to Water:	28.90	Did Well Dewater:	NO	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1x250	—	NO3/NO2	—				—
1x250	H2SO4	NH3/TOC	—				—
3x40	HCl	VOC	—				—
2x40	HCl	RSK	—				—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 1-60	Job Number:	
Client:	Nustar Vancouver	Date:	9/27
Project:	GWM 3Q15	Sampler:	AW
Weather:	Sun	Time In/Out:	1140 -

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	30.04	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~~ / ~~B~~	Pump Intake Depth:	MS
Sampling Method:	~~B~~	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	
1150			30.04	.2	7.04	20.05	818	3.16	-235.2	clear
1153			"		7.15	15.90	426	2.93	-257.1	↓
1156			30.04		7.17	15.71	336	2.60	-253.2	
1159			"	.2	7.14	15.70	368	2.44	-239.7	
1202			"		7.13	15.57	368	2.36	-226.1	

PURGING DATA

Sample ID:	MGMS 1-60 1202	Sampling Flow Rate:	.2		Analytical Laboratory:		Apex
Sample Time:		Final Depth to Water:	30.05		Did Well Dewater:		
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2	—				
1 x 250	H2SO4	NH3/TOC	—				
3 x 40	HCl	VOC	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 2 - 600	Job Number:	
Client:	Nustar VAN	Date:	9/27/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	RAIN	Time In/Out:	1220 - 1350

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:		Depth to Free Product:	—
	Other: MGMS	Well Depth:		Free Product Thickness:	—
Monument Condition:		Depth to Water:	30.40	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/PP/PB	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	
1330			30.40	.2	6.89	17.20	279	1.54	-236.0	clear
1333					7.02	17.00	265	1.09	-238.1	
1336			30.41		7.08	16.80	253	.76	-235.4	
1339					7.11	16.50	248	.04	-232.2	
1342					7.12	16.41	246	.05	-228.4	
1345			30.41		7.15	16.20	246	.05	-225.4	

PURGING DATA

Sample ID:	MGMS2 - 600	Sampling Flow Rate:	.2		Analytical Laboratory:	ATEK
Sample Time:	1345	Final Depth to Water:	30.41		Did Well Dewater:	N
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	AMMS				
1X250	H2SO4	NO2/NO3				
1X250		NH3				
~~2X40~~	~~HCl~~	~~RSK~~				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS2-40	Job Number:	
Client:	Nustar Van	Date:	9/27
Project:	GWM-3919	Sampler:	AW
Weather:	Rain	Time In/Out:	1350 - 1435

WELL DATA

Monument Type:	Flush-mount / Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	27.95	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	
1352			← 27.95		7.65	16.74	1391	7.63	-110.1	clear
1355			.2 →		7.64	16.40	1372	7.52	-113.8	↓
1358			← 27.95		7.76	16.31	1394	7.51	-129.7	
1401			.2 →		7.77	16.29	1446	7.40	-131.0	
1404			← 27.97		7.75	16.25	1402	7.37	-133.9	

PURGING DATA

Sample ID:	MGMS2-40	Sampling Flow Rate:	.2		Analytical Laboratory:		Apex
Sample Time:	1404	Final Depth to Water:	27.98		Did Well Dewater:		NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
1 x 250	—	NO3/NO2	—				
1 x 250	H2SO4	NH3/TOC	—				
3 x 40	HCl	VOC	—				
2 x 40	HCl	RSK	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-32S	Job Number:	
Client:	Nhytan var	Date:	9/24/19
Project:	B&19 GW	Sampler:	
Weather:	drizzle	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up (circled: mount)	Well Diameter:	2"	Depth to Free Product:	–
	Other:	Well Depth:	–	Free Product Thickness:	–
Monument Condition:	Good	Depth to Water:	30.91	Water Column Length:	–
Well Cap Lock Present:	~~Yes~~ / No (circled)	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 - dedicated	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	Ded. — NEW / DEDICATED (circled: 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	
1405			30.91	0.2	7.13	16.16	1238	0.63	-38.1	clear
1408			31.11	↓	6.86	15.50	1247	0.42	-60.7	↓
1411			31.31		6.79	15.35	1257	0.25	-98.9	
1414			31.51		6.71	15.90	1259	0.22	-167.9	
1417			31.71		6.71	15.80	1252	0.22	-181.5	
1420			31.91		6.70	15.80	1248	0.24	-181.7	

PURGING DATA

Sample ID:	MW-32S	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1420	Final Depth to Water:	32.91	Did Well Dewater:	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	[illegible]				
1x250	—	NH3				
1x250	H2SO4	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-12	Job Number:	
Client:	Nustar VAN	Date:	9/26/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	Overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other	Well Depth:	-	Free Product Thickness:	-
Monument Condition:		Depth to Water:	28.05	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:	LF	Tubing Material & Type:	SB

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	
1222			25.08	0.25	6.89	17.28	4448	2.11	-184.2	
1225			~~28.05~~		6.86	16.60	4576	0.94	-209.7	
1228			28.05		6.86	16.63	4500	0.69	-217.0	
1231			↓		6.86	16.70	4476	0.46	-223.6	
1234			↓	↓	6.86	16.70	4463	0.29	-227.1	

PURGING DATA

Sample ID:	MW-12	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex NW
Sample Time:	1240	Final Depth to Water:	28.05		Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				✓ MW-12 Dup
1x250		NH3				
1x250	H2SO4	NO2/NO3				↓
2x40	HCl	RSK-175				

NOTES/ADDITIONAL COMMENTS

Antea 1243-1247

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-13	Job Number:	
Client:	[illegible]	Date:	9/24/19
Project:	3Q19	Sampler:	CW
Weather:	Overcast	Time In/Out:	

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	4"	Depth to Free Product:	
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	28.99	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:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SB — 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	
1137			28.99	0.2	6.54	17.40	1359	8.32	144.2	clear
1140			29.07	↓	6.81	17.10	2994	2.18	-187.4	↓
1143			29.19	↓	6.83	16.90	3014	1.18	-225.7	↓
1146			29.14	↓	6.83	16.80	3018	0.84	-245.2	↓
1149			29.01	↓	6.83	16.80	3022	0.63	-255.2	↓
1152			28.99	↓	6.83	16.80	3033	0.50	-261.4	

PURGING DATA

Sample ID:	MW-13	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1150	Final Depth to Water:	28.80	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	HVOC				
2X40	HCl	RSK				
1X250	—	NO2/NO3				
1X250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

Antea: 1158-1201

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	Nustar VAN	Date:	9/26/19
Project:	3Q19 GWM	Sampler:	CW
Weather:	overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	29.30	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:	LF	Tubing Material & Type:	SS

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			29.30	0.2	7.35	17.10	1676	2.66	-16.2	clear
1049			29.46	↓	6.97	15.70	1746	1.22	-165.0	↓
1052			29.54		6.92	15.48	1755	1.06	-182.9	
1055			29.64		6.90	15.50	1744	0.87	-183.9	
1058			29.81	↓	6.88	15.40	1737	0.67	-182.9	↓

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	0.2		Analytical Laboratory:	~~Apex~~
Sample Time:	1100	Final Depth to Water:	30.22		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40 mL	HCl	HVOCs				✓ MW-7-DUP
1X250	H2SO4	NO2/NO3 & NH3				↓
1X250						

NOTES/ADDITIONAL COMMENTS

Antea 1107 - 1110

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-19	Job Number:	
Client:	Nustar VAN	Date:	9/24/19
Project:	3419 Gwen	Sampler:	LW
Weather:	Overcast	Time In/Out:	

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:	29.25	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:	LF	Tubing Material & Type:	SB

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	
954			29.25	0.2	7.29	16.40	4885	6.12	-2.2	clear
959			29.25		7.09	16.30	5053	4.27	-108.5	
1002			↓	↓	7.08	16.35	4966	2.96	-160.7	
1005					7.07	16.40	4984	2.49	-175.3	
1008					7.06	16.50	5054	2.05	-185.0	
1011					7.05	16.50	5088	1.88	-188.3	
1014					7.04	16.50	5122	1.73	-192.4	

PURGING DATA

Sample ID:	MW-19	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1010	Final Depth to Water:	29.25		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40 mL	HCl	HVOCs				✓ MW-19 DUP
1X250	—	NH3				✓
1X250	H2SO4	NO2 NO3				✓

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MP-1	Job Number:	
Client:	NuStar VAN	Date:	9/26/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	overcast	Time In/Out:	

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:	29.5	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:	LF	Tubing Material & Type:	SB 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			29.51	0.2	7.14	11.93	2143	8.83	16.4	clear
920			29.51	↓	7.08	14.70	2072	7.68	-78.9	↓
923			↓	↓	7.09	14.60	2100	6.68	-111.9	↓
926			↓	↓	7.11	14.50	2108	1.31	-136.5	↓
929			↓	↓	7.13	14.40	2124	1.01	-153.8	↓
932			↓	↓	7.16	14.40	2124	0.76	-160.0	↓
935			↓	↓	7.17	14.40	2136	0.70	-16.25	↓

PURGING DATA

Sample ID:	MP-1	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	930	Final Depth to Water:	29.51			Did Well Dewater:	no
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	HVOCs					
1x250	–	NH3					
1x250	H2SO4	NO2/NO3					
2x40	HCl	RSK 175					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	
Client:	Nustar VAN	Date:	9/26/19
Project:	3Q19 GW	Sampler:	LW
Weather:	Overcast, ~50s	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.30	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:	LF	Tubing Material & Type:	SIB 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	
831			29.30	0.2	6.87	15.80	2537	1.43	31.1	clear
834			29.30	↓	6.21	14.60	2339	0.32	-99.9	
837			↓	↓	5.99	14.20	2335	0.26	-139.4	
840			↓	↓	5.94	14.10	2333	0.22	-152.9	
843			↓	↓	5.90	14.10	2331	0.21	-164.2	
846			↓	↓	5.87	14.08	2349	0.19	-169.3	↓

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	845	Final Depth to Water:	29.30		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	HVOCs				
1X250	H2SO4	NH3				
1X250	—	NO2NO3				

NOTES/ADDITIONAL COMMENTS

Antea 851-855

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-17	Job Number:	
Client:	Nustar VAN	Date:	9/24/19
Project:	3Q19 GWM	Sampler:	LW
Weather:		Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.56	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 LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SB — 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	
753			28.52	0.1	7.06	16.40	2818	9.56	84.6	clear
756			28.52	0.2	6.95	16.00	2853	1.93	24.1	
759			28.52		6.91	16.40	2866	1.06	42.3	
802			↓	↓	6.90	15.70	2851	0.68	38.0	
805			↓	↓	6.89	15.50	2853	0.36	27.5	↓
808			↓	↓	6.89	15.40	2851	0.29	24.5	↓

PURGING DATA

Sample ID:	MW-17	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	810	Final Depth to Water:	28.52		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	VOCs				
1X250	H2SO4	NH3				
1X250	—	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

Anfea 812-816

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	S-2	Job Number:	
Client:	Nustar VAN	Date:	9/25/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	Sunny	Time In/Out:	

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	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:	LF	Tubing Material & Type:	SB 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	
1422			30.50	0.3	7.12	22.10	2433	9.47	48.5	~~clear~~/cloudy
1425			30.02	↓	6.61	18.00	4157	1.41	-24.9	
1428			29.41	0.26	6.62	17.58	4171	0.88	-37.2	
1431			29.42	↓	6.62	17.20	4179	0.69	-45.7	
1434			29.44	↓	6.63	17.40	4145	0.64	-42.6	

PURGING DATA

Sample ID:	S-2	Sampling Flow Rate:	0.26		Analytical Laboratory:	Apex
Sample Time:	1440	Final Depth to Water:	29.42		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOCs				
1x250	H2SO4	NO2/NO3				
1x250	—	NH3				

NOTES/ADDITIONAL COMMENTS

Antea 1440 - 1443

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-14	Job Number:	
Client:	NW Harvan	Date:	9/25/19
Project:	3919 GWM	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	29.30	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:	LF	Tubing Material & Type:	SB

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	
1253			29.54	0.3	6.96	19.95	3592	3.63	65.8	clear
1256			29.55	0.2	6.68	19.55	3545	1.58	71.1	↓
1259			29.45	↓	6.69	20.30	4279	1.02	71.1	
1302			29.45	↓	6.71	20.50	4523	0.85	69.9	
1305			29.45	↓	6.72	20.60	4665	0.80	69.1	
1308			29.45	↓	6.73	20.60	4737	0.77	67.5	↓

PURGING DATA

Sample ID:	MW-14	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1310	Final Depth to Water:			Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	HVOCs				
1X250	H2SO4	NO2/NO3				
1X250	—	NH3 / TOC				
2X40	HCl	RSK 175				

NOTES/ADDITIONAL COMMENTS

*New coupler (DTW from top of pvc (coupler))

Antea 1314.

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-10	Job Number:	
Client:	Nutter VAN	Date:	9/25/19
Project:	3019 GWM	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up (Flush-mount circled)	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.1	Water Column Length:	—
Well Cap Lock Present:	Yes (circled) 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:	LF	Tubing Material & Type:	SB	NEW / DEDICATED (DEDICATED circled)

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			29.01	0.2	5.36	20.95	6248	3.16	67.4	clear
1205			29.11	↓	5.62	18.76	6460	1.75	68.9	↓
1208			29.21	↓	5.64	18.10	6406	1.12	61.8	↓
1211			29.31	↓	5.64	17.80	6418	0.85	52.6	↓
1214			29.41	↓	5.65	18.30	6409	0.78	46.0	↓
1217			29.48	0.18	5.65	18.40	6428	0.80	41.8	↓
1220			29.52	↓	5.66	18.76	6420	0.79	40.1	↓

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	0.2	Analytical Laboratory:	APEX
Sample Time:	1220	Final Depth to Water:	29.68	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	VOCs				
1X250	—	NO2/NO3				
1X250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

Antea 1227 - 1230

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-22i	Job Number:	
Client:	Nustar VAN	Date:	9/25/19
Project:	3@19 GWM	Sampler:	CW
Weather:	Sunny	Time In/Out:	

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:	31.68	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:	BP LP	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SB — 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	
1116			31.68	0.3	7.74	20.20	1010	2.65	-26.1	clear
1119			↓	↓	7.27	18.00	1028	0.76	-36.2	↓
1122			↓		7.02	16.90	1048	0.42	-49.0	
1125			↓		6.90	16.80	1049	0.37	-61.2	
1128			31.69		6.86	17.00	1038	0.34	-68.3	
1131			31.70	↓	6.84	17.10	1038	0.34	-70.7	↓

PURGING DATA

Sample ID:	MW-22i	Sampling Flow Rate:	0.35			Analytical Laboratory:	Apex
Sample Time:	1130	Final Depth to Water:	31.71			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOCs					
1x250	H2SO4	NOx (NO3 NH3)					
1x250	-	NH3					

NOTES/ADDITIONAL COMMENTS

Antea split sampling 1136 - 1139

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-21i-105	Job Number:	
Client:	Nustar VAN	Date:	9/25/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	Sun	Time In/Out:	

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:	31.18	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:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SB

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	
1022			31.18	0.15	8.91	18.90	1250	5.54	48.5	clear
1025			31.18	↓	8.93	18.72	1239	4.11	46.0	↓
1028			31.18	↓	8.94	18.68	1224	3.22	42.0	↓
1032			31.18	↓	8.95	18.60	1220	2.22	38.3	↓
1035			↓	↓	8.97	18.40	1223	1.73	35.2	↓
1038			↓	↓	8.96	18.30	1228	1.45	34.7	↓
1041			↓	↓	8.95	18.73	1225	1.28	34.1	↓

PURGING DATA

Sample ID:	MW-21i-105	Sampling Flow Rate:	0.15			Analytical Laboratory:	Apex
Sample Time:	1040	Final Depth to Water:	31.18			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3X40	HCl	VOCs					
1X250	—	NO3/NO2					
1X250	H2SO4	TOC / Ammonia					

NOTES/ADDITIONAL COMMENTS

Aqua Read Aqua meter

Antea 1044 – 1048

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	Nustar VAN	Date:	9/27/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	Sun	Time In/Out:	

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:	30.2	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 LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SS — 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	
809			30.20	0.2	6.97	14.99	1294	4.27	1.7	Clear
812			30.50	0.15	6.53	14.50	1468	1.19	-11.5	↓
815			30.69	0.15	6.53	14.60	1507	1.61	-10.0	↓
818			30.91	0.1	6.53	14.60	1452	1.60	-10.6	↓
821			30.99	0.1	6.53	14.50	1449	1.48	-11.2	↓

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	0.1			Analytical Laboratory:	Apex
Sample Time:	825	Final Depth to Water:	31.54			Did Well Dewater:	N/D
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOCs					
1x250	—	NO2/NO3					
1x250	H2SO4	NH3					

NOTES/ADDITIONAL COMMENTS

Antea 830-840

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	
Client:	Nuc tak VAN	Date:	9/27/19
Project:	3614 GWM	Sampler:	CM
Weather:	SUN	Time In/Out:	

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:	29.95	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:	NS
Sampling Method:	PP	Tubing Material & Type:	I

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	
904			29.95	0.2	6.75	14.50	1801	0.38	-168.1	clear
907			30.22	↓	6.78	14.43	1809	0.39	-192.8	↓
910			30.41		6.79	14.60	1813	0.35	-195.1	
913				↓	6.80	14.40	1814	0.28	-208.1	

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	915	Final Depth to Water:	30.93		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOC				
1x250	H2SO4	NO2/NO3				
1x250	—	NH3				

NOTES/ADDITIONAL COMMENTS

New tubing (2 total) SB

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-6	Job Number:	
Client:	Nustak UAN	Date:	9/27/19
Project:	3019 GWM	Sampler:	LW
Weather:	Sun	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up (Flush-mount circled)	Well Diameter:		Depth to Free Product:	—
	Other:	Well Depth:		Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	28.32	Water Column Length:	—
Well Cap Lock Present:	Yes (circled) 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:	LF	Tubing Material & Type:	SD 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	
948			28.46	0.2	6.57	17.80	1630	2.07	-85.0	clear
951			28.44	0.25	6.51	16.30	1590	0.69	-116.1	↓
954			28.41	↓	6.50	15.80	1489	0.56	-129.1	↓
957			28.42	↓	6.52	15.43	1364	0.44	-145.1	↓
1000			28.43	↓	6.53	15.20	1294	0.40	-153.1	↓
1003			28.44	↓	6.53	15.20	1232	0.37	-161.6	↓

PURGING DATA

Sample ID:	MW-6	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex
Sample Time:	1000	Final Depth to Water:	28.44	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	—	NO2/NO3				
1x250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	
Client:	NUSTAR VAN	Date:	9/27/19
Project:	30th Quay	Sampler:	LW
Weather:	Sun	Time In/Out:	

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:	28.58	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:	LC	Tubing Material & Type:	SB

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	
1030			28.57	0.25	6.84	18.70	3617	6.72	23.5	clear
1033			28.84	0.2	6.55	17.50	4047	0.65	-15.9	↓
1036			28.78	↓	6.53	17.20	3715	0.59	-25.1	↓
1039			28.79		6.52	17.40	3639	0.57	-26.5	↓
1042			28.79	↓	6.52	17.50	3569	0.56	-28.8	↓

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	0.2			Analytical Laboratory:	Apex
Sample Time:	1045	Final Depth to Water:	28.79			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOCs					
1x250	H2SO4	NO2/NO3					
1x250	—	NH3					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 3-60	Job Number:	
Client:	Nustar VAN	Date:	9/27/19
Project:	3Q19 GWM	Sampler:	LW
Weather:	SUN	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	28.95	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:	~~Bailer~~ LF	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	
1215			28.95	0.15	6.97	14.75	529	4.46	-173.1	clear
1218			28.99		6.84	17.50	512	1.60	-88.5	
1221			29.04		6.89	17.10	427	0.68	-62.1	
1224			29.09		6.89	17.00	424	0.59	-55.5	
1227			29.15		6.84	16.90	422	0.51	-49.0	

PURGING DATA

Sample ID:	MGMS 3-60	Sampling Flow Rate:	0.15		Analytical Laboratory:	Apex
Sample Time:	1230	Final Depth to Water:			Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	HVOCs				
1X250	H2SO4	NH4 NO3				
1X250	—	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS3-40	Job Number:	
Client:	Nustar USA	Date:	9/27/19
Project:	3219	Sampler:	LW
Weather:		Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:		Depth to Free Product:	—
	Other: MGMS	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	28.59	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:	~~BP~~ 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	
1236			28.59	0.1	6.77	17.13	1316	1.02	-168.6	clear
1239			28.59	↓	6.84	16.20	1301	0.62	-183.4	↓
1242			↓	↓	6.85	15.90	(30)	0.42	-183.4	
1245					6.86	15.80	1298	0.35	-182.8	

PURGING DATA

Sample ID:	MGMS3-40	Sampling Flow Rate:	0.1		Analytical Laboratory:	Apex
Sample Time:	1250	Final Depth to Water:	28.59		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	VOCs				MGMS3-40 Dup
1X750		NO2/NO3				↓
1X250	H2SO4	NH3				
2X40	HCl	RSK175				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	S-1	Job Number:	
Client:	NUSTAR VAN	Date:	9/25/19
Project:	3Q19 GWM	Sampler:	CW
Weather:	Sunny	Time In/Out:	

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:	29.7	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:	LK	Tubing Material & Type:	SB

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	
1340			29.76	0.2	8.08	22.63	515	10.34	32.9	clear
1343			29.77	↓	7.45	18.85	487	1.42	83.3	↓
1346			29.76		7.12	17.50	490	1.03	87.7	
1349			29.72	↓	6.92	17.20	488	1.07	88.1	
1352			29.69	↓	6.86	16.90	492	1.28	86.0	↓
1355				↓	6.82	17.00	502	1.39	82.6	↓

PURGING DATA

Sample ID:	S-1	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1400	Final Depth to Water:			Did Well Dewater:	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOCs				
1x250	—	NH3/NO2				
1x250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 2 of 2

Company: Cascadia	Project Mgr: Stephanie Salisbury	Project Name: NuStar Van 3Q19	Project #:
Address: 5820 SW Kelly Ave Unit B		Phone:	Email:	PO #
Sampled by: LW/JW			

Site Location: OR (WA) CA AK ID ____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	TOC	RSK 175 **					Archive
MGMS1-GO		9/27	1202	GW	5							X														
MGMS2-GO		↓	1345	↓	5							X														
MGMS2-FD		↓	1401	↓	7							X									X	X				

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:
* HVOCs same list as NuStar Van 2Q19 GWM event
** ethane, ethene, methane by RSK175

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Date: 9/27/19	Signature: Date: 9.27.19	Signature: Date:	Signature: Date:
Printed Name: Time: Jay Weatherford 1600	Printed Name: Time: Michael Kachmit 1600	Printed Name: Time:	Printed Name: Time:
Company: Cascadia	Company: Apex Labs	Company:	Company:

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 1 of 1

Company: Cascadia	Project Mgr: Stephanie S	Project Name: SI Investigation	Project #: Master VAA
Address: 5820 SW Kelly	Phone:	Email: SSalisbury@cascadia-consulting.com	PO #
Sampled by: LW			

ANALYSIS REQUEST

Site Location: OR (WA) CA AK ID ___ / SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	Ammonia	Nitrate	Nitrite				Archive
SVE		9/27	1335	S	1														X		X	X	X				
Butte/Main IRP		↓	1340	↓	1														↓		↓	↓	↓				
River		↓	1430	↓	1														↓		↓	↓	↓				

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle)

1 Day 2 Day 3 Day

4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

* Please hold Cu for analysis until contacted by S. Salisbury

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Jon Weatherford	Signature:	Signature:	Signature:
Date: 9/27/19	Date: 9-27-19	Date:	Date:
Printed Name: Jon Weatherford	Printed Name: Michael Kachmik	Printed Name:	Printed Name:
Time: 1600	Time: 1600	Time:	Time:
Company: Cascadia	Company: Apex Labs	Company:	Company:

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 1 of 2

Company: Cascadia	Project Mgr: Stephanie Salisbury	Project Name: NuStar VAN 3Q19	Project #:
Address: 5820 SW Kelly Ave	Phone:	Email:	PO #
Sampled by: LW/JW			

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	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)	TDC	RSK 175 **					Archive
MW-3		9/27	825	GW	5																	X	X			
MW-2			915		5																					
MW-6			1000		5																					
MW-1			1045		5																					
MGMS 3-60			1230		5																					
MGMS3-40			1250		7																X	X				
MGMS3-40 DUP			1250		5																					
MW-24i			0840		5							X														
MW-24d			1024		5							X														
MGMS1-40			1124		7							X									X	X				

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:

* HVOCs same list as NuStar Van 2Q19 GWM event

** ethane, ethene, methane by RSK 175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Jon W. Weatherford Date: 9/27/19	Signature: Date: 9-27-19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1600	Printed Name: Michael Yerkovich Time: 1600	Printed Name: Time:	Printed Name: Time:
Company: Cascadia	Company: Apex Labs	Company:	Company:

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:	Lindsay W
Date of Work:	9/17/19

Project Name and Address: NuStar Vancouver	Client/Owner: NuStar	Page 1 of 2
	Project Manager: Stephanie Salisbury	Weather: Rain

Description of Work: Well decommissioning of IN-1, MP-2, MP-3, MP-4, EX-1

Field Staff: LW / Jon W

Report: 0650 - LW/JW / Cascade Drilling / Parametrix on Site.

0700 - Safety meeting. Issued work permit. (

0715 - Safety debrief with Cascade (HASP meeting). ~~Calibrated~~

0730 - Mob to work location. Excavating in area occupied by Clark Excavating. Calibrated PID with 100 ppm isobutylene. Clark Excavating to do demo of well boxes of wells to be decom. Oversight by Cascade (licensed well drillers) and Cascadia. Clark excavating around operational wells and SVE vaults with Cascadia oversight.

0830 - Clark Completed demo of well monuments. Continue Excavation of corridor, around well monuments and SVE vaults with Cascade / Cascade / Parametrix oversight.

1045 - Dump truck on site, begin loading demo asphalt.

Marked wells to stay w/ survey paint

Site Status:

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

Time of Arrival On-Site:	Total Mileage:
Time of Departure from Site:	

Attachments:

Cascadia
Associates, LLC

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DAILY FIELD REPORT

Job No. —
Report By: JW
Date of Work: 9/17/19

Project Name and Address: Vancouver Terminal
Client/Owner: Nu Star
Page 2 of 2
Project Manager: Stephanie Salisbury
Weather: Rain

Description of Work: Well Abadonment + Repair MW-14

Field Staff: JW

Report: 1130 Cascade + Cascadia mob to MW-14 - cut down to crack + remove threaded inner collar. Replace w/ temp.

1340 Cascade re seal casing with new 4" PVC. Sealed using Harvey TFE liquid teflon per SS & Ryan at Cascade drilling.

1350 Cascade removed remaining stick up portion of MP2, buried 1W1 casing. All casings below ground surface. Cascade leave site 1400.

1430 Clark Excavating state asphalt partially under warehouse door (2625 Butler). Nu Star (Brandon) inspected, states door doesn't open, Clark can just work close.

1445 PVC piping uncovered 15" below former ground surface at NE access panel. Called PM, determine piping is SVE. Remainder SVE piping excavated. No visible leaks / pooling 15"-18" below former ground in alley btw Butler + Small A. PM requests that pipe be recovered / backfill with same mix of coarse sand & gravel as prior. 1630 - talk w/ Mike (Clark Exc.) → agreed pending Port of Vanc. approval

Site Status: 1700 → Excavation uncovered, Clark off site
1715 → JW off site

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

Time of Arrival On-Site: 0645
Total Mileage:
Time of Departure from Site: 1715

Attachments: —

Cascadia
Associates, LLC

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DAILY FIELD REPORT

Job No.	
Report By:	JW
Date of Work:	9/18/19
Project Name and Address	Vancouver Port Asphalt Oversight
Client/Owner:	Nu Star
Page	1 of 1
Project Manager:	Stephanie Salisbury
Weather	Rain

Description of Work: Oversight of asphalt removal + repaving

Field Staff: JW

Report: 0645 On Site, 0700 Nu Star Safety Mtg.

0715 Contact Mike (Clark Excavating). Confirm backfill SVE in sand to 4" around pipe. Approved by Colin Hayden (Port of Vancouver)

0730 → Asphalt removal btw. 2565 & 2625 (near SVE) 0730 PID 0.0

Calibrated PID with 100 ppm Isobutylene 0830 PID 0.2

1030 → Removing ~~strips~~ asphalt at riverfront (near MW-12) 0930 PID 0.0

1045 → Continue excavating E. of Small A, leaving sand around SVE 1030 PID 0.1

1505 → MP-1 broken monument, Crew stated (Austin) 1130 PID 0.0

that monument fell apart when surrounding soil removed. 1230 PID 0.0

Phoned PM. PVC + cap intact. 1330 PID 0.0

1630 - Plan for Cascade to return 9/19 AM + repair/install 1430 PID 0.1

temp monument. Determine from Mike (foreman) that 1530 PID 0.0

target repaved surface is 19" above surveyed surface - 1630 PID 0.1

Confirm surface hight w/ Clark Exc (Austin) + laser level, mark w/ white paint. Crew worked until 1800

Site Status: JW SSO site 1815

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

Time of Arrival On-Site: 0645	Total Mileage:
Time of Departure from Site: 1815	

Attachments: —

Cascadia
Associates, LLC

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DAILY FIELD REPORT

Job No.	
Report By:	JW
Date of Work	9/20/19
Project Name and Address	Vancouver Terminal Repaving Oversight
Client/Owner:	NuStar
Page	1 of 1
Project Manager:	Stephanie Salisbury
Weather	Overcast

Description of Work: Oversight of removal of asphalt & repaving near wells

Field Staff: JW

Report: 0645 JW on site

0700 NuStar Safety Mtg., 0720 Receive Obs. Permit #80711

0725 Pavement scraping/removal near Berth 7. MP-1, MW-24, MW-24d, MW-32, MGMS2, MGMS1, MW-19, MW-13 in scraped area - monuments + lids intact. Alley between Butler + Small A covered in 2" gravel - felt underneath.

0945 Meet w/ Colin Hayden (Port of Vanc) + Mike (Clark Exc.). Plan to excavate area S. of Butler today (9/20). 1010 Met w/ Zach + Tom (NuStar) suggest cones on wells. Tom to contact ILW for cone placement. Asphalt removed from W end of Small A + cleanup S of Sm. A.

1400 Mike conversation says that grinding delayed until Wednesday. Plan to excavate for shallow pipes Mon + Tues

Crew off site 1515. Cones placed on wells to prevent accidental driving on monument

Measured depth of SVE vault adjacent to Butler → 24" surface to bottom

Site Status: —

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

Time of Arrival On-Site: 0645	Total Mileage: —
Time of Departure from Site: 1530	

Attachments: —

Project: 3Q19 GW M
Client: Nustar VANCOUVER
Sampler: LW

Date: 9/23/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-21i-105	916	—	30.96	—	
MW-8	926	—	28.80	—	
MW-32s	934	—	30.24	—	
MW-32i	947	—	31.45	—	
S-1	1000	—	30.02	—	
S-2	1006	—	30.31	—	
MW-25i	1011	—	30.80	—	New 2" well cap & coulant tighten bolts
MW-24i	1032	—	30.75	—	
MW-20i	1043	—	30.23	—	
MW-18i	1048	—	30.44	—	
MW-19i	1054	—	30.72	—	
MW-14	1102	—	28.92	—	
MW-3	1111	—	30.12	—	
EW-1	1116	—	27.54	—	
MW-6	1122	—	28.32	—	
MW-12	1141	—	27.76	—	
MW-13 ~~MW-19~~	1146	—	28.01	—	*ph.to says MW-19*
MW-19	1152	—	29.18	—	
MGMS1-132	1203	—	29.78	—	
MGMS1-60	1205	—	29.79	—	
MGMS1-40	1208	—	29.11	—	
MGMS2-132	1213	—	29.38	—	
MGMS2-110	1216	—	29.38	—	
MGMS2-60	1219	—	29.37	—	
MGMS2-40	1221	—	28.28	—	
—	—	—	—	—	

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MP-1	Job Number:	
Client:	Nu Star Vance	Date:	12/3/19
Project:	GWM 4Q19	Sampler:	LB
Weather:	Sunny - Cold	Time In/Out:	0750 - 845

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:	29.81	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:	TSP LB	Pump Intake Depth:	MS STS
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	
0801			29.81	.2	7.61	8.95	852	41.76	457.7	clear
0804			↓	↓	7.01	12.41	1075	8.33	176.4	↓
0807			29.82		6.98	12.70	1095	7.24	176.3	
0811			↓		6.96	13.14	1165	5.71	177.9	
0814			29.82		6.96	13.32	1184	5.19	179.3	
0817			↓		6.97	13.41	1184	5.07	181.7	
0820			↓	↓	6.95	13.42	1183	5.01	181.8	↓

PURGING DATA

Sample ID:	MP-1	Sampling Flow Rate:	.2		Analytical Laboratory:		Apex
Sample Time:	0820	Final Depth to Water:	29.95		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 40	HCl						
1 x 250	H2SO4						
1 x 250	—						

NOTES/ADDITIONAL COMMENTS

Antea 0840-0855

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-19	Job Number:	
Client:	Nustar Vancouver	Date:	12/3
Project:	GWM 4Q19	Sampler:	GW
Weather:	Pt Sun	Time In/Out:	0905-1000

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:	28.86	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:	SB

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	
910			28.86	.25	6.57	9.55	1437	56.21	208.4	clear
913					6.92	10.83	1565	29.17	208.6	
916					6.89	12.12	1650	20.91	209.0	
919					6.93	13.96	2032	11.17	206.9	
922					7.03	14.52	2169	6.90	204.9	
925					7.11	14.69	2201	6.73	204.9	
928					7.11	14.71	2230	6.52	205.1	

PURGING DATA

Sample ID:	MW-19	Sampling Flow Rate:	.25			Analytical Laboratory:	Apex
Sample Time:	0928	Final Depth to Water:	29.09			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC					
2x40	HCl						
1x250	H2SO4						
1x250	—						
3x40	HCl	VOC				MW-19	Dup
1x250	H2SO4					MW-19	Dup

NOTES/ADDITIONAL COMMENTS

1x250 — — MW44 Dup

Antea Samp 935-945

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	NuStar Vanc	Date:	12/3
Project:	GWM 4Q 19	Sampler:	AW
Weather:	Sunny	Time In/Out:	1035 - 1125

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.06	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:	BL	Pump Intake Depth:	MS
Sampling Method:	BL	Tubing Material & Type:	SS

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	
1041			29.04	.25	7.23	9.21	1201	59.13	198.1	clear
1044				↓	7.02	10.96	1243	40.23	201.6	
1047				↓	6.77	12.67	1330	13.51	204.3	
1050				.25	6.74	13.44	1330	6.94	200.3	
1053				↓	6.74	13.49	1323	6.76	199.3	
1056				↓	6.75	13.56	1310	6.61	194.0	↓

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	.25			Analytical Laboratory:	Apex NS
Sample Time:	1056	Final Depth to Water:	29.14			Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl		—				
2x 40	HCl		—				
1x 250	H_2SO_4		—				
1x 250	—		—				
3x 40	HCl		—			MW-7	Dup
1x 250	H_2SO_4		—			MW-7	Dup

NOTES/ADDITIONAL COMMENTS

1x 250 — — MW-7 Dup

Arrive Sump 1105 - 1110

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-9	Job Number:	—
Client:	Nu Star Vance	Date:	12/3
Project:	GWM 4Q19	Sampler:	AW
Weather:	Cloudy	Time In/Out:	1130 / 1215

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.85	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: BP | Pump Intake Depth: MS

Sampling Method: LG | Tubing Material & Type: SS | 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	
1137			28.85	.25	6.83	10.14	1054	44.18	177.4	clear
1140			↓	↓	6.80	10.42	974	22.15	178.2	↓
1143					6.56	11.08	856	11.65	180.2	
1146					6.13	11.92	806	6.68	194.3	
1149					6.08	12.04	807	6.55	199.5	
1152					6.16	12.16	811	6.61	201.7	

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1152	Final Depth to Water:	28.92		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	—		—	—	—
1 x 250	H2SO4		—		—	—	—
1 x 250	—		—		—	—	—

NOTES/ADDITIONAL COMMENTS

Ambient Temp 1200-1205

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-13	Job Number:	
Client:	NuStar Vanc	Date:	12/3
Project:	GWM 4Q19	Sampler:	JW
Weather:	Pt Cloudy	Time In/Out:	1230 - 1320

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.42	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:	SS 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	
1249			28.42	.25	6.70	9.99	448	39.16	245.6	clear
1252				1	6.69	10.15	712	19.04	241.4	|
1255			29.26	1	6.65	12.71	1101	6.97	-85.6	|
1258				.15	6.66	13.57	1230	4.04	-124.0	|
1301			29.32	|	6.67	14.07	1326	2.55	-144.2	|
1304				|	6.67	14.15	1340	2.44	-147.1	|
1307			29.39	.15	6.67	14.21	1361	2.41	-149.4	cloudy

PURGING DATA

Sample ID:	MW-13	Sampling Flow Rate:	.15		Analytical Laboratory:		Apex
Sample Time:	1307	Final Depth to Water:	29.59		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—		—	—	—
1x250	H2SO4		—		—	—	—
1x250	—		—		—	—	—
2x40	HCl		—		—	—	—

NOTES/ADDITIONAL COMMENTS

Sediment in Samples

Antea Sump 1315 - 1320

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-17	Job Number:	—
Client:	NuStar Vance	Date:	12/3
Project:	GLSM 4Q19	Sampler:	JA
Weather:	27. sun	Time In/Out:	1340 - 1430

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	27.71	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:	BP	Pump Intake Depth:	
Sampling Method:	BP	Tubing Material & Type:	SS 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	
1349			27.71	.25	7.03	12.25	923	24.10	38.7	clear
1352			↓		6.95	12.98	897	15.40	54.2	↓
1355					6.71	13.74	865	8.91	82.5	
1358					6.65	13.96	861	6.64	109.6	
1401					6.73	14.00	865	6.32	129.0	
1404					6.76	14.03	869	6.41	139.7	
1407					6.78	14.05	871	6.38	154.1	
1410			↓		6.71	14.07	877	6.52	157.2	↓

PURGING DATA

Sample ID:	MW-17	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1410	Final Depth to Water:	27.75		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl	VOC	—		—	—	—
1x 250	H_2SO_4		—		—	—	—
1x 250	—		—		—	—	—

NOTES/ADDITIONAL COMMENTS

Ambient Sample 1415-1420

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	NuStar Vance	Date:	12/4
Project:	GWM 4Q19	Sampler:	AJ
Weather:	Cloudy	Time In/Out:	0740 - 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:	29.32	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:	SS

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	
0748			29.32	.25	7.33	8.16	222	27.16	190.4	clear
0751					7.47	8.54	468	15.90	170.1	↓
0754			29.45	.2	7.21	9.42	515	13.59	141.8	
0757			29.47	.15	6.68	10.87	479	11.94	83.7	
0800				↓	6.68	12.85	414	11.81	68.8	
0803			29.49		6.72	12.51	402	11.69	78.2	
0806			29.50		6.72	12.41	391	11.52	80.0	

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	.15		Analytical Laboratory:	Apex	
Sample Time:	0806	Final Depth to Water:	29.56		Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				—
1x250	H2SO4		—				—
1x250	—		—				—

NOTES/ADDITIONAL COMMENTS

Antea Pump 0815-0820

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-1	Job Number:	—
Client:	NuStar Vanc	Date:	12/4/19
Project:	GWM 4Q19	Sampler:	AW
Weather:	Pt. Sun	Time In/Out:	0840 - 920

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:	28.51	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:	BP	Pump Intake Depth:	MS
Sampling Method:	BP	Tubing Material & Type:	SS 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	
0849			28.51	.25	6.62	10.67	463	26.03	155.7	clear
0852					6.52	11.85	895	17.21	162.3	
0855			28.52		6.38	13.02	1195	12.99	159.0	
0858					6.43	13.83	1492	9.32	170.6	
0901					6.50	13.89	1501	9.17	174.4	
0904					6.52	13.95	1515	9.06	177.8	

PURGING DATA

Sample ID:	MW-1	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	0904	Final Depth to Water:	28.53		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl	VOC	—				—
1 x 250	H2SO4		—				—
1 x 250	—		—				—

NOTES/ADDITIONAL COMMENTS

Antea Sump 910-915

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	S-1	Job Number:	T
Client:	NuStar Vance	Date:	12/4
Project:	GWM 4Q19	Sampler:	JW
Weather:	PT.	Time In/Out:	0930-1030

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Damaged - paving	Depth to Water:	27.10	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:	SB 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	
0947			27.16	.25	6.62	11.70	1483	58.52	212.6	clear
0950					6.61	11.30	1415	18.60	213.4	↓
0953			27.16		6.65	11.12	1324	15.92	204.7	
0956			↓		6.71	10.25	1048	12.44	214.0	
0959					6.79	10.05	731	10.02	214.3	
1002					6.81	10.45	714	9.85	208.9	
1005					6.89	10.49	702	9.80	209.0	

PURGING DATA

Sample ID:	S-1	Sampling Flow Rate:	.25	Analytical Laboratory:	Apex
Sample Time:	1005	Final Depth to Water:	27.18	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x 40	HCl	VOC	—			
1x250	H2SO4		—			
1x250	—		—			

NOTES/ADDITIONAL COMMENTS

Antea Samp 1010-1015

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	S-2	Job Number:	—
Client:	NuStar Vance	Date:	12/4
Project:	GWM 4Q19	Sampler:	JW
Weather:	Pt. Sun	Time In/Out:	1035 1125

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:	27.91	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:	SB — 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	
1045			27.91	.25	6.82	9.74	813	64.17	225.1	Red/clear (not visibly silty)
1048					6.97	10.05	986	31.54	221.7	
1051			27.95	.2	6.78	11.50	1402	12.99	175.3	
1054					6.65	11.99	1510	7.76	94.7	
1057			28.01	.15	6.69	12.20	1575	5.54	42.5	
1100				↓	6.69	12.31	1599	5.60	36.9	
1103			28.09	↓	6.69	12.42	1601	5.35	33.9	

PURGING DATA

Sample ID:	S-2	Sampling Flow Rate:	.15		Analytical Laboratory:	Apex	
Sample Time:	1103	Final Depth to Water:	28.21		Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC					
1 x 250	H2SO4						
1 x 250							

NOTES/ADDITIONAL COMMENTS

Antea Sump 1100 - 1105

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-14	Job Number:	
Client:	NuStar Vance	Date:	12/4
Project:	GWM 4Q 19	Sampler:	JW
Weather:	Pt Sun	Time In/Out:	1135 - 1215

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	ok	Depth to Water:	29.22	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:	
Sampling Method:	ef	Tubing Material & Type:	SB 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	
1145			29.22	.25	7.65	10.73	977	41.15	119.5	clear
1148			↓	↓	7.47	12.04	2389	16.72	132.0	cloudy
1151					7.30	14.04	2975	8.69	127.2	↓
1154					7.32	14.45	3201	4.80	118.3	
1157					7.35	14.61	3249	4.54	112.5	
1200					7.36	14.65	3245	4.41	110.9	

PURGING DATA

Sample ID:	MW-14	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1200	Final Depth to Water:	29.18		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 40	HCl	RK	—				
1 x 250	H2SO4		—				
1 x 250	—		—				

NOTES/ADDITIONAL COMMENTS

Antea Sample 1210/1215

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-10	Job Number:	—
Client:	Nustar Vancouver	Date:	12/4
Project:	GWM 4Q19	Sampler:	AW
Weather:	Pt. Sun	Time In/Out:	1225 - 1310

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.22	Water Column Length:	—
Well Cap Lock Present:	Yes / No	Screened Interval:		Purge Volume:	—
Comments:	bolts sheared (1) stripped (1)				

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:	SB — 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	
1235			28.22	.25	7.35	12.60	2940	12.10	134.0	clear
1238					7.31	12.45	2935	9.41	136.6	↓
1241			28.41	↓	6.70	13.32	2993	4.52	153.5	↓
1244					6.51	13.46	3015	4.43	156.4	↓
1247			28.45	↓	6.48	13.52	3021	4.56	158.2	↓

PURGING DATA

Sample ID:	MW-10	Sampling Flow Rate:	.25	Analytical Laboratory:	Apex	
Sample Time:	1247	Final Depth to Water:	28.71	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOC	—	—	—	—
1x250	H2SO4		—	—	—	—
1x25	—		—	—	—	—

NOTES/ADDITIONAL COMMENTS

Arrive Samp 1255-1302

* Replace tubing

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-22i	Job Number:	
Client:	NuStar Vance	Date:	12/4
Project:	GWM - 4Q19	Sampler:	AW
Weather:	Pt. Sun	Time In/Out:	1320 - 1405

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:	28.80	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:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SD
			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	
1331			28.80	.25	6.08	12.10	2515	19.82	230.4	clear
1334					6.38	11.68	1267	12.14	226.4	
1337			28.84		6.20	12.91	635	5.54	182.1	
1340					6.71	13.48	445	3.12	81.6	
1343			28.87		6.60	13.67	420	3.01	77.4	
1346					6.54	13.71	407	2.96	67.5	

PURGING DATA

Sample ID:	MW-22i	Sampling Flow Rate:	.25		Analytical Laboratory:		Apex
Sample Time:	1346	Final Depth to Water:	29.01		Did Well Dewater:		NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—		—	—	
1x250	H2SO4		—				
1x250	—		—		—		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2i-105	Job Number:	—
Client:	NW Star Vans	Date:	12/4
Project:	GWM 4Q19	Sampler:	JW
Weather:	cloudy	Time In/Out:	1415 - 1570

WELL DATA

Monument Type:	Flush-mount / Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	cracked	Depth to Water:	28.54	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:	SB

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	
1442			28.54	.3	7.34	12.55	439	20.83	-61.2	clear
1445			↓	↓	8.69	13.22	465	10.27	-28.7	↓
1448					8.68	13.23	464	5.09	-28.1	
1451					8.72	13.22	463	4.46	-23.1	
1454					8.71	13.15	461	4.24	-20.3	
1457					8.72	13.08	461	4.19	-17.4	

PURGING DATA

Sample ID:	MW-2i-105	Sampling Flow Rate:	.3			Analytical Laboratory:	Apex
Sample Time:	1457	Final Depth to Water:	28.60			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
1x250	H2SO4		—				
1x250	—		—				

NOTES/ADDITIONAL COMMENTS

Antrea Samp 1505 - 1570

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-12	Job Number:	—
Client:	Nu Star Vance	Date:	12/5
Project:	GWM 4Q19	Sampler:	AS
Weather:	Pt Sun	Time In/Out:	0735 - 830

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.33	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:	BP	Pump Intake Depth:	MS
Sampling Method:	LL	Tubing Material & Type:	DB

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	
0748			29.37	.3	7.11	10.27	1204	35.33	202.5	clear
0751					6.71	13.13	1166	16.30	210.3	
0754					6.52	14.75	1121	9.81	214.8	
0757					6.58	15.21	1073	9.24	201.7	
0800					6.69	15.37	1050	9.32	191.7	
0803					6.74	15.38	1051	9.18	185.5	

PURGING DATA

Sample ID:	MW-12	Sampling Flow Rate:	.3			Analytical Laboratory:	APEX
Sample Time:	0803	Final Depth to Water:	29.37			Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl	VOC	—				
1x 250	H2SO4		—				
1x 250	—		—				
2x 40	HCl		—				
3x 40	HCl	VOC	—		—	MW-12	Dup
1x 250	H2SO4		—		—	MW-12	Dup

NOTES/ADDITIONAL COMMENTS

1x 250 — — MW-12 Dup

Antea Samp 810-815

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-2	Job Number:	—
Client:	Nustar Vance	Date:	12/5
Project:	GWM 4Q19	Sampler:	JW
Weather:	Pt Sun	Time In/Out:	0850 - 0940

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:	29.94	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:	BP	Pump Intake Depth:	MS
Sampling Method:	LB	Tubing Material & Type:	SB

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	
902			29.94	.25	6.95	11.76	920	85.65	41.2	clear
905			↓	↓	7.07	10.57	762	25.12	38.6	↓
908					7.06	10.01	705	13.02	11.1	cloudy
911					6.88	10.05	654	12.01	-63.3	
914					6.85	11.58	632	6.25	-73.6	Sediment
917					6.91	11.77	634	6.68	-86.1	↓
920					6.93	11.80	636	6.60	-87.2	Solids

PURGING DATA

Sample ID:	MW-2	Sampling Flow Rate:	.25			Analytical Laboratory:	Apex
Sample Time:	920	Final Depth to Water:	30.07			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOC	—				
1x250	H2SO4		—				
1x250	—		—				

NOTES/ADDITIONAL COMMENTS

Ante a Sump 925-930

Per # 8159

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-6	Job Number:	
Client:	NuStar Vancouver	Date:	12/5
Project:	GWM 4Q19	Sampler:	AG
Weather:	Pt Sun	Time In/Out:	0945 - 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:	27.82	Water Column Length:	—
Well Cap Lock Present:	Yes NS	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:	SB — 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	
952			27.82	.25	6.98	10.65	494	42.03	-79.5	clear
955					6.87	10.99	444	19.52	-59.7	↓
958			27.89	.2	6.45	12.78	350	10.91	-33.9	↓
1001			↓	↓	6.40	13.11	313	7.45	-28.0	↓
1004			↓	.2	6.40	13.29	301	7.40	-31.2	↓
1007			↓	↓	6.46	13.34	299	7.21	-38.2	↓

PURGING DATA

Sample ID:	MW-6	Sampling Flow Rate:	.2			Analytical Laboratory:	Apex
Sample Time:	1007	Final Depth to Water:	27.92			Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3 x 40	HCl	VOC	—				
1 x 250	H2SO4		—				
1 x 250	—		—				

NOTES/ADDITIONAL COMMENTS

Area Sump 1015 - 1020

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-23i	Job Number:	—
Client:	NuStar Vancouver	Date:	12/5
Project:	GWM 4Q19	Sampler:	AD
Weather:	Pt Sun	Time In/Out:	1100 - 1145

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	ok	Depth to Water:	28.30	Water Column Length:	—
Well Cap Lock Present:	(Yes) No	Screened Interval:	—	Purge Volume:	—
Comments:	Lid damaged/bolts stripped				

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:	SB — 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	
1110			28.30	.2	7.29	10.54	91	44.97	19.8	clear
1113				↓	7.27	10.87	166	24.54	19.5	↓
1116			28.29	↓	7.32	11.92	184	15.01	8.9	↓
1119			↓	↓	7.38	12.76	162	9.25	7.8	↓
1122			↓	↓	7.17	14.14	157	6.21	17.6	↓
1125			↓	↓	7.16	14.24	158	6.19	18.2	↓
1128			↓	↓	7.16	14.28	158	6.23	19.4	↓

PURGING DATA

Sample ID:	MW-23i	Sampling Flow Rate:	.2	Analytical Laboratory:	Apex
Sample Time:	1128	Final Depth to Water:	28.41	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x 40	HCl	VOC	—				
1x 250	H2SO4		—				
1x 250	—		—				

NOTES/ADDITIONAL COMMENTS

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 1 of 2

Company: Cascadia Associates	Project Mgr: S. Salisbury	Project Name: NuStar Vancouver GWM 4Q19	Project #:
Address: 5820 SW Kelly Ave Portland	Phone: (503) 906-6577	Email: sbsalisbury@cascadiaassociates.com	PO #:
Sampled by: J. Weatherford / L. Wallis			

ANALYSIS REQUEST

Site Location: OR WA CA AK ID ____ / SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	NH3	NO2/NO3	RSK-175	TOC			Archive
MP-1		12/3	0820	GW	7							✓										✓	✓				
MW-19			0928		7																	✓	✓				
MW-19 Dup			0928		5																						
MW-7			1056		7																	✓	✓				
MW-7 Dup			1056		5																						
MW-9			1152		5																						
MW-13			1307		7																	✓	✓				
MW-17			1410		5																						
MW-25i			820		5																						
MW-26			910		7																	✓	✓				

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle)

~~1 Day~~ 2 Day 3 Day

4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

* VOC same as Vancouver GWM 3Q19
Ethene, Ethane, Methane by RSK-175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/3/19	Signature: Date: 12/3/19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1547	Printed Name: Charles Wallis Time: 1547	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

APEX LABS

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

CHAIN OF CUSTODY

Lab # ________ COC 2 of 2

Company: Cascadia Associates	Project Mgr: S. Salisbury	Project Name: NuStar Vancouver GWM 4Q19	Project #:
Address: 5820 SW Kelly Unit B Portland	Phone: (503) 906-6574	Email: sbsalisbury@cascadiaassociates.com	PO #:
Sampled by: J Weatherford / L. Wallis			

Site Location: OR (WA, circled) CA

AK ID ____

ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	NH3	NO2/NO3	RSK-175	TOC			Archive
MW-24D		12/3	1000	GW	5							X									X	X					
MW-24i			1045		5																						
MW-8			1135		5																						
MW-22i-40			1220		5																						
MW-16			1310		5																						
MW-18i			1350																								
MW-20i			1440																								
Trip Blank			-	W	2																						

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:

* VOCs same list as NuStar VAN 3Q19 GWM event

** ethane/ethene/methane by RSK-175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/3/19	Signature: [signature] Date: 12/3/19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1547	Printed Name: Charley Hel... Time: 1547	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

APEX LABS

CHAIN OF CUSTODY

Lab # _____ COC 1 of 3

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: NuStar VAN 4Q19 GWM | Project # 0060-007-004

Address: 5520 SW Kelly Ave, Suite B | Phone: 503-906-6577 | Fax: | Email: ssalisbury@cascadiaassociates.com

Sampled by: Lindsay Wilson

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	NH3	NO2 NO3	RSK-175	TOC			
1	MGMS2-60		12/4	800	GW	5				X													X	X					
2	MGMS2-110			820		5																							
3	MGMS2-132			850		5																							
4	MGMS2-40			920		7																			X	X			
5	MGMS1-60			950		5																							
6	MGMS1-43			1015		7																			X	X			
7	MGMS1-110			1045		5																							
8	MGMS3-40			1140		7																			X	X			
9	MGMS3-40 DUP			1140		5																							
10	MGMS3-60			1200		5																							

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:
#2 VOCs same list as NuStar VAN 3Q19 GWM
#4 Ethane/ethene/methane by RSK175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:		RECEIVED BY:	
Signature:	Date: 12/4	Signature:	Date:
Printed Name: Jon Weatherford	Time: 1624	Printed Name:	Time:
Company: Cascadia Assoc.		Company: Apex	

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

APEX LABS

CHAIN OF CUSTODY

Lab # _____ COC 2 of 3

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: N. State Vancouver 4019	Project # 0060-002-004
Address: 5820 SW Kelly Ave Suite B	Phone: 503-906-6577	Fax:	Email: ssalisbury@cascadiaassoc
Sampled by: LW / JW			

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	NH3	NO2/NO3	RSK-175 *	TOC			
1	MGMS 3-101		12/4	1220	GW	5				X													X	X					
2	MGMS 3-132			1240		5																							
3	EW-1			1310		5																							
4	MW-19i			1350		5																							
5	MW-5			1430		5																			~~✓~~	~~✓~~			
6	MW-14			1200		7																			✓	✓			
7	MW-3			0806		5																							
8	MW-1			0904		5																							
9	S-1			1005		5																							
10	S-2			1103		5																							

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:
* HVOCs same list as N. State Van 3019 Groun
** ethane / -ene / methane by RSK 175
RSK-175, TOC for MW-14, not MW-5

RELINQUISHED BY:		RECEIVED BY:	
Signature: [signature]	Date: 12/4	Signature: [signature]	Date: 12/4/10
Printed Name: Jon Weatherford	Time: 1612	Printed Name: [illegible]	Time: 1624
Company: Cascadia Assoc.		Company: Apex	

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

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 3 of 3

Company: Cascadia Associates	Project Mgr: S. Salisbury	Project Name: Nu Star Vancouver GWM 4Q19	Project #:
Address: 5820 SW Kelly Unit B Portland	Phone: (503) 906-6577	Email: ssalisbury@cascadiaassociates.com	PO #
Sampled by:			

Site Location: OR (WA) CA AK ID ____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	NH3	NO2/NO3					Archive
MW-10		12/4	1247	GW								✓														
MW-22i		↓	1346	↓								↓														
MW-21i-105		↓	1457	↓								↓														

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:

* HVOCs same list as Nu Star Vancouver 3Q19 GWM

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/4	Signature: [signature] Date: 12/4/19	Signature: Date:	Signature: Date:
Printed Name: Jon Braithwaite Time: 1624	Printed Name: Chris Hutton Time: 1624	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Assoc.	Company: 4 pct	Company:	Company:

APEX LABS

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

CHAIN OF CUSTODY

Lab # _____ COC 1 of 1

Company: Cascadia Associates	Project Mgr: S. Salisbury	Project Name: Nu Star Vanc GWM 4Q19	Project #: 0060-002-004
Address: 5820 SW Kelly Ave. Unit B, Portland	Phone: (503) 906-6577	Email: ssalisbury@cascadiaassociates.com	PO #
Sampled by: J. Weatherford			

ANALYSIS REQUEST

Site Location: OR (WA) CA AK ID ____ / SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	NH3	NO2/NO3	RSK-175	TOC			Archive
MW-12		12/5	0803	GW	7							✓									✓	✓	✓	✓			
MW-12 Dup			0803		5							✓									✓	✓					
MW-2			0920		5							✓									✓	✓					
MW-6			1007		5							✓									✓	✓					
MW-23i			1128		5							✓									✓	✓					

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle)

1 Day 2 Day 3 Day

4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

* VOCs same list as Nu Star Vancouver 3Q19 GWM

Ethane, ethene, methane by RSK-175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/5/19	Signature: [signature] Date: 12/6/19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1615	Printed Name: [illegible] Time: 1615	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Assoc.	Company: APEX LABS	Company:	Company:

Project:
Client:
Sampler:

Date:
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MGMS2-40					
MGMS2-60					
MGMS2-110					
MGMS2-132					
MGMS1-43					
MGMS1-60					
MGMS1-110					
MW-24d	1124	—	28.70	—	
MW-24i	1054	—	28.19	—	Notes 0/2
S-1	1035	—	27.53	—	
MW-23i	1624	—	28.56	—	
MW-25i	1019	—	28.42	—	
MW-22i	1016	—	29.29	—	
MW-21i-105					
MW-21i-40					
MW-32i	1008	—	29.36	—	
MW-18i					
MW-20i					
MW-19i					

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-5	Job Number:	
Client:	KINDER MORGAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LN
Weather:	Overcast, 40	Time In/Out:	

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:	28.16	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 LL	Pump Intake Depth:	NS
Sampling Method:		Tubing Material & Type:	SB — 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	
1415			28.91	0.2	6.90	12.32	429	5.87	-39.9	clear
1418			28.92	↓	6.53	14.17	361	3.11	-52.9	↓
1421			28.92	↓	6.44	14.83	347	1.12	-52.9	↓
1424			↓	↓	6.43	14.97	345	0.94	-53.9	↓
1427			↓	↓	6.42	15.16	345	0.80	-55.2	↓

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1430	Final Depth to Water:	28.92		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOC	—	—	—	—
1x250	H2SO4	NH3	—	—	—	—
1x250	—	NO2/NO3	—	—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS2-60	Job Number:	
Client:	Nustar VAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS well	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	29.58	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 / Bed Pump	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 (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
744			29.58	0.2	6.82	13.44	182	13.18	-47.9	Clear
747			29.43	↓	6.92	13.51	181	2.80	-92.7	↓
750			29.43		7.00	14.02	182	1.49	-95.2	
753			↓		7.03	14.13	181	1.43	-97.3	
756				↓	7.05	14.23	181	1.19	-99.3	↓

PURGING DATA

Sample ID:	MGMS2-60	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	800	Final Depth to Water:	29.43		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	H_2SO_4	NO2/NO3				
1x250	-	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS2-110	Job Number:	
Client:	Nwirar JAN	Date:	12/14/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS well	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	MG	Depth to Water:	29.35	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 / Ded pump	Pump Intake Depth:	NV
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 (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
810			29.38	0.3	6.95	13.51	171	1.12	-94.7	clear
813			↓	↓	7.00	13.79	165	1.37	-89.8	↓
816					7.14	13.75	161	2.08	-90.1	
819					7.22	13.74	159	2.24	-90.2	
822					7.28	13.68	159	2.35	-90.9	
825					7.32	13.57	158	2.48	-90.7	

PURGING DATA

Sample ID:	MGMS2-110	Sampling Flow Rate:	0.3	Analytical Laboratory:	Apex
Sample Time:	820	Final Depth to Water:	29.38	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	TVOCs	—			
1x250	—	NO2/NO3	—			
1x250	H2SO4	NH3	—			

NOTES/ADDITIONAL COMMENTS

Cascadi
Associates, LLC

Project: 4Q19 GWM
Client: NuStar Vanc Main
Sampler: LW

Date: 12/2/19
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	
MW-1	1150	—	27.69	—	
MW-5	1157	—	28.81	—	
MW-12	1144	—	26.60	—	
MW-19	1137	—	28.71	—	
MP-1	1122	—	29.01	—	
MW-7	1120	—	28.83	—	
MW-9	1113	—	29.00	—	
MW-13					
S-2	1040	—	28.05	—	
MW-17	937	—	27.86	—	
MW-14	943	—	29.00	—	
MW-26	949	—	28.93	—	
MW-10	953	—	28.74	—	Broken off 6
MW-8	957	—	28.59	—	
MW-32s	1004	—	29.27	—	
MW-16					
MW-15					
MW-F					
MW-2					
MW-6					
EW-1					
MW-3					
MGMS3-40					
MGMS3-60					
MGMS3-101					
MGMS3-132					

Monument Type: Flush-m / Other:
Monument Condition: M
Well Cap Lock Present: Yes N
Comments:
Purge Volume = (Water Height) X (Mu
Water height multipliers (gal):

Purge Method:
Sampling Method:

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	
834			
837			
840			
843			2
846			
849			
852			2

Sample ID:	MGMS2-1
Sample Time:	852
No. of Containers/Type	Preservative
1X250	—
1X250	H2SO4
3x40	HCl

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS2-40	Job Number:	
Client:	Nutrien JWN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS well	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:		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/Del Pump 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 (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
903			29.41	0.25	7.34	12.44	1189	8.14	-56.1	clear
906			↓	↓	7.38	13.50	1369	5.45	-71.0	↓
909					7.23	13.98	1421	5.67	-76.6	
912				↓	7.19	14.13	1432	4.60	-80.9	
915					7.19	14.12	1431	4.89	-81.2	
918			↓	↓	7.19	14.24	1435	4.39	-82.2	↓

PURGING DATA

Sample ID:	MGMS2-40	Sampling Flow Rate:	0.25	Analytical Laboratory:		Apex
Sample Time:	920	Final Depth to Water:	29.41	Did Well Dewater:		NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2X40	HCl	BTEX/TPH	—			
3X40	HCl	HVOCs	—			
1X250	—	NH3	—			
1X250	H2SO4	NO2/NO3	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS1-60	Job Number:	
Client:	NWStar / AN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:		Depth to Free Product:	—
	Other: MGMS1	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	28.66	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:	BP/Ded Pump LF	Pump Intake Depth:	~5
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 (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
941			28.66	0.3	7.37	13.44	754	21.19	-63.8	clear
944			28.61	0.25	7.48	13.85	319	3.27	-95.0	
947			28.58		7.42	13.91	189	3.13	-89.4	
950			28.54		7.39	13.90	160	3.19	-85.1	
953			28.51		7.34	13.90	161	3.23	-84.8	

PURGING DATA

Sample ID:	MGMS1-60	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex
Sample Time:	950	Final Depth to Water:	28.49		Did Well Dewater:	ND

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	—	NH3				
1x250	H2SO4	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 1-43	Job Number:	
Client:	Nustar GAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:		Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2	Depth to Free Product:	—
	Other: MGMS	Well Depth:	40	Free Product Thickness:	—
Monument Condition:		Depth to Water:	29.09	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:	BP	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 (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1001			29.09	0.2	7.07	13.76	1921	9.73	45.5	clear
1004			29.09	↓	7.19	13.87	2593	7.60	-32.2	↓
1007			↓		7.19	13.86	2611	7.11	-32.7	
1010					7.19	13.89	2617	7.09	-32.9	
1013				↓	7.19	13.90	2618	6.76	-32.5	↓

PURGING DATA

Sample ID:	MGMS 1-43	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1015	Final Depth to Water:	29.09		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2x40	HCl	VOCs		—		
3x40	HCl	P:SK / TOC		—		
1x250		VH3		—		
1x250	H2SO4	NH3/NO3		—		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 1-110	Job Number:	
Client:	Mission CAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	CW
Weather:	Overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MW Swell	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	28.31	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:	Bailer ~~Bladder Pump~~	~~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	
1033			28.31	0.2	7.33	13.60	523	5.89	-69.1	clear
1036			↓	↓	7.26	13.47	336	1.65	-78.7	↓
1039					7.23	13.21	205	0.92	-87.3	
1042					7.22	13.10	188	0.81	-87.1	
1045					7.21	13.06	178	0.79	-86.6	

PURGING DATA

Sample ID:	MGMS 1-110	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1045	Final Depth to Water:	28.31	Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOCs				
1x250	H2SO4	NH3				
1x250	—	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS3-40	Job Number:	
Client:	Mustang VAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS Wells	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	26.74	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:	BP / PP	Pump Intake Depth:	MS
Sampling Method:	LP	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	
1125			26.74	0.25	6.73	14.18	404	4.42	-57.8	clear
1128			26.89	↓	6.75	14.52	424	3.50	-90.8	↓
1131			27.01		6.73	14.39	424	3.00	-84.4	
1134			27.04		6.74	14.34	423	2.95	-86.3	
1137			27.05		6.76	14.19	422	2.92	-91.1	

PURGING DATA

Sample ID:	MGMS3-40	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex
Sample Time:	1140	Final Depth to Water:			Did Well Dewater:	

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	8260	—	—	✓ MGMS3-40	Dup
2x250	—	NH3	—	—	↓	
1x250	H2SO4	NO3/NO2	—	—		
2x40	HCl	BSK175/TOC	—	—		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS 3-60	Job Number:	
Client:	Nustar USA	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS Wells	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Mgms Wells	Depth to Water:	27.11	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:	BP/PP LF	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	
1149			27.11	0.25	6.84	14.14	205	5.38	-82.9	clear
1152			↓	↓	7.09	14.32	164	3.81	-87.8	↓
1155					7.15	14.50	146	3.63	-76.3	
1158					7.17	14.60	144	3.72	-64.2	
1201					7.17	14.62	143	3.65	-61.1	

PURGING DATA

Sample ID:	MGMS3-60	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex
Sample Time:	1200	Final Depth to Water:	27.11		Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOCs	—			
1x250	H2SO4	NH3	—			
1x250	—	NO2/NO3	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MGMS3-101	Job Number:	
Client:	NuStar Energy	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MGMS well	Well Depth:	—	Free Product Thickness:	
Monument Condition:		Depth to Water:		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/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	
1207			27.40	0.25	7.02	14.74	159	5.26	9.7	clear
1210			27.38	↓	7.14	14.40	162	2.00	-31.2	↓
1213			↓	↓	7.21	14.29	163	1.91	-37.4	
1216			↓	↓	7.27	14.20	163	1.91	-41.3	↓

PURGING DATA

Sample ID:	MGMS3-101	Sampling Flow Rate:	0.25		Analytical Laboratory:	~~Apex~~
Sample Time:	1220	Final Depth to Water:	27.38		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	VOCs				
1X250		NH3				
1X250	H2SO4	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MgMS 3-132	Job Number:	
Client:	NW Natural GWM	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other: MgMS wells	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:		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 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	
1224			26.34	0.2	7.32	14.65	193	3.56	46.5	clear
1227			26.47	↓	7.38	14.41	193	2.01	7.1	↓
1230			26.51		7.43	14.34	193	0.52	-22.8	
1233			↓		7.47	14.19	193	0.39	-42.9	
1236					7.48	14.17	193	0.46	-47.6	
1239					7.48	14.18	193	0.48	-48.1	↓

PURGING DATA

Sample ID:	MgMS3-132	Sampling Flow Rate:	0.2		Analytical Laboratory:		Apex
Sample Time:	1240	Final Depth to Water:	26.51		Did Well Dewater:		No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	HVOCs					
1x250		NH3					
1x250	H2SO4	NO2/NO3					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	EW-1	Job Number:	
Client:	NWStar-UAN	Date:	12/4/19
Project:	4Q19 GWMs	Sampler:	LW
Weather:	Overcast, 40	Time In/Out:	

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:	26.61	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:	BP	Pump Intake Depth:	
Sampling Method:	LF	Tubing Material & Type:	SB ~~DPE~~ 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	
1256			26.98	0.25	7.16	12.35	223	11.99	89.3	clear
1259			26.61	↓	6.88	12.71	234	3.83	5.6	↓
1302			↓	↓	6.81	13.07	237	4.66	-26.9	↓
1305			↓	↓	6.67	14.38	250	2.89	-34.4	↓
1308			↓	↓	6.65	14.43	250	2.04	-38.7	↓
1311			↓	↓	6.65	14.48	249	1.92	-39.2	↓
1314			↓	↓	6.65	14.46	247	2.02	-43.4	↓

PURGING DATA

Sample ID:	EW-1	Sampling Flow Rate:	0.25		Analytical Laboratory:	~~Apex~~ NWS
Sample Time:	1310	Final Depth to Water:	26.61		Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x125	H2SO4	NO2/NO3				
1x250	—	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-19i	Job Number:	
Client:	Mr Star LAN	Date:	12/4/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast 40	Time In/Out:	

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:	26.84	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:	LF	Tubing Material & Type:	SS — 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			26.84	0.2	6.84	12.86	128	5.90	-96	clear
1339			26.62		6.99	13.45	726	4.38	-45.0	
1342			26.41		7.06	13.41	215	2.52	-66.6	
1345			26.51		7.06	13.42	213	2.41	-65.8	
1348			26.54		7.08	13.41	212	2.43	-66.7	

PURGING DATA

Sample ID:	MW-19i	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1350	Final Depth to Water:	26.59		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	H2SO4	NO3				
1x250		NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-25i	Job Number:	
Client:	Alaskan VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Sun, 30F	Time In/Out:	820 / 845

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	3/3 good	Depth to Water:	29.56	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:	LF	Tubing Material & Type:	SB NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
808			29.56	0.25	7.52	8.73	198	34.56	25.1	clear
811			29.56	↓	7.27	9.98	205	10.04	16.1	↓
814			29.56	↓	6.98	11.05	215	4.95	4.3	↓
817			↓	↓	6.84	11.41	218	2.83	2.7	↓
820			↓	↓	6.78	11.39	215	2.42	3.4	↓
823			↓	↓	6.77	11.39	214	2.34	4.2	↓

PURGING DATA

Sample ID:	MW-25i	Sampling Flow Rate:	0.2	Analytical Laboratory:	Anatek
Sample Time:	820	Final Depth to Water:	29.56	Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
3x40	HCl	VOCs	N				
1x250	—	Ammonia	N				
1x250	H2SO4	NO2/NO3	N				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-26	Job Number:	
Client:	Nustar VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Clear, 35	Time In/Out:	845/

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	28.96	Free Product Thickness:	-
Monument Condition:	Good 3/3	Depth to Water:	-	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:	LF	Tubing Material & Type:	SS

NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
856			28.96	0.25	6.04	12.67	3004	7.38	79.4	Clear
859			28.96	↓	6.23	13.93	3478	2.92	74.3	↓
902			28.96		6.36	14.37	3118	3.07	58.8	
905			28.96		6.41	14.46	2851	3.08	51.1	
908			28.96	↓	6.42	14.48	2801	3.12	49.2	↓

PURGING DATA

Sample ID:	MW-26	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex
Sample Time:	910	Final Depth to Water:	28.96		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs	—			
1x125	—	NO2/NO3	—			
1x125	H2SO4	NH3	—			
2x40	HCl	RSK 175	—			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-24D	Job Number:	
Client:	Nustar VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Clear, 30	Time In/Out:	940 /

WELL DATA

Monument Type:	(Flush-mount)/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	50	Free Product Thickness:	-
Monument Condition:	Good	Depth to Water:	29.70	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 ≠ drop	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SB

NEW / (DEDICATED)

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
948			29.70	0.25	7.58	9.82	370	34.71	-4.9	Clear
951			29.81	↓	7.63	11.47	320	5.61	-21.2	↓
954			29.72		7.72	12.16	297	2.30	-47.1	
957			29.69		7.80	12.14	294	1.53	-57.6	
1000			29.74	↓	7.86	12.30	295	1.92	-63.5	
1003			29.71		7.89	12.44	297	1.71	-68.1	

PURGING DATA

Sample ID:	MW-24D	Sampling Flow Rate:	0.25		Analytical Laboratory:	~~Apex~~
Sample Time:	1000	Final Depth to Water:	29.74		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	VOCs				
1x250	—	NO2/NO3				
1x250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-24	Job Number:	
Client:	MASTER VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	CLEAR, 30	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	—	Free Product Thickness:	-
Monument Condition:	~~Poor~~ 2 0/3	Depth to Water:		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:	25
Sampling Method:	LF	Tubing Material & Type:	SS — NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1030			26.38	0.25	7.56	6.47	247	12.26	-6.6	clear
1033			26.41	↓	7.78	8.60	242	10.76	-3.3	↓
1036			26.45		7.58	11.49	197	7.47	+4.3	
1039			26.49		7.24	13.23	176	3.30	-7.0	
1042			26.52		7.14	13.49	175	3.17	-3.1	
1045			26.56		7.67	13.48	176	3.09	+1.3	

PURGING DATA

Sample ID:	MW-24	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex	
Sample Time:	1045	Final Depth to Water:	26.59		Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID	
2x40	HCl	VOCs	—				
3x40	HCl	RSK 175	—				
1x125	H2SO4	NO2/NO3	—				
1x250	—	NH3	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	Navitas VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Clear, 35	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	OK 0/3	Depth to Water:	28.65	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 LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SB NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1123			28.65	0.25	6.37	12.84	1632	8.17	22.2	Clear
1126			28.90	0.2	6.16	14.33	2072	2.63	16.1	
1129			↓	↓	6.20	14.52	2119	4.38	18.0	
1132					6.24	14.56	2127	4.60	20.9	
1135					6.25	14.57	2131	4.74	22.2	↓

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	0.2		Analytical Laboratory:	Anix
Sample Time:	1135	Final Depth to Water:	28.90		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	HCl	VOCs				
1X250	-	NO2/NO3				
1X250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-21:-40	Job Number:	
Client:	Nustar UAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 40	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	28.35	Free Product Thickness:	-
Monument Condition:	ok 1/2 (stuck)	Depth to Water:	-	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 LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	SB NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1210			28.35	0.3	6.50	12.72	1423	5.53	21.3	clear
1213			28.49	0.25	6.73	1427	400	2.26	11.8	↓
1216			28.52	↓	6.71	14.40	304	1.05	14.0	
1219			28.55		6.70	14.36	288	0.80	15.1	
1222			28.58	↓	6.69	14.33	272	0.81	15.2	↓

PURGING DATA

Sample ID:	MW-21:-40	Sampling Flow Rate:	0.25		Analytical Laboratory:	Apex
Sample Time:	1220	Final Depth to Water:	28.61		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	—	NO2/NO3				
1x250	H2SO4	NH3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-16	Job Number:	
Client:	Master VAN	Date:	12/3/19
Project:	4Q19 GW	Sampler:	LW
Weather:	Overcast, 30	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good - bolts stripped	Depth to Water:	26.08	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:	LF	Tubing Material & Type:	SB — NEW / (DEDICATED)

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1257			26.08	0.25	7.04	11.11	393	9.21	25.1	Clear
1300			26.18	0.20	6.63	12.09	471	6.50	24.5	↓
1303			26.18	↓	6.44	12.72	529	3.10	20.3	↓
1306			↓	↓	6.44	12.83	536	2.24	19.0	↓
1309			↓	↓	6.44	12.93	535	2.04	17.8	↓
1312			↓	↓	6.46	12.96	523	2.24	17.4	↓

PURGING DATA

Sample ID:	MW-16	Sampling Flow Rate:	0.20		Analytical Laboratory:	APEX
Sample Time:	1310	Final Depth to Water:	26.18		Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs	—	—		
1x250	—	NO2/NO3	—	—	—	—
1x250	H2SO4	NH3	—	—	—	—

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-18i	Job Number:	
Client:	Nustar JAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 30	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:		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	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:	PP	Tubing Material & Type:	SB — NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1331			27.26	0.2	6.58	12.24	372	7.91	22.6	clear
1334			27.34	↓	6.83	13.53	219	7.21	17.9	↓
1337			27.38		6.95	13.83	166	5.16	18.5	
1340			27.40		6.96	13.76	161	4.81	18.7	
1343			27.48		6.97	13.74	160	4.41	18.5	
1346			27.55		6.97	13.60	159	4.31	17.9	

PURGING DATA

Sample ID:	MW-18i	Sampling Flow Rate:	0.2		Analytical Laboratory:	Apex
Sample Time:	1350	Final Depth to Water:	27.65		Did Well Dewater:	No

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs				
1x250	H2SO4	NH3				
1x250	—	NO2/NO3				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

Cascadia Associates, LLC

Well ID:	MW-20i	Job Number:	
Client:	NAVSTAR VAN	Date:	12/3/19
Project:	4Q19 GWM	Sampler:	LW
Weather:	Overcast, 30	Time In/Out:	

WELL DATA

Monument Type:	Flushmount/Stick-up	Well Diameter:		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	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:	LF	Tubing Material & Type:	SB NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (mg/L)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1419			26.61	0.25	7.05	11.68	.83	5.67	16.7	clear
1422			26.67	↓	6.98	12.05	169	5.67	17.0	↓
1425			26.72		6.88	12.63	201	4.04	15.2	
1428			26.78		6.87	12.92	202	3.85	14.6	
1431			26.83	↓	6.86	13.05	202	4.12	15.1	↓

PURGING DATA

Sample ID:	MW-20i	Sampling Flow Rate:	0.28		Analytical Laboratory:	Apex
Sample Time:	1440	Final Depth to Water:	26.89		Did Well Dewater:	NO

No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40	HCl	HVOCs	—	—	—	—
1x250	—	NH3	—	—	—	—
1x250	H2SO4	NO2/NO3	—	—	—	—

NOTES/ADDITIONAL COMMENTS

Project: GWM4Q19
Client: Nustar Vance
Sampler: JW

Date: 12/2
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MGMS2-40	1122		28.10		
MGMS2-60	1124		27.77		
MGMS2-110	1128		27.75		
MGMS2-132	1130		27.78		
MGMS1-43	1110		28.31		
MGMS1-60	1113		27.79		
MGMS1-110	1116		27.72		
MW-24d					
MW-24i					
S-1					
MW-23i					
MW-25i					
MW-22i					
MW-21i-105	1057		28.83		
MW-21i-40	1046		28.44		
MW-32i					
MW-18i	1039		28.19		
MW-20i	1030		28.01		
MW-19i	1019		28.43		

Project: GWM 4Q19
Client: NuStar Vanc Main
Sampler: AW

Date: 12/2
Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-1					
MW-5					
MW-12					
MW-19					
MP-1					
MW-7					
MW-9					
MW-13	1311		28.26		
S-2					
MW-17					
MW-14					
MW-26					
MW-10					
MW-8					
MW-32s					
MW-16	1157		27.94		
MW-15	1210		33.86		
MW-F	1014		29.11		
MW-2	1007		29.08		
MW-6	0957		27.61		
EW-1	0950		26.45		
MW-3	0942	—	28.32		
MGMS3-40	1139		26.64		
MGMS3-60	1142		26.45		
MGMS3-101	1146		26.50		
MGMS3-132	1148		26.52		

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: Lindsay Wallis

Date of Work: 11/4/19

Project Name and Address: Nustar Vancouver

Client/Owner: Nustar

Page 1 of 2

Project Manager: Stephanie Salisbury

Weather: overcast, Fog, 40°F

Description of Work: SVE O+M

Field Staff: LW

Report: 0645 - LW onsite. Signed in at office.

0700 - HAS meeting. Issued work permit. Completed JSA for work.

0730 - Mob to South SVE system. System on upon arrival.

0740 - Got anemometer readings:

near (5): 5027 FPM : 23.45 MPS

mid (7): 5338 FPM : 29.55 MPS

far (9): 5720 FPM = 29.92 MPS

No Blue Water in knockout drum

SVE samples:

SVE_South_PreCarbon_110419 34001403

P_i = -30 P_f = -2 T_i = 851 T_f = 852

SVE_South_PostCarbon_110419 34001257

P_i = -30 P_f = -5 T_i = 858 T_f = 859

	Pressure	PID
Pre Blower	-21	0.9
Post Blower	29	31.6
Post Carbon 1	12	18.1
Post Carbon 2	6	16.2

Nustar VANCOUVER SVE O&M
11/4/19

PID Readings of SVE vaults in Butler Building

~~VE-8-4(D)~~ (vault open upon arrival)

	PID	Notes	Pressure (initial / open)
VE-8-4(D)	0.4	No suction / cracked fitting	0 / 6
VE-8-4(S)	0.4	Cracked fitting	7
VE-8-1(D)	0.4	No suction	0 / 6
VE-8-1(S)	0.4	↓ cracked fitting	0 / 3
VE-8-2(D)	0.4	↓	0 / 0
VE-8-2(S)	0.4	Apparent leak	1 / 1
VE-8-3(D)	0.4	No suction	0 / 6
VE-8-3(S)	0.4	No suction	0 / 6

Vault Closed upon ARRIVAL — Opened during measurements, then closed vault.

	PID	Pressure	Notes
VE-7-3S	0.6	5	
VE-7-3D	0.6	5	
VE-7-1S	0.6	6	
VE-7-1D	0.6	6	
VE-7-2S	0.6	8	
VE-7-2D	0.6	6	

Sounds of air flow from both vaults, even with all sampling ports closed (leaks)

Left with SVE system ON and both handles OPEN for

TestAmerica Sacramento
880 Riverside Parkway

West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	**Client Project Manager:** Stephanie Salisbury	**Samples Collected By:** Lindsay Wallis
Company Name: Cascadia Associates	**Phone:** 503-906-6577	COC No: 1 of 1 COCs
Address: 5820 SW Kelly Ave, Unit B	**Email:** sbsalisbury@cascadiaassociates.com	
City/State/Zip Portland, OR 97239		
Phone: 503-906-6577	**Site Contact:**	
FAX:	**Tel/Fax**	
Project Name: NuStar Vancouver	**Anaylsis Turnaround Time**	
Site/Location: Vancouver, WA	Standard (Specific): ✓	
P O #	Rush (Specifiy):	

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Type	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE-South_PostCarbon_090919	~~9/5~~ 9/9/19	0805	9/9/19	0806	-30	-1	—	34001584	X														
SVE-South_PreCarbon_090919	9/9	0815	9/9	0816	-30	-1	—	34002009	X														

For Lab Use Only:
Walk-in Client:
Lab Sampling:

Job / SDG No.:

(See below for Add'l Items)

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

Special Instructions/QC Requirements & Comments:
Email Results to sbsalisbury@cascadiaassociates.com

Samples Shipped by: Lindsay Wallis (Cascadia)	**Date / Time:** 9/9/19	**Samples Received by:**
Samples Relinquished by:	**Date / Time:**	**Received by:**
Relinquished by:	**Date / Time:**	**Received by:**
Lab Use Only: **Shipper Name:**	**Opened by:**	**Condition:**

Cascadia Associates, LLC

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DAILY FIELD REPORT

Job No.

Report By: Lindsay W

Date of Work: 9/9/19

Project Name and Address: Nustar Vancouver

Client/Owner: NuStar

Page 1 of 3

Project Manager: Stephanie Salisbury

Weather: Rain/overcast

Description of Work: SVE O&M / Prep for well abandonment

Field Staff: LW

Report: 0645 - LW arrive onsite; Sign in

0700 - Safety meeting; Site specific orientation (new card expires 9/9/20); Received work permit

0730 - Mob to SVE system

	Pressure	PID
Pre Blower	-21	1.0
Post Blower	29	29.7
Post Carbon 1	17	27.1
Post Carbon 2	6	22.8

(34001584) SVE_South_PostCarbon_090919 P_i: -30 P_f: -1 T_i: 805 T_f: 806

(34002009) SVE_South_PreCarbon_090919 P_i: -30 P_f: -1 T_i: 815 T_f: 816

NO water present in KO Drum (drum in good condition)

Site Status:

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

Time of Arrival On-Site:

Total Mileage:

Time of Departure from Site:

Attachments:

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:	LW
Date of Work:	9/9/19

Project Name and Address: Nustar Vancouver	Client/Owner: Nustar	Page 2 of 3
	Project Manager: Stephanie S	Weather: overcast

Description of Work: SVE o&M / Well decom. prep (cont.)

Field Staff: LW

Report: 0830 – Turned SVE system back on; mob to MW5: MW-24d, EX-1, etc.

0845 – Mapped alley for correct placement of monitoring wells

EX-1 open with lid off when LW arrived. Well cap on in place.

IW-1:

DTB:

MP-1: 33.85	0	
MP-2: 34.45	0	
MW-24d: >194	0	(Raised monument)
MP-3: 33.60	0	
MW-24i: 65.45	0	
MP-4: 32.09	0	
EX-1: Bentonite	0	
MW-19	0	

Site Status: RIVER

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

Time of Arrival On-Site:	Total Mileage:
Time of Departure from Site:	

Attachments:

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:	LW
Date of Work:	9/9/19
Project Name and Address	Vancouver
Client/Owner:	NuStar
Page of	3 3
Project Manager:	Stephanie S
Weather	Rain

Description of Work: SVE O&M / Well decom (cont.)

Field Staff: LW

Report: 0900 - SS onsite & Locates Dan under. Marking utilities in ~~car~~ alley with wells to be replaced and SVE system. LW confirmed depths / locations of wells. Spray painted well names / outlined wells to be abandoned (EX-1, MP-4, MP-3, MP-2, IW-1).
1045 - LW took pic of MW-14 - well with cracked casing.
1100 - LW signed out
1115 - LW offsite

Site Status:

Drum Inventory:

Time of Arrival On-Site:	Total Mileage
Time of Departure from Site:	Truck Car

Attachments:

ver SVE other (cont.)

uth_Post Carbon_030819
Ti: 825 Pf: -5 Tf: 826
32

g 1 screw, 3 washers,
t; loose fitting well plug
ked monument
od condition
ssing 2 washers,
sket; 2 bolts lost
ghten; well plug
good - holds water

in work permit #
meter

LP

7/8/19 25

Nu Star - Vance Main
4W - LW
SVE O+M

645 On Site
700 Safety
715 Arrive S. SVE

	Pressure	PID	NH3
Pre Blower	-21	0.6	3
Post Blower	29	33.6	>99
Post Carbon 1	17	26.1	>99
Post Carbon 2	7	27.1	>99

SVE_South_Pre Carbon_070819
3400017
PI: -30 Ti: 0835 Tf: 0836
#3400017 Pf: -1

SVE_South_Post Carbon_070819
Pi: -30 Ti: 0855 Tf: 0856
#8275 Pf: -2

Checked manhole drum
- No blue water
- No holes/deterioration

Rite in the Rain

SVE Adjacent Warehouse full
09:10 system on - 1W, 2W left SVE

2 drums IDW in Waste Area

2W 1W offsite 9:30.

1.2W

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	**Client Project Manager:** Stephanie Salisbury	**Samples Collected By:** J. Weatherford	COC No:
Company Name: Cascadia Associates	**Phone:** (503) 906-6577 x110		1 of 1 COCs
Address: 5820 SW Kelly Ave	**Email:** sbsalisbury@cascadiaassociates.com		
City/State/Zip Portland, OR 97239	**Site Contact:**		**For Lab Use Only:**
Phone: (503) 906-6577	**Tel/Fax**		Walk-in Client:
FAX:	**Anaylsis Turnaround Time**		Lab Sampling:
Project Name: NuStar	Standard (Specific): X		Job / SDG No.:
Site/Location: Vancouver Main	Rush (Specifiy):		(See below for Add'l Items)
P O #			

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	~~Flow Controller ID~~	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	*Sample Type*	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE_South-PreCarbon_070819	7/8/19	0835	7/8/19	0836	-30	-1	3400017		X														
SVE_South_PostCarbon_070819	7/8/19	0855	7/8/19	0856	-30	-2	8275		X														

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

Special Instructions/QC Requirements & Comments:
Email Results to: sbsalisbury@cascadiaassociates.com

Samples Shipped by: Jon Weatherford	**Date / Time:** 7/8/19 1200	**Samples Received by:**
Samples Relinquished by:	**Date / Time:**	**Received by:**
Relinquished by:	**Date / Time:**	**Received by:**

Lab Use Only: **Shipper Name:** **Opened by:** **Condition:**

APPENDIX B

HISTORICAL GROUNDWATER ANALYTICAL DATA

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-1	11/17/93	--	500	--	--	<250	<250	--	14,000	--	--	750	<250	--	1,400	<500
	09/01/95	<250	<500	<250	<250	<250	<250	<250	13,000	<250	<250	620	<250	--	890	610
	09/24/96	<5	<20	<2	<2	54	<2	8.4	11,000	83	17	2,600	68	--	1,800	420
	12/02/96	0.8	<0.50	<0.50	<0.20	6.7	<0.50	0.3	1,500	4.4	<0.20	1,200	7.3	--	310	1.6
	11/12/97	<125	<250	<125	<125	<125	<125	<125	11,600	<125	<125	6,330	<125	--	2,880	<250
	08/11/99	<50	<250	<25	<250	43.1	<25	<25	8,590	86	<25	2,520	52.5	--	1,210	408
	11/16/99	<50	<125	<25	<50	38	<25	<25	6,250	47.5	<25	2,400	28	--	829	148
	02/29/00	<100	<500	<50	<50	<50	<50	<50	6,720	60.9	<50	1,370	<100	--	590	438
	06/27/00	<100	<500	<50	<50	<50	<50	<50	6,480	65.1	<50	1,780	<100	--	795	284
	08/31/00	<100	<500	<50	<50	<50	<50	<50	5,160	<50	<50	1,960	<100	--	720	<50
	11/30/00	<20	<100	<10	<10	15	<10	<10	1,550	12.7	<10	660	<20	--	234	<10
	02/27/01	<100	<100	<50	<50	<50	<50	<50	4,990	<50	<50	1,140	<100	--	440	190
	05/29/01	<50	<250	<25	<25	<25	<25	<25	4,050	<25	<25	1,040	<50	--	407	91
	09/25/01	<50	<50	<50	<50	<50	<50	<50	5,000	<50	<50	890	<50	--	440	240
	12/17/01	<2	<10	<1	<1	<1	<1	<1	109	1.26	<1	164	<2	--	42.9	<1
	03/19/02	<50	<25	<25	<50	35	<25	<25	4,120	35	<25	710	<25	--	349	170
	05/30/02	<10	<5	<5	<10	10.8	<5	<5	1,140	6.6	<5	307	<5	--	101	22.3
	11/08/02	<20	<10	<10	<20	22.8	<10	<10	1,980	20.2	<10	367	<10	--	174	14.4
	05/30/03	<20	<10	<10	<20	21.2	<10	<10	2,180	<10	<10	1,200	14.2	--	340	22.6
	11/02/04	<20	<10	<10	<20	22.4	<10	<10	2,130	23.6	<10	335	<10	--	169	22.8
	11/16/04	<12	<12	<12	<12	15	<12	<12	1,300	<12	<12	310	<12	--	130	<12
	05/18/05	<5	<2.5	<2.5	<5	12	<2.5	<2.5	773	14.1	<2.5	193	<2.5	--	87.6	3.8
	05/23/07	<10	<10	<10	<10	15.5	<10	<10	1,110	<10	<10	58.5	<10	--	45.4	11.7
	09/11/07	<50	<25	<25	<50	<25	<25	<25	916	<25	<25	34	<25	--	34	62.5
	12/13/07	<10	<5	<5	<10	9.7	<5	<5	526	5	<5	81.9	<5	--	45.4	8.8
	03/05/08	<1	<0.500	<0.500	<1	16.1	<0.500	1.66	826	9.18	2.3	49.7	0.88	<0.500	45.6	58.8
	09/19/08	<20	<10	<10	<20	20.4	<10	<10	633	<10	<10	108	<10	<10	74.8	<10
	12/10/08	<2.5	<2.5	<2.5	<2.5	15	<2.5	<2.5	570	6.2	<2.5	28	<2.5	<2.5	25	48
	03/27/09	<2.5	<2.5	<2.5	<2.5	17	<0.50	<2.5	580	5.7	<2.5	39	<2.5	<2.5	42	4.4
	06/17/09	<0.90	<0.90	<0.90	<0.90	6.3	<0.90	<0.90	310	3.6	0.99	21	<0.90	<0.90	14	9.7
	09/18/09	<0.80	<0.80	<0.80	<0.80	19	<0.80	<0.80	590	4.2	1.9	29	<0.80		27	8.1
	12/17/09	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	<0.50	170	0.72	0.67	53	0.53	<0.50	26	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-1 (continued)	03/19/10	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	0.61	300	3.6	1.4	22	<0.50	<0.50	21	26
	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.6	<0.50	<0.50	22	<0.50	<0.50	6.6	<0.50
	09/23/10	<0.90	<0.90	<0.90	<0.90	12	<0.90	<0.90	380	3.4	1.6	25	<0.90	<0.90	27	7.1
	12/09/10	<1.5	<1.5	<1.5	<1.5	7.1	1.5	<1.5	250	2.2	<1.5	25	<1.5	<1.5	17	8
	03/10/11	<1.5	<1.5	<1.5	<1.5	7.5	<1.5	<1.5	250	3	<1.5	16	<1.5	<1.5	16	18
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	<0.5	11	<0.5	<0.5	3.4	<0.5
	09/19/11	<1.5	<1.5	<1.5	<1.5	12	<1.5	<1.5	300	3.2	<1.5	5.2	<1.5	<1.5	13	30
	12/09/11	<1.5	<1.5	<1.5	<1.5	11	<1.5	<1.5	260	2.9	<1.5	6.2	<1.5	<1.5	8.4	40
	03/09/12	<0.50	<0.50	<0.50	<0.50	7.8	<0.50	<0.50	200	2.4	1	3.1	<0.50	<0.50	9.5	19
	06/22/12	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	<0.5	140	1.7	0.53	17	<0.5	<0.5	13	14
	09/13/12	<1.5	<1.5	<1.5	<1.5	10	<1.5	<1.5	260	2.4	<1.5	<1.5	<1.5	<1.5	7	25
	12/13/12	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	47	0.64	<0.50	26	<0.50	<0.50	14	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	140	1.6	0.8	0.83	<0.50	<0.50	6	0.98
	06/13/13	<0.50	<0.50	<0.50	<0.50	7.2	<0.50	<0.50	130	1.9	0.63	1.1	<0.50	<0.50	2.4	28
	09/19/13	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	180	1.6	1	3.2	<0.50	<0.50	5.6	0.92
	12/16/13	<0.50	<0.50	<0.50	<0.50	7.8	<0.50	<0.50	110	1.8	<0.50	8.5	<0.50	<0.50	5.9	13
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.1	<0.50	<0.50	10	<0.50	<0.50	4.3	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	45	1	<0.50	<0.50	<0.50	<0.50	0.65	5.9
	9/30/2014	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	170	1.3	0.83	12	<0.50	<0.50	9.7	3.3
	12/11/2014	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	30	<0.50	<0.50	17	<0.50	<0.50	9.4	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	6.2	<0.50	<0.50	47.4	0.67	<0.50	1.1	<0.50	<0.50	1.9	<5
	6/17/2015	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	75	0.8	<0.50	4.3	<0.50	<0.50	4.6	4.9
	9/24/2015	<0.50	<0.50	<0.50	<0.50	8.4	<0.50	<0.50	39.1	0.65	<0.50	2.8	<0.50	<0.50	2.4	32.7
	12/8/2015	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	25.2	<0.50	<0.50	18	<0.50	<0.50	8.9	<0.50
	3/7/2016	<0.50	<2	<5	<0.50	4.4	<0.50	<0.50	51.9	<0.50	<0.50	18	<0.50	<0.50	10.3	0.57
	6/15/2016	<0.50	<2	<0.50	<0.50	3.7	<0.50	<0.50	13.1	<0.50	<0.50	0.67	<0.50	<0.50	1.2	5.3
	9/27/2016	<0.50	<2	<0.50	<0.50	8.6	<0.50	<0.50	25.2	<0.50	<0.50	2.3	<0.50	<0.50	3.1	23.9
	12/16/2016	<0.50	<2	<0.50	<0.50	3.4	<0.50	<0.50	22.5	<0.50	<0.50	8	<0.50	<0.50	5.8	0.86
	3/30/2017	<0.50	<2	<0.50	<0.50	<0.5	<0.5	<0.50	1.6	<0.50	<0.50	4.6	<0.50	<0.50	1.6	<0.50
	6/12/2017	<2.0	<2.0	<0.50	<0.50	2.1	<1.0	<0.50	9.9	<0.50	<0.50	4.4	<0.50	<0.50	3.1	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	6.8	<1.0	<0.50	6.7	<0.50	<0.50	1.5	<0.50	<0.50	1.6	22.6
	11/9/2017	<2.0	<2.0	<0.50	<0.50	5.00	<0.50	<0.50	22.80	<0.50	<0.50	9.50	<0.50	<0.50	6.50	1.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-1 (continued)	3/20/2018	<0.500	<2.50	<0.500	<0.500	4.84	<0.500	<0.500	6.13	<0.500	0.322 J	2.49	<0.500	<0.500	2.06	<0.500
	7/1/2018	<0.500	<2.50	<0.500	<0.500	6.70	<0.500	0.204 J	16.1	0.303 J	0.427 J	0.530	<0.500	<0.500	1.63	10.5
	9/25/2018	<1.00	<5.00	<1.00	<1.00	7.33	<0.400	0.740	44.9	0.610	0.510	4.24	<0.400	<0.500	8.09	3.19
	12/4/2018	<1.00	<5.00	<1.00	<1.00	4.73	<0.400	<0.400	22.7	<0.400	<0.500	15.700	<0.400	<0.500	9.04	2.57
	3/21/2019	<1.00	<5.00	<1.00	<1.00	4.37	<0.400	0.780	28.5	0.530	<0.500	2.78	<0.400	<0.500	6.65	0.400
	6/5/2019	<1.00	<5.00	<1.00	<1.00	2.54	<0.400	<0.400	27.6	0.481	<0.500	12.9	<0.400	<0.500	8.43	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	8.66	<0.400	0.57	106	1.78	0.703	19.1	0.45	<0.500	18.4	2.97
	12/4/2019	<1.00	<5.00	<1.00	<1.00	3.22	<0.400	<0.400	26.6	0.494	<0.500	10.6	<0.400	<0.500	7.39	0.67
MW-2	11/17/93	--	51	--	--	12	<0.50	--	10	--	--	<0.50	<0.50	--	<0.50	<0.10
	09/01/95	<0.50	16	<0.50	<0.20	8.2	<0.50	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	--	<0.50	2.2
	09/24/96	<0.50	19	<0.20	<0.20	9.6	0.5	<0.20	9.4	<0.20	<0.20	<0.20	<0.50	--	0.3	5.1
	12/02/96	<0.50	8.8	<0.50	<0.20	6.9	0.6	<0.20	11	<1	<0.20	<0.50	<1	--	<0.30	7.2
	11/13/97	<0.50	<1	<0.50	<0.50	5.32	0.571	<0.50	7.9	<0.50	<0.50	<0.50	<0.50	--	<0.50	<1
	08/11/99	<1	18.3	<0.50	<0.50	6.38	<0.50	<0.50	20	<0.50	<0.50	<0.50	<1	--	10.4	1.64
	02/29/00	<1	16	<0.50	<0.50	5.68	<0.50	<0.50	23.5	<0.50	<0.50	<0.50	<1	--	4.52	1.21
	06/27/00	<1	18.3	<0.50	<0.50	5.34	<0.50	1.27	23.4	<0.50	<0.50	12.8	<1	--	16.6	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50
	05/30/02	<1	1.68	<0.50	<1	2.65	<0.50	<0.50	0.51	<0.50	<0.50	0.61	<0.50	--	<0.50	<0.50
	11/08/02	<1	10.4	<0.50	<1	3.13	<0.50	<0.50	1.84	<0.50	<0.50	1.05	<0.50	--	0.98	<0.50
	05/30/03	<1	3.64	<0.50	<1	1.95	<0.50	<0.50	0.59	<0.50	<0.50	6.6	<0.50	--	1.13	<0.50
	09/12/07	<1	5.9	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	03/07/08	<1	7.86	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.5	<0.500	<0.500	<0.500	<0.500
	09/18/08	<1	5.93	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	03/24/09	<0.50	4.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	5.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	0.85	<0.50
	03/19/10	<0.50	5.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/23/10	<0.5	3.8	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	4.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/11	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/09/12	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/13/12	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	3.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-2 (continued)	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/30/2014	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2015	<0.50	0.96	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/23/2015	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/7/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/29/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/28/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	3.0	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	3/21/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	06/05/19	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-3	11/17/93	--	210	--	--	27	4	--	240	--	--	190	20	--	97	130
	09/01/95	<50	<100	<50	<50	<50	<50	<50	2,700	<50	<50	1,300	<50	--	140	730
	09/24/96	<5	<20	7.9	<2	12	<2	<2	1,100	9.5	4	1,800	21	--	330	82
	12/02/96	<50	<50	<50	<20	<30	<50	<20	650	<100	<20	2,100	<100	--	470	<50
	11/12/97	<25	<50	<25	<25	<25	<25	<25	464	<25	<25	2,000	<25	--	241	<50
	08/11/99	<20	<100	<10	<10	<10	<10	<10	500	<10	<10	1,760	25.4	--	247	<10
	11/16/99	<20	<50	<10	<20	14	<10	<10	628	15.2	<10	700	<10	--	132	<10
	02/29/00	<20	<100	<10	<10	<10	<10	<10	473	<10	<10	1,890	25.4	--	356	<10
	06/27/00	<20	<100	<10	<10	<10	<10	<10	410	<10	10.2	1,460	<20	--	241	<10
	08/31/00	<20	<100	<10	<10	52.2	<10	<10	2,580	25.5	<10	399	<20	--	100	171
	11/30/00	<5	<25	<2.5	<2.5	13.3	<2.5	<2.5	374	3.73	<2.5	366	<5	--	80.3	3.1
	02/27/01	<5	<25	3.64	<2.5	5.78	<2.5	<2.5	153	<2.5	2.5	358	<5	--	76.1	<2.5
	05/29/01	<5	<25	2.8	<2.5	<2.5	<2.5	<2.5	112	<2.5	<2.5	647	5.12	--	93.3	<2.5
	09/25/01	<1.3	3.1	2.4	<1.3	10	2	<1.3	210	3	1.7	550	7.2	--	90	4.9
	12/17/01	<10	<50	<5	<5	<5	<5	<5	164	<5	<5	826	16.9	--	155	<5
	03/19/02	<5	<2.5	2.75	<5	<2.5	<2.5	<2.5	138	4.1	<2.5	758	9.6	--	107	<2.5
	05/30/02	<10	7.8	<5	<10	27.8	<5	<5	1,380	42.6	6	302	11.5	--	55.1	96.7
	11/08/02	<5	15	<2.5	<5	29.4	3.55	<2.5	399	9.05	5.7	359	5.8	--	67.1	19.4
	05/30/03	<5	<2.5	6.45	<5	<2.5	<2.5	<2.5	50.1	3.65	<2.5	706	4.95	--	72.6	<2.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-3 (continued)	11/16/04	<10	<5	<5	<10	15	<5	<5	440	5.9	<5	270	<5	--	72	<5
	03/23/05	<2	2.26	4.16 B	<2	8.92	<1	<1	246	8.4	2.86	329	5.04	--	71.9	3.84
	05/18/05	<2	<1	3.86	<2	5.74	<1	<1	188	4.72	3.02	304	5.06	--	88.5	<1
	05/23/07	<2	<2	<2	<2	<2	<2	<2	110	6.3	<2	349	4.54	--	70.6	<2
	09/11/07	<5	9.95	14.4	<5	43	6.1	<2.50	950	28.2	12	601	31	--	223	6.1
	12/12/07	<10	<5	<5	<10	<5	<5	<5	95.7	<5	<5	254	<5	--	63.2	<5
	03/06/08	<1	<0.500	2.10 J	<1	1.32	<0.500	<0.500	127	8.49	2.37	144	5.66	<0.500	94.7	<0.500
	09/19/08	<5	3.7	2.65 J	<5	10.6	<2.50	<2.50	187	5.85	2.95	283	6.6	<2.50	75	<2.50
	12/10/08	<0.90	1.5	1.9	<0.90	5.3	1.2	<0.90	120	4.3	1.5	200	3.8	<0.90	54	<0.90
	03/26/09	<0.50	<0.50	1.4	<0.50	1.6	<0.50	<0.50	83	4.3	1.2	180	3.6	<0.50	46	<0.50
	06/17/09	<0.50	<0.50	1.1	<0.50	0.89	<0.50	<0.50	76	4.7	0.71	190	3.4	<0.50	49	<0.50
	09/18/09	<0.50	<0.50	3.3	<0.50	10	<0.50	<0.50	180	6.2	2.2	270	7.3	<0.50	62	1.2
	12/17/09	<0.90	<0.90	0.96	<0.90	<0.90	<0.90	<0.90	50	3.2	<0.90	180	3.2	<0.90	47	<0.90
	03/19/10	<0.90	<0.90	1 BE	<0.90	<0.90	<0.90	<0.90	77	5.4	<0.90	280	4.1	<0.90	49	<0.90
	06/16/10	<0.50	<0.50	2.3	<0.50	1.6	0.9	<0.50	42	1.7	<0.50	180	1.9	<0.50	30	<0.50
	09/23/10	<0.5	<0.5	2.8 BE	<0.5	0.56	<0.5	<0.5	75	4.4	0.51	220	3	<0.5	39	<0.5
	12/09/10	<0.5	<0.5	2.7	<0.5	<0.5	<0.5	<0.5	39	3.4	<0.5	210	3	<0.5	35	<0.5
	03/10/11	<0.50	<0.50	5.4	<0.50	<0.50	<0.50	<0.50	8.9	1.1	<0.50	110	1.6	<0.50	15	<0.50
	06/10/11	<0.5	<0.5	1.6	<0.5	2.2	0.76	<0.5	36	1.1	0.54	99	1.6	<0.5	30	<0.5
	09/16/11	<0.50	<0.50	2	<0.50	3	0.59	<0.50	70	1.7	0.91	130	2.4	<0.50	31	<0.50
	12/09/11	<0.50	<0.50	2.2	<0.50	2.9	0.54	<0.50	62	1.6	0.83	190	2.6	<0.50	45	<0.50
	03/12/12	<0.50	<0.50	2.4	<0.50	0.83	<0.50	<0.50	52	2.8	1	140	3.1	<0.50	45	<0.50
	06/21/12	<0.5	<0.5	2.3	<0.5	0.9	<0.5	<0.5	45	2.7	0.56	170	2.7	<0.5	37	<0.5
	09/13/12	<0.50	<0.50	1.7	<0.50	4.1	<0.50	<0.50	100	2.1	1.4	140	3.3	<0.50	45	<0.50
	12/13/12	<0.50	<0.50	1.3	<0.50	0.78	<0.50	<0.50	27	1.6	<0.50	170	2	<0.50	36	<0.50
	03/14/13	<0.50	<0.50	1.8	<0.50	1	<0.50	<0.50	64	2.5	1.4	160	3.2	<0.50	53	<0.50
	06/14/13	<0.90	<0.90	1.4	<0.90	1.1	<0.90	<0.90	68	3.1	1.3	210	3.3	<0.90	48	<0.90
	09/19/13	<0.50	<0.50	1.1	<0.50	1.1	<0.50	<0.50	99	1.5	1.4	86	1.7	<0.50	30	<0.50
	12/16/13	<0.50	<0.50	1.4	<0.50	1.3	<0.50	<0.50	47	2.1	0.81	170	2.4	<0.50	38	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-3 (continued)	3/21/2014	<0.50	<0.50	1.3	<0.50	0.64	<0.50	<0.50	27	1.6	<0.50	150	2	<0.50	30	<0.50
	6/24/2014	<0.50	0.86	0.86	<0.50	1.4	<0.50	<0.50	65	3.2	1.3	180	3.2	<0.50	44	<0.50
	9/30/2014	<0.50	<0.50	1	<0.50	6.7	0.7	<0.50	110	2.1	1.3	180	2.8	<0.50	47	<0.50
	12/11/2014	<0.50	<0.50	1.2	<0.50	0.8	<0.50	<0.50	28	1.7	<0.50	150	2.2	<0.50	37	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/15/2015	<0.50	<0.50	0.86	<0.50	1.1	<0.50	<0.50	49	2	0.88	160	2.8	<0.50	44	<0.50
	12/9/2015	<0.50	<0.50	0.66	<0.50	4.9	<0.50	<0.50	72	1.8	1.1	145	1.8	<0.50	33.6	<0.50
	3/7/2016	<0.50	<2	0.76	<0.50	2.2	<0.50	<0.50	61.8	2.5	1.3	199	3.6	<0.50	45.1	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	50.2	0.82	<0.50	49.5	0.77	<0.50	17.4	<0.50
	9/30/2016	<0.50	<2	0.67	<0.50	8.2	0.73	<0.50	95.3	1.5	1.6	145	2	<0.50	40.1	<0.50
	12/16/2016	<0.50	<2	0.52	<0.50	1.1	<0.50	<0.50	26.8	0.9	0.57	86.2	1.2	<0.50	23.9	<0.50
	3/29/2017	<0.50	<2	<0.50	<0.50	7.1	1.3	<0.50	77.9	1.2	<0.50	67.6	0.64	<0.50	20.2	2.5
	6/14/2017	<2.0	<2.0	1.0	<0.50	2.1	<1.0	<0.50	39.0	1.5	<0.50	163	1.7	<0.50	30.4	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	5.6	<1.0	<0.50	73.3	1.3	<0.50	127	1.5	<0.50	29.5	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	5.0	<0.50	<0.50	59.5	0.6	<0.50	67	0.6	<0.50	16.1	0.7
	3/20/2018	<0.500	<2.50	0.380 J	<0.500	2.0	0.144 J	<0.500	77.8	2.2	1.99	194	3.4	<0.500	48.6	<0.500
	7/2/2018	<0.500	<2.50	0.439 J	<0.500	<0.500	3.2	<0.500	64.5	1.6	1.07	180	2.6	<0.500	43.1	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	6.41	<0.400	<0.400	75.6	0.73	1.18	145	1.18	<0.500	36.3	<0.400
	12/7/2018	<2.00	<10.0	<2.00	<2.00	3.1	<0.800	<0.800	44.2	1.0	<1.00	96	1.0	<1.00	27.8	<0.800
	3/20/2019	<1.00	<5.00	<1.00	<1.00	0.930	<0.400	<0.400	37.5	1.16	1.03	112	1.55	<0.500	33.2	<0.400
	6/7/2019	<1.00	<5.00	1.02	<1.00	1.22	<0.400	<0.400	41.6	1.99	0.708	195	2.62	<0.500	39.8	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	7.00	0.47	<0.400	72.3	1.25	1.32	130	1.7	<0.500	32.9	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	1.54	<0.400	<0.400	36.5	1.07	0.634	136	1.33	<0.500	36.4	<0.400
MW-4	11/17/93	--	850	--	--	12	<50	--	20	--	--	40	<50	--	5.4	<10
	09/01/95	<5	340	<5	<5	5.2	<50	<5	14	<5	<5	<50	<50	--	<50	30
	09/24/96	<0.50	300	<0.20	<0.20	7.1	1.4	<0.20	3.2	<0.20	1	0.5	<0.50	--	0.8	4.7
	12/02/96	<0.50	310	<0.50	0.3	3.8	1	<0.20	19	<1	0.3	<0.50	<1	--	<0.30	39
	11/13/97	<0.50	252	<0.50	<0.50	4.22	1.23	<0.50	6.91	<0.50	0.688	<0.50	<0.50	--	<0.50	<1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-4 (continued)	08/11/99	<2	144	<1	<1	1.21	<1	<1	<1	<1	<1	3.6	<2	--	<1	<1
	11/16/99	<1	26.3	<0.50	<1	2.3	<0.50	<0.50	4.18	<0.50	<0.50	1.2	<0.50	--	0.88	2.07
	02/29/00	<2	119	<1	<1	2.84	<1	<1	4.1	<1	<1	<1	<2	--	<1	5.72
	06/28/00	<5	59.4	<2.5	<2.5	3.89	<2.5	<2.5	2.5	<2.5	<2.5	<2.5	<5	--	<2.5	<2.5
	07/05/00	Well Abandoned														
MW-5	11/17/93	--	1,900	--	--	<25	<25	--	100	--	--	1,200	<25	--	52	<50
	09/01/95	<1	<2	<1	<2	<1	<1	<1	1,300	<1	<1	60,000	<1	--	<1	<2
	09/24/96	<5	140	<2	<2	35	<2	7.5	2,600	80	5.3	16,000	64	--	670	370
	12/02/96	71	<50	<50	27	<30	<50	<20	5,600	<100	<20	27,000	110	--	1,700	340
	11/12/97	<500	<1	<500	<500	<500	<500	<500	<500	<500	<500	28,000	<500	--	1,250	<1
	08/11/99	<200	<1	<100	<100	<100	<100	<100	1,750	<100	<100	25,100	<200	--	862	238
	02/29/00	<100	<500	<50	<50	<50	<50	<50	126	<50	<50	5,250	<100	--	135	<50
	08/31/00	<50	<250	<25	<25	41.4	<25	<25	1,860	<25	<25	5,660	<50	--	347	280
	11/30/00	<50	<250	<25	<25	27.3	<25	<25	3,850	26.8	<25	6,150	<50	--	511	189
	02/27/01	<50	<250	<25	<25	<25	<25	<25	1,370	<25	<25	7,350	<50	--	445	127
	05/30/01	<50	<250	<25	<25	<25	<25	<25	2,410	<25	<25	5,560	<50	--	439	129
	09/25/01	<25	200	<25	<25	34	<25	<25	1,800	<25	<25	2,200	<25	--	180	180
	12/17/01	<100	<500	<50	<50	<50	<50	<50	1,480	<50	<50	10,100	<100	--	646	<50
	03/19/02	<50	<25	<25	<50	<25	<25	<25	360	<25	<25	4,640	<25	--	221	114
	05/29/02	<50	46	<25	<50	<25	<25	<25	916	<25	<25	4,330	<25	--	238	39.5
	08/29/02	<50	<25	<25	<50	<25	<25	<25	1,160	<25	<25	4,090	<25	--	288	310
	11/08/02	<5	178	<2.5	<5	8.3	<2.5	<2.5	385	3.25	<2.5	603	<2.5	--	63.4	66
	01/23/03	<50	<25	<25	<50	<25	<25	<25	582	<25	<25	4,090	<25	--	349	<25
	05/30/03	<10	14.1	<5	<10	<5	<5	<5	382	<5	<5	1,450	7.9	--	140	67
	11/10/03	<1	84.2	<1	<1	1.06	<1	<1	90.7	<1	<1	161	<1	--	30.8	9.42
	01/26/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/04/04	<20	<20	<20	<20	<20	<20	<20	432	<20	<20	2,440	<20	--	178	188
	08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/16/04	<50	<50	<50	<50	<50	<50	<50	6,300	<50	<50	1,800	<50	--	370	990
	03/23/05	<20	<10	<10	<20	26.2	<10	<10	2,350	27.6	<10	511	<10	--	147	604
	05/18/05	<5	<2.5	<2.5	<5	9.25	<2.5	6.45	817	10.2	<2.5	611	<2.5	--	156	329

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-5 (continued)	08/18/05	<5	5.15	<2.50	<5	14.4	<2.50	<2.50	397	4.7	<2.50	169 B	<2.50	--	81.8	278
	11/15/05	<20	<10	<10	<20	36.2	<10	<10	2,790	14	<10	408	<10	--	177	615
	02/21/06	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	72.7	1.06	<0.500	184	0.78	--	31.5	5.05
	06/05/06	<20	<20	<20	<20	<20	<20	<20	2,800	<20	<20	157	<20	--	75	199
	09/06/06	<2	10.6	<1	<2	8.3	<1	<1	377	3.66	<1	104	<1	--	45	29.9
	12/06/06	<2	<1	<1	<2	1.32	<1	1.34	113	1.28	1.52	240	1.6	--	58	43.3
	02/07/07	<10	<5	<5	<10	<5	<5	<5	1,220	18	<5	124	<5	--	26.9	600
	05/22/07	<5	<5	<5	<5	<5	<5	<5	634	8.45	<5	102	<5	--	40.8	59.4
	09/12/07	<1	67.5	<0.50	<1	<0.50	<0.50	<0.50	16.2	<0.50	<0.50	0.89	<0.50	--	1.38	1.86
	12/13/07	<1	<0.50	<0.50	<1	7.1	<0.50	4.67	2,420	9.22	1.14	180	<0.50	--	179	416
	03/07/08	<1	<0.500	<0.500	<1	2.18	<0.500	1.33	411	3.21	<0.500	86.4	<0.500	<0.500	26.1	105
	09/18/08	<1	101	<0.500	<1	0.79	<0.500	<0.500	11.2	<0.500	<0.500	1.14	<0.500	<0.500	1.27	1.74
	12/10/08	<2	<2	<2	<2	3.7	<2	<2	360	2.3	<2	49	<2	<2	53	150
	03/27/09	<0.50	4.2	<0.50	<0.50	4	<0.50	<0.50	170	1	<0.50	0.59	<0.50	<0.50	<0.50	64
	06/17/09	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	0.6	160	2.5	<0.50	11	<0.50	<0.50	12	11
	09/18/09	<0.50	65 BE	<0.50	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	1.2
	12/17/09	<0.50	<0.80	<0.50	<0.50	2.1	<0.50	1.4	340	2	<0.50	19	<0.50	<0.50	37	93
	03/19/10	<0.50	1.4	<0.50	<0.50	4.4	<0.50	<0.50	72	<0.50	<0.50	24	<0.50	<0.50	14	21
	06/16/10	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	0.83	94	0.65	0.54	4.1	<0.50	<0.50	10	23
	09/23/10	<0.5	59	<0.5	<0.5	0.84	<0.5	<0.5	9.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.97	1.3
	12/09/10	<0.5	<0.5	<0.5	<0.5	0.84	<0.5	<0.5	140	0.73	<0.5	5.6	<0.5	<0.5	8.8	15
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	34	<0.50	<0.50	8.4	<0.50	<0.50	7.6	4.7
	06/10/11	<0.5	<0.5	<0.5	<0.5	5	<0.5	<0.5	40	<0.5	0.63	2.2	<0.5	<0.5	3.8	26
	09/19/11	<0.50	2.3	<0.50	<0.50	2.8	<0.50	<0.50	97	<0.50	<0.50	1.3	<0.50	<0.50	11	6.3
	12/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	47	<0.50	<0.50	2.7	<0.50	<0.50	7.7	2.8
	03/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4
	06/22/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	0.54	<0.5	<0.5	2.9	3
	09/14/12	<0.50	20	<0.50	<0.50	0.75	<0.50	<0.50	26	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4
	12/13/12	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	67	0.65	<0.50	<0.50	<0.50	<0.50	1.7	6.6
	03/15/13	<0.50	7.4	<0.50	<0.50	1.5	<0.50	<0.50	48	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	6.6

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-5 (continued)	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.5	<0.50	<0.50	7.2	<0.50	<0.50	7.2	1.7
	09/19/13	<0.50	23	<0.50	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	0.61
	12/16/13	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	180	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	71
	3/21/2014	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	39	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	10
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<5	<0.50	<0.50	14	<0.50	<0.50	1.3	<0.50	<0.50	8	2.3
	9/30/2014	<0.50	28	<0.50	<0.50	<5	<0.50	<0.50	20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.6
	12/16/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	33	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	1.9
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26.5	<0.50	<0.50	8.4	<0.50	<0.50	5.8	5.6
	6/17/2015	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	0.63	<0.50	<0.50	0.64	<0.50
	9/24/2015	<0.50	24.6	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	199	<0.50	<0.50	29.5	<0.50	<0.50	43.2	32.3
	12/8/2015 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.68	175	<0.50	<0.50	27.1	<0.50	<0.50	38.5	28.4
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	9.9	<0.50	<0.50	3.1	<0.50
	6/17/2016	<0.50	7.5	<0.50	<0.50	<0.50	<0.50	<0.50	23.3	<0.50	<0.50	7.3	<0.50	<0.50	3.2	<0.50
	9/29/2016	<5	<20	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	<0.50	11.5	<0.50	<0.50	2.5	1.1
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	8.4	<0.5	<0.5	6.5	<0.5	<0.5	5.8	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.2	<0.50	<0.50	16.3	<0.50	<0.50	6.8	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	1.60	<1.0	<0.50	15.6	<0.50	<0.50	26.7	<0.50	<0.50	15.6	0.64
	11/7/2017	<2.0	<2.0	<0.50	<0.50	0.99	<0.50	<0.50	35.6	<0.50	<0.50	3.5	<0.50	<0.50	9.7	5.30
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.9	<0.500	<0.500	10.6	0.199 J	<0.500	2.4	0.260 J
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.56	<0.500	<0.500	45.5	0.174 J	<0.500	21.3	<0.500	<0.500	11.8	1.17
	9/27/2018	<1.00	26.9	<1.00	<1.00	<0.400	<0.400	<0.400	0.562	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/7/2018	<1.00	<5.00	<1.00	<1.00	1.03	<0.400	<0.400	129.0	<0.400	<0.500	4.7	<0.400	<0.500	11.7	4.80
	3/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2.01	<0.400	<0.500	0.947	<0.400	<0.500	0.977	<0.400
	6/7/2019	<1.00	<5.00	<1.00	<1.00	0.404	<0.400	<0.400	11.1	<0.400	<0.500	20.4	<0.400	<0.500	8.63	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.4	<0.400	<0.400	10.7	<0.400	<0.500	0.972	<0.400	<0.500	1.35	1.10
	12/4/2019	<1.00	<5.00	<1.00	<1.00	0.817	<0.400	1.60	632	1.11	<0.500	0.925	<0.400	<0.500	9.85	10.70

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-6	11/17/93	--	<1	--	--	<0.50	<0.50	--	1.2	--	--	2.1	<0.50	--	0.54	<1
	09/01/95	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<1
	09/24/96	<0.50	<2	<0.20	<0.20	<0.20	<0.20	<0.20	0.3	<0.20	<0.20	<0.20	<0.50	--	<0.20	<1
	12/02/96	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50	<0.20	<0.20	<1	<0.20	<0.50	<1	--	<0.20	<0.20
	11/12/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.03	<0.50	--	<0.50	<1
	08/11/99	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	1.37	<0.50
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	02/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.654	<1	--	<0.50	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50
	05/29/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	1.51	<0.50	<0.50	1.31	<0.50	--	<0.50	<0.50
	08/28/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/08/02	<1	<0.50	<0.50	<1	0.51	<0.50	<0.50	2.55	<0.50	<0.50	0.97	<0.50	--	0.55	0.52
	01/23/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/03	<0.50	<0.50	<0.50	<1	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	3.73	<0.50	--	0.99	<0.50
	11/17/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.16	<0.500	<0.500	<0.500	<0.500
	09/19/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/05/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	10/2/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-6 (continued)	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/7/2016	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2016	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	7/1/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	3/22/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/5/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-7	12/02/96	81	<50	<50	39	<30	<50	110	110	<100	<20	73,000	1,900	--	7,600	<50
	11/12/97	<500	<1	<500	<500	<500	<500	<500	<500	<500	<500	36,400	<500	--	7,670	<1
	08/11/99	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	49,000	1,210	--	4,650	<500
	11/16/99	<100	<250	<50	<100	<50	<50	92	353	<50	<50	54,800	914	--	5,320	<50
	02/28/00	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	52,400	<1	--	4,060	<500
	06/28/00	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	54,300	<1	--	3,390	<500
	08/31/00	<500	<2	<250	<250	<250	<250	<250	<250	<250	<250	50,900	824	--	3,960	<250
	11/30/00	<500	<2	<250	<250	<250	<250	<250	<250	<250	<250	33,500	520	--	3,560	<250
	02/27/01	<500	<2	<250	<250	<250	<250	<250	386	<250	<250	26,700	<500	--	3,290	<250
	05/30/01	<200	<1,000	<100	<100	<100	<100	<100	374	<100	<100	20,400	214	--	2,820	<100
	09/25/01	<25	<25	<25	<25	28	<25	35	350	<25	<25	19,000	260	--	2,500	<25
	12/17/01	<100	<50	<50	<50	84.6	<50	<50	506	<50	<50	10,100	200	--	1,960	<50
	03/18/02	<50	<25	<25	<50	<25	<25	<25	206	<25	<25	7,250	71	--	1,020	<25
	05/31/02	<50	<25	<25	<50	<25	<25	<25	42.5	<25	<25	5,500	<25	--	311	<25
	08/29/02	<50	<25	<25	<50	<25	<25	50.5	93	<25	<25	4,940	44.5	--	634	<25
	11/07/02	<50	<25	<25	<50	<25	<25	<25	123	<25	<25	5,810	43	--	758	<25
	01/23/03	<20	<10	<10	<20	<10	<10	<10	59.8	<10	<10	2,010	14	--	282	<10
	05/28/03	<10	<5	<5	<5	6.3	<5	<5	<5	<5	<5	1,080	10.9	--	67.9	<5
	11/11/03	<20	<20	<20	<20	40.2	<20	<20	246	<20	<20	2,460	62	--	599	<20

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-7 (continued)	01/27/04	<20	<10	<10	<20	17	<10	<10	105	<10	<10	3,510	33	--	380	<10
	05/04/04	<20	<20	<20	<20	<20	<20	<20	72.4	<20	<20	3,940	22	--	323	<20
	11/16/04	<50	<50	<50	<50	<50	<50	<50	99	<50	<50	8,000	<50	--	520	<50
	03/24/05	<50	<25	<25	<50	<25	<25	<25	98.5	<25	<25	3,930	26	--	404	<25
	05/18/05	<10	<5	<5	<10	<5	<5	<5	72.7	<5	<5	1,310	12.4	--	180	<5
	05/18/05 DUP	<10	<5	<5	<10	<5	<5	<5	69.4	<5	<5	1,250	12.4	--	179	<5
	08/18/05	<20	<10	<10	<20	<10	<10	<10	54.8	<10	<10	1,800	<10	--	237	<10
	11/15/05	<20	<10	<10	<20	15.2	<10	<10	107	<10	<10	1,960	29.6	--	333	<10
	02/21/06	<20	<10	<10	<20	<10	<10	<10	<10	<10	<10	2,640	<10	--	139	<10
	06/05/06	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	26,100	<200	--	568	<200
	09/06/06	<100	<50	<50	<100	<50	<50	<50	56	<50	<50	12,800	<50	--	422	<50
	12/06/06	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	24,600	<100	--	408	<100
	02/07/07	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	31,500	<100	--	352	<100
	05/22/07	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	29,100	<200	--	450	<200
	09/12/07	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	21,300	<100	--	366	<100
	12/13/07	<500	<250	<250	<500	<250	<250	<250	345	<250	<250	18,700	<250	--	1,040	280
	03/06/08[7.]	<1	<0.500	<0.500	<1	5.06	2.57	3.99	42.3	2.9	<0.500	26,300	38.7	<0.500	430	<0.500
	06/10/08	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	27,000	<500	<500	575	<500
	09/18/08	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	23,200	<500	<500	530	<500
	12/11/08	<50	<50	<50	<50	<50	<50	<50	130	<50	<50	15,000	<50	<50	450	<50
	12/11/08 DUP	<50	<50	<50	<50	<50	<50	<50	120	<50	<50	14,000	<50	<50	430	<50
	03/23/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	420	<0.50	<0.50	3,330	<0.50	<0.50	270	<0.50
	06/18/09	<3	<3	<3	<3	3.7	<3	<3	520	<3	<3	890	5.2	<3	350	<3
	06/18/09 DUP	<2.5	<2.5	<2.5	<2.5	3.8	<2.5	<2.5	520	<2.5	<2.5	910	5.6	<2.5	360	<2.5
	09/18/09	<3	<3	<3	<3	9.8	<3	5.5	930	<3	<3	2,600	10	<3	250	<3
	09/18/09 DUP	<3	<3	<3	<3	8.7	<3	4.8	850	<3	<3	2,600	9.3	<3	240	<3
	12/18/09	<5	<5	<5	<5	6.7	<5	<5	330	<5	<5	1,600	6.7	<5	160	<5
	12/18/09 DUP	<5	<5	<5	<5	6.6	<5	<5	320	<5	<5	1,500	6.6	<5	160	<5
	03/16/10	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	180	<2.5	<2.5	510	<2.5	<2.5	52	<2.5
	03/16/10 DUP	<2	<2	<2	<2	<2	<2	<2	180	<2	<2	560	<2	<2	55	<2
	06/17/10	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	360	<1.5	<1.5	200	2.7	<1.5	72	<1.5
	06/17/10 DUP	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	360	<1.5	<1.5	200	2.8	<1.5	72	<1.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-7 (continued)	09/23/10	<3	<3	<3	<3	3.3	<3	<3	690	<3	<3	750	3.5	<3	110	4.8
	09/23/10 DUP	<3	<3	<3	<3	3.1	<3	<3	700	<3	<3	740	3.8	<3	100	4.1
	12/10/10	<0.9	<0.9	<0.9	<0.9	1.8	<0.9	<0.9	94	<0.9	<0.9	220	1.6	<0.9	36	1.7
	12/10/10 DUP	<0.9	<0.9	<0.9	<0.9	1.7	<0.9	<0.9	98	<0.9	<0.9	230	1.7	<0.9	36	1.8
	03/11/11	<0.90	<0.90	<0.90	<0.90	6.6	<0.90	1.6	150	0.91	<0.90	420	5.1	<0.90	82	9.3
	03/11/11 DUP	<0.90	<0.90	<0.90	<0.90	6.5	<0.90	1.9	150	1.1	<0.90	400	5.2	<0.90	80	9.7
	06/07/11	<2.5	<2.5	<2.5	<2.5	4.8	<2.5	3.4	1,400	3.3	<2.5	430	4	<2.5	110	7.9
	06/07/11 DUP	<6	<6	<6	<6	<6	<6	<6	1,400	<6	<6	400	<6	<6	110	7.8
	09/19/11	<5	<5	<5	<5	<5	<5	<5	1,300	<5	<5	410	<5	<5	84	78
	09/19/11 DUP	<7	<7	<7	<7	<7	<7	<7	1,300	<7	<7	420	<7	<7	87	81
	12/07/11	<5	<5	<5	<5	8	<5	6.9	3,400	6.8	<5	200	<5	<5	32	110
	12/07/11 DUP	<6	<6	<6	<6	7.6	<6	7.8	3,400	6.8	<6	210	<6	<6	32	110
	03/12/12	<5	<5	<5	<5	9.2	<5	<5	1,600	<5	<5	41	<5	<5	8.6	600
	03/12/12 DUP	<7	<7	<7	<7	9.5	<7	<7	1,600	<7	<7	42	<7	<7	8.9	660
	06/22/2012	<2	9.2	<2	<2	9.8	<2	<2	540	<2	<2	24	<2	<2	5.1	300
	06/22/12 DUP	<2	8.1	<2	<2	9	<2	<2	500	<2	<2	25	<2	<2	5.2	290
	09/14/12	<0.50	6.3	<0.50	<0.50	3.8	<0.50	0.54	180	0.7	<0.50	28	<0.50	0.52	5.2	80
	09/14/12 DUP	<0.50	5.7	<0.50	<0.50	3.8	<0.50	<0.50	180	0.78	<0.50	28	<0.50	<0.50	5.3	79
	12/14/12	<0.50	6.3	<0.50	<0.50	1.9	<0.50	<0.50	130	<0.50	<0.50	8.2	<0.50	<0.50	5.3	16
	12/14/12 DUP	<0.50	5.6	<0.50	<0.50	1.8	<0.50	<0.50	130	<0.50	<0.50	11	<0.50	<0.50	6.8	18
	03/15/13	<0.50	5.2	<0.50	<0.50	0.68	<0.50	<0.50	110	<0.50	<0.50	1.5	<0.50	<0.50	0.75	11
	03/15/13 DUP	<0.50	5.4	<0.50	<0.50	0.69	<0.50	<0.50	110	<0.50	<0.50	1.6	<0.50	<0.50	0.78	11
	06/14/13	<0.50	2	<0.50	<0.50	<0.50	<0.50	<0.50	57	<0.50	<0.50	1.6	<0.50	<0.50	<0.50	15
	06/14/13 DUP	<0.50	2	<0.50	<0.50	0.51	<0.50	<0.50	58	<0.50	<0.50	1.5	<0.50	<0.50	<0.50	16
	09/20/13	<0.50	3	<0.50	<0.50	1.5	<0.50	<0.50	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10
	09/20/13 DUP	<0.50	3	<0.50	<0.50	1.5	<0.50	<0.50	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10
	12/16/13	<0.50	2.4	<0.50	<0.50	2.9	<0.50	<0.50	6.9	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	9.1
	12/16/13 DUP	<0.50	2.4	<0.50	<0.50	2.4	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.9
	3/24/2014	<0.50	0.97	<0.50	<0.50	1.6	<0.50	<0.50	13	<0.50	<0.50	9.8	<0.50	<0.50	2.6	7.6
	3/24/2014 DUP	<0.50	1	<0.50	<0.50	1.6	<0.50	<0.50	13	<0.50	<0.50	9.4	<0.50	<0.50	2.5	7.7

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-7 (continued)	6/25/2014	<0.50	1.3	<0.50	<0.50	0.17	<0.50	<0.50	0.59	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3
	6/25/14 DUP	<0.50	0.15	<0.50	<0.50	0.19	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4
	9/30/2014	<0.50	1.9	<0.50	<0.50	2.7	<0.50	<0.50	4.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.8
	9/30/2014 DUP	<0.50	1.7	<0.50	<0.50	2.6	<0.50	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.8
	12/15/2014	<0.50	1.2	<0.50	<0.50	3.4	<0.50	<0.50	12	<0.50	<0.50	<0.50	<0.50	<0.50	1	15
	12/15/2014 DUP	<0.50	1.6	<0.50	<0.50	4.5	<0.50	<0.50	16	<0.50	<0.50	0.61	<0.50	<0.50	1.5	21
	3/20/2015	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	8.4	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	1
	3/20/15 DUP	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	7.7	<0.50	<0.50	0.53	<0.50	<0.50	1	10.4
	6/17/2015	<0.50	0.72	<0.50	<0.50	2.6	<0.50	<0.50	12	<0.50	<0.50	1.2	<0.50	<0.50	1	12.6
	6/17/2015 DUP	<0.50	0.71	<0.50	<0.50	2.6	<0.50	<0.50	12.2	<0.50	<0.50	0.96	<0.50	<0.50	1	12.3
	9/24/2015	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	12.4	<0.50	<0.50	4.5	<0.50	<0.50	4.2	4.6
	9/24/2015 DUP	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	12.7	<0.50	<0.50	4.5	<0.50	<0.50	4.2	4.8
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	9.4	<0.50	<0.50	1.7	1.9
	6/17/2016	<0.50	<2	<0.50	<0.50	0.6	<0.50	<0.50	10.9	<0.50	<0.50	0.69	<0.50	<0.50	2.1	5.4
	6/17/16 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	0.62	<0.50	<0.50	2	5.4
	9/29/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	10.9	<0.50	<0.50	<0.50	<0.50	<0.50	5.5	5.5
	9/29/2016 DUP	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	10.9	<0.50	<0.50	<0.50	<0.50	<0.50	6	5.5
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.2	<0.50	<0.50	0.65	<0.50	<0.50	<0.50	0.98
	12/14/2016 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.4	<0.50	<0.50	0.78	<0.50	<0.50	<0.50	1
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	0.73	<0.5
	3/28/2017 DUP	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	0.69	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	0.55	2.5
	6/14/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.7	<0.50	<0.50	2.60	<0.50	<0.50	1.60	1.6
	9/27/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.7	<0.50	<0.50	2.60	<0.50	<0.50	1.60	1.7
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	<0.50	6.30	<0.50	<0.50	7.80	1.4
	11/7/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	3.80	<0.50	<0.50	6.40	1.5
	3/21/2018	<0.500	<2.50	<0.500	<0.500	0.495 J	<0.500	<0.500	17.6	<0.500	<0.500	0.228 J	<0.500	<0.500	2.86	4.9
	3/21/2018 DUP	<0.500	<2.50	<0.500	<0.500	0.55	<0.500	<0.500	17.2	<0.500	<0.500	0.284 J	<0.500	<0.500	2.99	4.9
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.461 J	<0.500	<0.500	5.5	<0.500	<0.500	9.89	<0.500	<0.500	3.53	1.5
	6/29/2018 DUP	<0.500	<2.50	<0.500	<0.500	0.437 J	<0.500	<0.500	5.4	<0.500	<0.500	8.94	<0.500	<0.500	3.48	1.6

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-7 (continued)	9/27/2018	<1.00	<5.00	<1.00	<1.00	1.23	<0.400	<0.400	8.48	<0.400	<0.500	6.50	<0.400	<0.500	10.8	2.08
	12/7/2018	<1.00	<5.00	<1.00	<1.00	3.97	<0.400	0.43	15.4	<0.400	<0.500	30.40	<0.400	<0.500	18.10	1.6
	12/7/2018 DUP	<1.00	<5.00	<1.00	<1.00	3.84	<0.400	0.47	17.7	<0.400	<0.500	26.60	<0.400	<0.500	16.40	1.1
	3/20/2019	<1.00	<5.00	<1.00	<1.00	1.87	<0.400	<0.400	22.2	<0.400	<0.500	22.3	<0.400	<0.500	10.8	0.605
	3/20/19 DUP	<1.00	<5.00	<1.00	<1.00	1.84	<0.400	<0.400	22.8	<0.400	<0.500	22.8	<0.400	<0.500	10.7	0.553
	6/5/2019	<1.00	<5.00	<1.00	<1.00	2.91	<0.400	0.559	20.2	<0.400	<0.500	28.1	<0.400	<0.500	12.7	1.11
	6/5/2019 DUP	<1.00	<5.00	<1.00	<1.00	2.87	<0.400	0.494	20.2	<0.400	<0.500	28.4	<0.400	<0.500	12.7	1.15
	9/26/2019	<1.00	<5.00	<1.00	<1.00	2.98	<0.400	0.65	20.1	<0.400	<0.500	41.7	<0.400	<0.500	17.9	0.42
	9/26/2019 DUP	<1.00	<5.00	<1.00	<1.00	2.95	<0.400	0.672	21	<0.400	<0.500	39.6	<0.400	<0.500	17.8	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	4.61	<0.400	0.837	29.4	<0.400	<0.500	65.8	<0.400	<0.500	31	<0.400
	12/3/19 DUP	<1.00	<5.00	<1.00	<1.00	4.58	<0.400	0.839	29.7	<0.400	<0.500	66.1	<0.400	<0.500	31.8	<0.400
MW-8	12/02/96	<0.50	<0.50	<0.50	<0.20	1	<0.50	0.2	6.5	<1	<0.20	2.3	<1	--	12	<0.50
	11/13/97	<1	<2	<1	<1	1.72	<1	2.44	9.32	<1	<1	52.4	4	--	38.6	<2
	08/11/99	<1	<5	<0.50	<0.50	0.75	<0.50	<0.50	1.82	<0.50	<0.50	46.2	4.79	--	24.3	<0.50
	11/16/99	<1	<2.5	<0.50	<1	1.22	<0.50	<0.50	2.11	<0.50	<0.50	39.8	1.55	--	15.5	<0.50
	02/28/00	<1	<5	<0.50	<0.50	0.929	<0.50	0.721	2.38	<0.50	<0.50	41.8	3.7	--	20.5	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.46	<0.50	<0.50	33.7	2.88	--	17.5	<0.50
	05/30/01	<100	<5	<0.50	<0.50	0.611	<0.50	<0.50	0.601	<0.50	<0.50	11.8	<1	--	5.46	<0.50
	05/30/02	<1	<0.50	<0.50	<1	1.09	<0.50	<0.50	2.02	<0.50	<0.50	12.1	<0.50	--	4.47	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.84	<0.50	<0.50	40.4	1.55	--	11.2	<0.50
	11/02/04	<1	<0.50	<0.50	<1	1.02	<0.50	<0.50	1.99	<0.50	<0.50	8.88	<0.50	--	2.4	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	1.6	<0.50	<0.50	0.6	<0.50	--	3.1	<0.50
	03/23/05	<1	<0.50	<0.50	<1	0.78	<0.50	<0.50	1.82	<0.50	<0.50	13.5	0.53	--	2.41	<0.50
	05/17/05	<1	<0.50	<0.50	<1	1.1	<0.50	<0.50	6.45	<0.50	<0.50	13.2	<0.50	--	6.92	<0.50
	05/17/05 DUP	<1	<0.50	<0.50	<1	1.19	<0.50	<0.50	6.97	<0.50	<0.50	11.4	<0.50	--	6.39	<0.50
	11/16/05	<1	<0.500	<0.500	<1	0.78	<0.500	<0.500	4.19	<0.500	<0.500	14.8	0.65	--	2.99	<0.500
	06/05/06	<1	<1	<1	<1	1.26	<1	<1	19.8	<1	<1	20.7	<1	--	11.4	<1
	12/06/06	<1	<0.50	<0.50	<1	1.11	<0.50	<0.50	14.2	<0.50	<0.50	18.3	<0.50	--	5.08	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	22.8	<1	--	2.32	<1
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	12.4	0.6	--	0.65	<0.50
	12/12/07	<1	<0.50	<0.50	<1	1.03	<0.50	<0.50	13.7	<0.50	<0.50	8.27	<0.50	--	2.71	<0.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.64	<0.500	<0.500	19.1 J	<0.500	<0.500	1.4	<0.500
	6/10/08[7.]	<1	<1	<1	<1	1.07	<1	<1	10.5	<1	<1	10.8	<1	<1	3.87	<1
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.58	<0.500	<0.500	13.2	0.5	<0.500	1.21	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	9.1	<0.50	<0.50	0.57	<0.50
	12/09/08 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	9.7	<0.50	<0.50	0.59	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-8 (continued)	03/26/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	8	<0.50	<0.50	0.56	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	12	<0.50	<0.50	4.8	<0.50	<0.50	1.4	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	8.4	<0.50	<0.50	0.51	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	20	0.52	<0.50	4.2	<0.50	<0.50	1.1	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	8.1	<0.5	<0.5	<0.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	20	1.1	<0.5	2.5	<0.5	<0.5	0.6	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	<0.50	20	0.58	<0.50	7.9	<0.50	<0.50	0.95	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	40	0.82	<0.5	4	<0.5	<0.5	1.1	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	10	<0.50	<0.50	0.54	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	10	<0.50	<0.50	<0.50	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.5	<0.50	<0.50	6.8	<0.50	<0.50	0.56	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	0.89	<0.5	<0.5	22	<0.5	<0.5	6.1	<0.5	<0.5	1.4	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	7	<0.50	<0.50	<0.50	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	36	1	<0.50	4.8	<0.50	<0.50	1	<0.80
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	7.2	<0.50	<0.50	<0.50	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	0.84	<0.50	<0.50	18	0.64	<0.50	6.2	<0.50	<0.50	0.76	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	<0.50	4.8	<0.50	<0.50	<0.50	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.5	0.54	<0.50	4	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	21	1.1	<0.50	2.3	<0.50	<0.50	0.85	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	5.6	<0.50	<0.50	<0.50	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	6.1	<0.50	<0.50	<0.50	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	13	0.86	<0.50	2.3	<0.50	<0.50	0.62	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	7.6	<0.50	<0.50	<0.50	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	<0.50	<0.50
	9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-8 (continued)	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	6.4	<0.50	<0.50	<0.50	<0.50
	6/15/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	35.7	0.96	<0.5	2.3	<0.5	<0.5	0.57	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	14.3	<0.50	<0.50	4.3	<0.50	<0.50	0.56	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	4.4	<0.50	<0.50	<0.50	<0.50
	3/19/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.6	<0.500	<0.500	4.2	<0.500	<0.500	<0.500	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.139 J	<0.500	<0.500	2.6	<0.500	<0.500	5.4	<0.500	<0.500	0.368 J	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.76	<0.400	<0.500	<0.400	<0.400
	12/7/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.0	<0.400	<0.500	<0.400	<0.400
	3/22/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.83	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	0.430	<0.400	<0.400	6.57	<0.400	<0.500	2.05	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	4.2	<0.400	<0.500	<0.400	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	4.06	<0.400	<0.500	<0.400	<0.400
MW-9	12/02/96	<50	<50	<50	<20	<30	<50	<20	<20	<100	<20	5,000	200	--	1,600	<50
	11/13/97	<50	<100	<50	<50	<50	<50	<50	487	<50	<50	2,890	<50	--	1,840	<100
	08/11/99	<20	<100	<10	<10	<10	<10	<10	54	<10	<10	1,490	43.2	--	517	<10
	11/16/99	<20	<50	<10	<20	<10	<10	<10	103	<10	<10	1,730	32	--	305	<10
	02/28/00	<20	<100	<10	<10	<10	<10	<10	<10	<10	<10	2,040	36.4	--	315	<10
	06/27/00	<50	<250	<25	<25	<25	<25	<25	<25	<25	<25	1,300	<50	--	298	<25
	08/31/00	<10	<50	<5	<5	<5	<5	<5	<5	<5	<5	1,560	31.3	--	229	<5
	11/30/00	<10	<50	<5	<5	21.7	<5	10.5	1,330	11.7	<5	823	26.6	--	528	8.15
	09/25/01	<2.5	<2.5	<2.5	<2.5	3.8	<2.5	<2.5	9.1	<2.5	<2.5	680	16	--	140	<2.5
	12/17/01	<5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	306	<5	--	74.2	<2.5
	03/18/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	113	<0.50	--	19.1	<0.50
	05/31/02	<2	<1	<1	<2	<1	<1	<1	1.22	<1	<1	296	1.44	--	44	<1
	08/29/02	<2	<1	<1	<2	<1	<1	<1	1.88	<1	<1	294	2.12	--	67.4	<1
	11/07/02	<5	<2.5	<2.5	<5	<2.5	<2.5	<2.5	17.2	<2.5	<2.5	453	4	--	145	<2.5
	01/23/03	<2	<1	<1	<2	<1	<1	<1	1.66	<1	<1	205	2.74	--	59.5	<1
	05/28/03	<1	<0.50	<0.50	<1	1.81	<0.50	<0.50	0.97	<0.50	<0.50	141	2.85	--	27.4	<0.50
	11/11/03	<5	<5	<5	<5	<5	<5	<5	23.7	<5	<5	401	6.25	--	91.4	<5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
Mw-9 (continued)	01/27/04	<2	<1	<1	<2	<1	<1	<1	2.58	<1	<1	179	2.54	--	58.1	<1
	05/04/04	<1	<1	<1	<1	<1	<1	<1	1.09	<1	<1	178	2.56	--	51.9	<1
	11/15/04	<25	<25	<25	<25	28	<25	<25	1,200	27	<25	1,800	<25	--	1,000	<25
	03/24/05	<5	<2.5	<2.5	<5	3.3	<2.5	<2.5	54.2	<2.5	<2.5	675	8	--	239	<2.5
	05/18/05	<2	<1	<1	<2	<1	<1	<1	2.68	<1	<1	2.41	2.08	--	62.4	<1
	08/18/05	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	20.5 B	<2.50	<2.50	551	7.6	--	209	<2.50
	11/15/05	<10	<5	<5	<10	27.1	<5	6.8	1,020	18.6	<5	1,040	14.1	--	633	21.2
	02/21/06	<10	<5	<5	<10	<5	<5	<5	16.7	<5	<5	534	<5	--	165	<5
	06/05/06	<1	<1	<1	<1	<1	<1	<1	1.47	<1	<1	151	2.6	--	57.3	<1
	09/05/06	<5	<2.50	<2.50	<5	5.5	<2.50	<2.50	117	3.15	<2.50	698	6.8	--	314	<2.50
	12/06/06	<5	<2.50	<2.50	<5	2.95	<2.50	<2.50	59	<2.50	<2.50	578	5.55	--	237	<2.50
	02/07/07	<5	<2.50	<2.50	<5	3.15	<2.50	<2.50	72.6	<2.50	<2.50	591	6.1	--	239	2.65
	05/23/07	<2	<2	<2	<2	<2	<2	<2	6.32	<2	<2	210	3	--	90.4	<2
	09/12/07	<2	<1	<1	<2	2.34	<1	<1	47.1	1.44	<1	282	5.12	--	184	<1
	12/13/07	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	253	4.45	--	78.4	<2.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.92	<0.500	<0.500	138	3.77	<0.500	61.5	<0.500
	06/10/08	<1	<1	<1	<1	<1	<1	<1	2.73	<1	<1	297	5.16	<1	87.7	<1
	09/18/08	<5	<2.50	<2.50	<5	7.05	<2.50	<2.50	172	3.8	<0.5000	524	5.35	<0.500	315	4.15
	12/09/08	<0.90	<0.90	<0.90	<0.90	3.8	<0.90	1.3	130	2.5	<0.90	270	5.1	<0.90	140	2.3
	03/26/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	<0.50	170	4	<0.50	56	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	1.1	72	2.8	<0.50	420	4.9	<0.50	180	1.8
	09/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	170	4.4	<0.50	60	<0.50
	12/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	120	2.5	<0.50	43	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	160	3	<0.50	48	<0.50
	06/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	100	1.4	<0.50	36	<0.50
	09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	140	2.9	<0.5	50	<0.5
	12/10/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100	1.3	<0.5	330	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	17	0.82	<0.50	190	2.7	<0.50	81	0.52
	03/11/11 DUP	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	17	0.85	<0.50	200	2.8	<0.50	84	0.51

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-9 (continued)	06/10/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	53	1.9	<0.5	31	<0.5
	09/19/11	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	72	2.3	<0.50	230	3.1	<0.50	120	0.78
	12/09/11	<0.90	<0.90	<0.90	<0.90	53	<0.90	11	1,800	40	<0.90	600	10	<0.90	590	26
	03/12/12	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	20	0.57	<0.50	140	2	<0.50	56	<0.50
	06/22/12	<0.5	<0.5	<0.5	<0.5	3.3	<0.5	1.1	140	4.3	<0.5	220	3.3	<0.5	180	2.3
	09/14/12	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	17	<0.90	<0.90	210	2.4	<0.90	78	<0.90
	12/13/12	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	29	0.96	<0.50	110	1.1	<0.50	49	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5	<0.50	<0.50	86	1.8	<0.50	34	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	1	100	3.7	<0.50	240	3.1	<0.50	150	2.2
	09/20/13	<0.50	<0.50	<0.50	<0.50	2	<0.50	0.51	74	2.2	<0.50	160	2	<0.50	87	0.82
	12/16/13	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	1.4	230	6.4	<0.50	210	3.5	<0.50	180	2.8
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	39	0.57	<0.50	19	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.68	41	1.6	<0.50	190	2.3	<0.50	91	1.1
	9/30/2014	<0.90	<0.90	<0.90	<0.90	2.3	<0.90	<0.90	77	2.3	<0.90	230	2.9	<0.90	110	1.3
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	35	0.64	<0.50	18	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	18.9	0.6	<0.50	155	2	<0.50	59.5	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	0.54	12.5	0.78	<0.50	160	1.9	<0.50	61.8	1.6
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	74.3	2.2	<0.50	31.6	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	0.85	145	4.2	<0.50	199	2.4	<0.50	113	2
	12/8/2015 DUP	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	0.93	153	4.4	<0.50	198	2.5	<0.50	118	2.1
	3/8/2016	<1	<4	<1	<1	4.1	<1	<1	117	3.8	<1	164	2.3	<1	94.6	3.4
	6/17/2016	<0.50	<2	<0.50	<0.50	1.8	<0.50	0.58	60.7	2.4	<0.50	116	1.7	<0.50	68.3	0.89
	9/29/2016	<0.50	<2	<0.50	<0.50	1.2	<0.50	<0.50	39.3	1.8	<0.50	192	2.5	<0.50	91.9	0.76
	12/14/2016	<0.50	<2	<0.50	<0.50	1.3	<0.50	<0.50	59.7	1.6	<0.50	75.8	1.1	<0.50	44.9	0.52
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.77	<0.5	<0.5	27.9	0.89	<0.5	12.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	17.5	0.60	<0.50	104	1.3	<0.50	47.2	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	2.80	<1.0	<0.50	83.1	2.50	<0.50	102	2.4	<0.50	66.7	0.99
	11/7/2017	<2.0	<2.0	<0.50	<0.50	20.30	<0.50	3.30	569.0	15.20	<0.50	205	4.5	<0.50	167.0	7.80
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.2	<0.500	<0.500	39	1.1	<0.500	14.9	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	6.86	<0.500	1.63	169.0	8.28	<0.500	332	3.5	<0.500	182.0	2.42 J
	9/27/2018	<1.00	<5.00	<1.00	<1.00	5.69	<0.400	1.59	219	7.54	<0.500	243	3.96	<0.500	168	3.90
	12/7/2018	<1.00	<5.00	<1.00	<1.00	0.75	<0.400	<0.400	20.0	0.80	<0.500	178	3.4	<0.500	66.5	0.55

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-9 (continued)	3/20/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2.47	<0.400	<0.500	58.9	1.47	<0.500	20.0	<0.400
	6/7/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.99	<0.400	<0.500	108	1.34	<0.500	49.4	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.34	<0.400	<0.500	81.3	2.34	<0.501	25.4	<0.401
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2.34	<0.400	<0.500	67.5	1.46	<0.502	24.3	<0.402
MW-10	12/02/96	<0.50	<0.50	<0.50	<0.20	<0.30	<0.50	<0.20	<0.20	<1	<0.20	2.7	<1	--	0.4	<0.50
	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.53	<0.50	--	3.65	<1
	08/11/99	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.02	<1	--	1.24	<0.50
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	69.6	1.89	--	10.3	<0.50
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.63	<1	--	1.16	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.72	<1	--	3.74	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.25	<1	--	2.52	<0.50
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.05	<0.50	--	1.43	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	2.21	<0.50	--	1.28	<0.50
	11/02/04	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	--	0.98	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	--	3.4	<0.50
	03/23/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.02	<0.50	--	1.21	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.26	<0.50	--	1.19	<0.50
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59 J	<0.50	--	0.83	<0.50
	03/05/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.66	<0.500	<0.500	1.67	<0.500
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.13	<0.500	<0.500	1.4	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	1.6	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	2	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	1.6	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	1.4	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	0.8	<0.50
	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	2.1	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	2	<0.50
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	<0.50	1.4	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	<0.50	3.1	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	1.4	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	8.8	<0.50	<0.50	16	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	2	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	1.8	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.6	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-10 (continued)	3/7/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	1.4	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	1.5	<0.5
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	2.4	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	1.1	<0.50
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.161 J	<0.500	<0.500	0.8	<0.500	<0.500	5.7	0.145 J	<0.500	5.8	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.74	<0.400	<0.500	1.45	<0.400
	9/25/2018 DUP	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.76	<0.400	<0.500	1.54	<0.400
	3/21/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.24	<0.400	<0.500	2.00	<0.400
	6/6/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	7.51	<0.400	<0.500	4.19	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	2.03	<0.400	<0.500	1.35	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.65	<0.400	<0.500	1.15	<0.400
MW-11	12/02/96	<50	<50	<50	<20	<30	<50	52	140	<100	<20	2,200	550	--	5,900	<50
	11/13/97	<50	<100	<50	<50	<50	<50	<50	<50	<50	<50	686	90.3	--	2,720	<100
	08/10/99	<5	<25	<2.5	<2.5	13.7	<2.5	22.8	14.4	<2.5	<2.5	259	112	--	1,300	<2.5
	11/16/99	<20	<50	<10	<20	12	<10	16.8	18.8	<10	<10	478	94.8	--	1,500	<10
	02/28/00	<5	<25	<2.5	<2.5	2.71	<2.5	7.9	5.05	<2.5	<2.5	247	30.2	--	473	<2.5
	06/27/00	<10	<50	<5	<5	12.1	<5	28.9	14.8	<5	<5	337	108	--	1,390	<5
	08/31/00	<20	<100	<10	<10	15.4	<10	28	24.8	<10	<10	646	159	--	1,690	<10
	11/30/00	<20	<100	<10	<10	12.2	<10	26.4	19.3	<10	<10	342	125	--	1,550	<10
	02/27/01	<5	<25	<2.5	<2.5	3.65	<2.5	7.82	7.1	<2.5	<2.5	198	35.1	--	468	<2.5
	05/30/01	<10	<50	<5	<5	5.2	<5	13.6	9.09	<5	<5	256	48.8	--	858	<5
	09/25/01	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	260	57	--	820	<13
	12/17/01	<10	<50	<5	<5	<5	<5	15.4	25.9	<5	<5	983	40.9	--	1,390	<5
	03/18/02	<10	<5	<5	<10	11.9	<5	19.4	17.1	<5	<5	433	79.8	--	1,370	<5
	05/30/02	<10	<5	<5	<10	5.9	<5	10.9	15.6	<5	<5	571	45.6	--	965	<5
	11/07/02	<10	<5	<5	<10	15	<5	19.3	18.9	<5	<5	347	112	--	1,640	<5
	01/23/03	<5	<2.5	<2.5	<5	3.35	<2.5	4.3	5.35	<2.5	<2.5	265	24.1	--	534	<2.5
	05/28/03	<10	<5	<5	<10	13.3	<5	17.9	17.6	<5	<5	305	105	--	1,580	<5
	11/11/03	<5	<5	<5	<5	5	<5	5.15	9.15	<5	<5	191	38.8	--	504	<5
	01/26/04	<10	<5	<5	<10	9.6	<5	11.5	13.5	<5	<5	369	73.3	--	1,070	<5
	03/22/04	Well Abandoned														

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-12	12/02/96	<50	<50	<50	<20	<30	<50	<20	29	<100	<20	2,500	<100	--	950	<50
	11/12/97	<250	<500	<250	<250	<250	<250	<250	2,710	<250	<250	12,900	645	--	5,400	<500
	08/11/99	<200	<1	<100	<100	120	<100	<100	2,680	<100	<100	11,300	758	--	3,520	<100
	11/16/99	<200	<500	<100	<200	<100	<100	<100	160	<100	<100	18,200	922	--	4,630	<100
	02/28/00	<200	<1	<100	<100	<100	<100	<100	908	<100	<100	3,780	<200	--	1,210	<100
	06/27/00	<100	<500	<50	<50	161	<50	<50	2,880	<50	<50	12,000	712	--	3,180	<50
	05/30/01	<50	<250	<25	<25	64.8	<25	54	1,650	<25	<25	4,990	298	--	1,810	<25
	05/30/02	<5	<2.5	<2.5	<5	4.25	<2.5	<2.5	101	<2.5	<2.5	344	6.6	--	81.6	<2.5
	05/29/03	<5	<2.5	<2.5	<5	28.4	<2.5	8	601	5.7	<2.5	362	18.2	--	199	<2.5
	11/16/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	59	<2.5	<2.5	410	3.5	--	96	<2.5
	03/23/05	<20	<10	<10	<20	247	<10	53	3,640	40.2	<10	1,080	49.8	--	639	14.2
	05/18/05	<1	<0.50	<0.50	<1	0.96	<0.50	0.98	30.1	0.57	<0.50	51.1	0.92	--	21.4	<0.50
	05/22/07	<5	<5	<5	<5	35.6	<5	7.45	785	11.1	<5	233	7.8	--	139	<5
	09/11/07	<100	<50	<50	<100	316	<50	57	6,700	53	<50	431	<50	--	516	<50
	12/12/07	<2	<1	<1	<2	1.1	<1	<1	43.8	<1	<1	106	3.16	--	39.6	<1
	03/05/08	<1	4.97	<0.500	<1	156	2.01	46.2	3,170	41.8	<0.500	440	21.2	<0.500	329	18.5
	09/19/08	<50	<25	<25	<50	394	<25	66	7,650	69	<25	968	45	<25	924	58
	12/10/08	<4	<4	<4	<4	33	<4	6.6	670	8.7	<4	99	5	<4	80	<4
	03/27/09	<4	4.8	<4	<4	230	<4	39	4,800	46	<4	540	28	<4	440	31
	03/27/09 DUP	<4	5	<4	<4	250	<4	44	4,700	51	<4	600	32	<4	490	35
	06/18/09	<15	<15	<15	<15	170	<15	32	3,500	36	<15	270	<15	<15	230	26
	06/18/09 DUP	<15	<15	<15	<15	170	<15	32	3,600	37	<15	310	<15	<15	250	25
	09/18/09	<15	<15	<15	<15	240	<15	46	4,200	50	<15	540	26	<15	440	51
	09/18/09 DUP	<15	<15	<15	<15	260	<15	49	4,600	52	<15	590	28	<15	470	56
	12/18/09	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	100	1.1	1.3	170	2.2	<0.50	65	<0.50
	12/18/09 DUP	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	96	1.1	1.3	160	2.1	<0.50	62	<0.50
	03/19/10	<0.50	4.1	<0.50	<0.50	220	2.6	48	4,400	53	<0.50	480	28	0.7	380	37
	03/19/10 DUP	<15	<15	<15	<15	270	<15	44	4,900	54	<15	600	29	<15	460	39
	06/16/10	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	19	<0.50	<0.50	38	<0.50	<0.50	17	<0.50
	06/16/10 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	0.54	<0.50	37	<0.50	<0.50	16	<0.50
	09/23/10	<15	<15	<15	<15	260	<15	47	4,800	56	<15	780	38	<15	560	68
	9/23/10 DUP	<15	<15	<15	<15	260	<15	49	4,800	57	<15	800	41	<15	580	65

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-12 (continued)	12/09/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	5.1	<0.5	<0.5	2.1	<0.5
	12/09/10 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	<0.5	5.8	<0.5	<0.5	2	<0.5
	03/10/11	<0.50	0.67	<0.50	<0.50	94	0.96	17	1,900	19	0.55	340	12	<0.50	220	11
	03/10/11 DUP	<0.50	0.87	<0.50	<0.50	93	1	17	1,600	19	0.55	260	13	<0.50	180	11
	06/07/11	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	59	1	<0.5	53	0.7	<0.5	25	<0.5
	06/07/11 DUP	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	60	1	<0.5	58	0.69	<0.5	27	<0.5
	09/19/11	<0.50	3	<0.50	<0.50	240	2.5	45	4,700	55	<0.50	860	65	0.94	690	63
	09/19/11 DUP	<20	<20	<20	<20	240	<20	53	4,700	60	<20	860	60	<20	680	68
	12/07/11	<0.50	<0.50	<0.50	<0.50	130	1.3	28	2,900	33	<0.50	520	34	0.54	380	40
	12/07/11 DUP	<0.50	<15	<0.50	<0.50	140	1.3	29	2,900	33	<0.50	580	34	0.55	400	41
	03/12/12	<15	<15	<15	<15	210	<15	44	3,800	45	<15	770	48	<15	540	46
	03/12/12 DUP	<20	<20	<20	<20	220	<20	44	4,000	47	<20	740	50	<20	540	45
	06/22/2012	<5	<5	<5	<5	100	<5	16	1,700	39	<5	270	13	<5	200	22
	06/22/12 DUP	<5	<5	<5	<5	100	<5	16	1,700	39	<5	270	13	<5	190	22
	09/14/12	<5	<5	<5	<5	220	<5	45	4,700	56	<5	890	61	<5	590	58
	09/14/12 DUP	<15	<15	<15	<15	270	<15	58	5,400	73	<15	1,100	76	<15	730	84
	12/13/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	0.97	<0.50	38	0.52	<0.50	22	<0.50
	12/13/12 DUP	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	0.92	<0.50	38	0.53	<0.50	23	<0.50
	03/15/13	<0.50	1	<0.50	<0.50	200	1.7	40	4,300	55	<0.50	760	53	0.71	540	53
	03/15/13 DUP	<0.50	1	<0.50	<0.50	200	1.8	40	4,200	56	<0.50	750	52	0.66	520	54
	06/13/13	<15	<15	<15	<15	230	<15	38	4,700	53	<15	590	44	<15	480	55
	06/13/13 DUP	<15	<15	<15	<15	240	<15	39	4,800	53	<15	610	46	<15	500	59
	09/20/13	<0.50	<0.50	<0.50	<0.50	170	1.6	37	3,400	49	<0.50	510	37	0.66	400	50
	09/20/13 DUP	<0.50	<0.50	<0.50	<0.50	180	1.7	36	3,400	48	<0.50	520	37	0.63	400	49
	12/16/13	<2.5	<2.5	<2.5	<2.5	36	<2.5	7.5	800	10	<2.5	150	5.7	<2.5	110	9.6
	12/16/13 DUP	<2.5	<2.5	<2.5	<2.5	35	<2.5	7.6	770	9.6	<2.5	140	5.8	<2.5	110	9.8
	3/24/2014	<0.50	<0.50	<0.50	<0.50	110	0.77	18	1,900	25	<0.50	180	8.6	<0.50	170	47
	3/24/2014 DUP	<7	<7	<7	<7	97	<7	16	1,900	22	<7	170	7.5	<7	140	35
	6/24/2014	<1.5	<1.5	<1.5	<1.5	14	<1.5	1.7	300	2.1	<1.5	42	<1.5	<1.5	32	<1.5
	6/24/2014 DUP	<1.5	<1.5	<1.5	<1.5	14	<1.5	1.9	310	2.3	<1.5	42	1.6	<1.5	34	<1.5
	9/30/2014	<15	<15	<15	<15	190	<15	39	3,500	45	<15	670	36	<15	480	42
	9/30/2014 DUP	<15	<15	<15	<15	180	<15	39	3,500	45	<15	680	35	<15	460	42

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-12 (continued)	12/11/2014	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	34	0.64	<0.50	25	<0.50	<0.50	15	<0.50
	12/11/2014 DUP	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	32	0.6	<0.50	24	<0.50	<0.50	14	<0.50
	3/20/2015	<5	<5	<5	<5	102	<5	25.4	2,110	29.4	<5	584	17.8	<5	344	36.8
	3/20/15 DUP	<12.5	<12.5	<12.5	<12.5	143	<12.5	25.8	2,490	28.8	<12.5	495	21.7	<12.5	340	29
	6/19/2015	<10	<10	<10	<10	151	<10	28.2	2,570	25	<10	514	23.6	<10	356	31.1
	6/19/2015 DUP	<10	<10	<10	<10	157	<10	31	2,680	30	<10	516	23.4	<10	362	33.2
	9/22/2015	<8.3	<8.3	<8.3	<8.3	120	<8.3	16.9	2,250	23.4	<8.3	343	15.7	<8.3	239	22.5
	9/22/2015 DUP	<8.3	<8.3	<8.3	<8.3	134	<8.3	21.4	2,490	25.7	<8.3	425	20.1	<8.3	282	26.5
	12/8/2015	<5	<5	<5	<5	8	<5	<5	40	0.7	<5	45	0.5	<5	22	<5
	3/8/2016	<3.6	<14.3	<3.6	<3.6	79.9	<3.6	15.4	1,380	16.2	<3.6	325	7.7	<3.6	209	21.3
	3/8/16 DUP	<3.6	<14.3	<3.6	<3.6	82	<3.6	16.6	1,390	15.6	<3.6	336	7.7	<3.6	210	21.2
	6/16/2016	<8.4	<33.4	<8.4	<8.4	174	<8.4	29.9	3,310	31.6	<8.4	314	12.8	<8.4	288	52.3
	6/16/16 DUP	<8.4	<33.4	<8.4	<8.4	192	<8.4	31.9	3,420	37.4	<8.4	367	15.4	<8.4	311	67
	9/27/2016	<10	<40	<10	<10	26	<10	<10	525	<10	<10	67.6	<10	<10	45.4	14.8
	9/27/2016 DUP	<2.5	<10	<2.5	<2.5	44.4	<2.5	11.5	867	11.4	<2.5	387	3.9	<2.5	163	22.6
	12/14/2016	<1	<4	<1	<1	<1	<1	<1	6.9	2.3	<1	<1	<1	<1	<1	20.5
	12/14/2016 DUP	<2.5	29.1	<2.5	<2.5	16.5	<2.5	4.7	744	<2.5	<2.5	62.3	<2.5	<2.5	42.2	21.2
	3/30/2017	<10	<40	<10	<10	<10	<10	<10	1,120	<10	<10	55.9	<10	<10	29.6	37.8
	3/30/2017 DUP	<2.5	<10	<2.5	<2.5	11.4	<2.5	3.8	853	6.1	<2.5	49	<2.5	<2.5	26	28.3
	6/12/2017	<125	<12.5	<3.1	<3.1	14.0	<3.1	4.7	893	7.6	<3.1	42.4	<3.1	<3.1	18.1	48.4
	6/12/2017 DUP	<3.1	<12.5	<3.1	<3.1	12.8	<3.1	<3.1	860	7.1	<3.1	40.0	<3.1	<3.1	16.5	47.4
	9/28/2017	<3.1	17.4	<3.1	<3.1	19.5	<3.1	<3.1	457	5.4	<3.1	<3.1	<3.1	<3.1	<3.1	47.7
	9/28/2017 DUP	<1.7	16.3	<1.7	<1.7	17.3	<1.7	<1.7	428	5.2	<1.7	<1.7	<1.7	<1.7	<1.7	45.1
	11/9/2017	<2.0	15.4	<0.50	<0.50	4.5	<0.50	<0.50	22	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	49.1
	11/9/2017 DUP	<2.0	12.6	<0.50	<0.50	4.5	<0.50	<0.50	21	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	36.4
	3/20/2018	<0.500	7.50	<0.500	<0.500	0.5	<0.500	<0.500	6	1.3	<0.500	<0.500	<0.500	<0.500	0.271 J	2.8
	3/20/2018 DUP	<0.500	8.18	<0.500	<0.500	0.550 J	<0.500	<0.500	6	1.29 J	<0.500	0.203 J	<0.500	<0.500	0.261 J	2.6
	7/1/2018	<0.500	9.73	<0.500	<0.500	0.9	<0.500	<0.500	4	1.6	<0.500	0.304 J	<0.500	<0.500	1.0	1.5
	7/1/2018 DUP	<0.500	8.34	<0.500	<0.500	0.8	<0.500	<0.500	4	1.6	<0.500	0.289 J	<0.500	<0.500	1.0	1.3
	9/25/2018	<1.00	24.5	<1.00	<1.00	0.730	<0.400	<0.400	1.46	0.520	<0.500	<0.400	<0.400	<0.500	<0.400	1.23
	9/25/2018 DUP	<1.00	23.7	<1.00	<1.00	0.670	<0.400	<0.400	1.31	0.500	<0.500	<0.400	<0.400	<0.500	<0.400	1.21
	12/4/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4	0.4	<0.500	1.3	<0.400	<0.500	1.3	1.7
	12/4/2018 DUP	<1.00	6.03	<1.00	<1.00	0.5	<0.400	<0.400	4	0.4	<0.500	1.0	<0.400	<0.500	1.0	1.6

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-12 (continued)	3/20/2019	<2.00	<5.00	<1.00	<1.00	0.655	<0.400	<0.400	6.70	0.675	<0.500	2.11	<0.400	<0.500	1.33	1.64
	3/20/19 DUP	<2.00	<5.00	<1.00	<1.00	0.615	<0.400	<0.400	6.31	0.621	<0.500	2.05	<0.400	<0.500	1.15	1.56
	6/5/2019	<2.00	<5.00	<1.00	<1.00	0.716	<0.400	<0.400	9.17	0.756	<0.500	3.30	<0.400	<0.500	3.45	2.64
	6/5/2019 DUP	<2.00	<5.00	<1.00	<1.00	0.719	<0.400	<0.400	9.36	0.725	<0.500	3.64	<0.400	<0.500	3.41	2.74
	9/26/2019	<1.00	18.1	<1.00	<1.00	6.26	<0.400	<0.400	5.31	0.565	<0.500	<0.400	<0.400	<0.500	0.442	6.82
	9/26/2019 DUP	<1.00	16	<1.00	<1.00	6.12	<0.400	<0.400	5.06	0.55	<0.500	<0.400	<0.400	<0.500	0.459	6.45
	12/5/2019					<0.400	<0.400	<0.400	2.61	<0.400	<0.500	2.37	<0.400	<0.500	1.41	0.413
	12/5/2019 DUP					<0.400	<0.400	<0.400	2.51	<0.400	<0.500	2.18	<0.400	<0.500	1.23	<0.400
MW-13	12/02/96	0.7	<0.50	<0.50	<0.20	<0.30	<0.50	0.3	9.1	<1	<0.20	750	6.6	--	82	<0.50
	11/12/97	<250	<500	<250	<250	291	<250	<250	5,050	<250	<250	18,100	<250	--	9,050	<500
	08/11/99	<200	<1	<100	<100	<100	<100	<100	2,280	<100	<100	9,590	<200	--	3,920	<100
	11/16/99	<50	<125	<25	<50	108	<25	51	2,620	<25	<25	7,210	67.5	--	3,050	--
	02/28/00	<200	<1	<100	<100	<100	<100	<100	562	<100	<100	1,340	<200	--	602	<100
	06/28/00	<100	<500	<50	<50	132	<50	142	4,210	<50	<50	14,700	155	--	6,360	<50
	05/30/01	<200	<1,000	<100	<100	<100	<100	<100	2,460	<100	<100	10,300	<200	--	4,620	<100
	05/30/02	<2	<1	<1	<2	1.44	<1	1.28	60.4	<1	<1	241	1.68	--	86.4	<1
	05/28/03	<1	<0.50	<0.50	<1	1.71	<0.50	1.75	79.6	1.26	<0.50	121	1.58	--	130	<0.50
	11/16/04	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	1,200	<12	--	230	<12
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	3.14	<0.50	<0.50	71.2	<0.50	--	10.3	<0.50
	09/12/07	<50	<25	<25	<50	55	<25	28	1,290	<25	<25	2,730	29.5	--	2,020	<25
	12/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	3.36	<0.50	<0.50	51.3	0.64	--	19.5	<0.50
	03/05/08	<1	<0.500	<0.500	<1	8.32	<0.500	4.46	174	4.52	<0.500	383	4.21	<0.500	337	0.96
	06/25/08	<5	<5	<5	<5	15.2	<5	<5	320	10.4	<5	132	<5	--	160	<5
	09/19/08	<5	<2.50	<2.50	<5	5.6	<2.50	<2.50	116	2.65	<2.50	266	<2.50	<2.50	187	<2.50
	12/10/08	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.62	32	0.69	<0.50	25	0.6	<0.50	39	<0.50
	03/27/09	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	15	<0.50	<0.50	25	<0.50	<0.50	17	<0.50
	03/27/09 DUP	<0.50	<0.50	<0.50	<0.50	0.79	<0.50	<0.50	15	<0.50	<0.50	25	<0.50	<0.50	17	<0.50
	06/18/09	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	0.8	58	1.8	<0.50	16	<0.50	<0.50	42	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	3.3	130	2.9	<0.50	430	4	<0.50	270	1
	12/18/09	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	16	<0.50	<0.50	66	0.61	<0.50	45	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	1.4	64	1.2	<0.50	130	1.3	<0.50	110	<0.50
	06/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	14	<0.50	<0.50	7.6	<0.50
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	45	<0.5	<0.5	12	<0.5
	12/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-13 (continued)	03/11/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	0.65	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	6.1	<0.5	<0.5	4.2	<0.5
	09/19/11	<0.50	0.54	<0.50	<0.50	35	<0.50	17	700	20	<0.50	2,200	17	0.63	1,300	3.6
	12/09/11	<9	<9	<9	<9	23	<9	11	530	18	<9	2,800	12	<9	1,400	<9
	03/12/12	<9	<9	<9	<9	24	<9	14	600	14	<9	1,800	11	<9	1,200	<9
	06/22/12	<4	<4	<4	<4	40	<4	13	940	30	<4	1,300	8.6	<4	1,000	4.5
	09/14/12	<4	<4	<4	<4	38	<4	21	900	22	<4	3,100	16	<4	1,800	<4
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13	0.62	<0.50	88	<0.50	<0.50	51	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	34	<0.50	21	890	20	<0.50	2,400	14	0.68	1,700	3.2
	06/14/13	<4	<4	<4	<4	19	<4	9.4	520	15	<4	1,100	6	<4	920	<4
	09/20/13	<0.50	<0.50	<0.50	<0.50	40	<0.50	20	770	19	<0.50	2,600	13	0.74	1,700	3.4
	12/13/13	<4	<4	<4	<4	11	<4	6.6	280	5.8	<4	1,300	4.9	<4	720	<4
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	100	<0.50	<0.50	54	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	880	33	<0.50	1,500	12	0.67	1,300	3.2
	09/30/14	<4	<4	<4	<4	38	<4	20	890	19	<4	3,100	13	<4	2,000	<4
	12/11/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	0.66	<0.50	91	<0.50	<0.50	65	<0.50
	3/18/2015	<1.6	<1.6	<1.6	<1.6	19	<1.6	3.1	515	7.4	<1.6	551	2.4	<1.6	609	<1.6
	6/18/2015	<0.50	<0.50	<0.50	<0.50	33.9	<0.50	15.9	615	15.3	<0.50	1,960	10.4	<0.50	1,390	2
	9/22/2015	<0.50	<0.50	<0.50	<0.50	33.9	<0.50	21	754	15.6	<0.50	2,370	10.4	<0.50	1,740	2.4
	12/8/2015	<0.50	<0.50	<0.50	<0.50	0.89	<0.50	0.64	30.5	0.88	<0.50	185	0.7	<0.50	121	<0.50
	3/8/2016	<2.5	<10	<2.5	<2.5	14.3	<2.5	6.4	336	4.6	<2.5	839	3.7	<2.5	736	<2.5
	6/16/2016	<8.4	<33.4	<8.4	<8.4	41.3	<8.4	17.8	841	19.2	<8.4	2,470	10.1	<8.4	1,820	<8.4
	9/28/2016	<2.5	<10	<2.5	<2.5	<2.5	<2.5	<2.5	148	<2.5	<2.5	4,840	<2.5	<2.5	895	<2.5
	9/28/16 DUP	<2.5	<10	<2.5	<2.5	<2.5	<2.5	<2.5	145	<2.5	<2.5	5,090	<2.5	<2.5	951	<2.5
	12/16/2016	<5	<20	<5	<5	<5	<5	<5	509	<5	<5	1,020	<5	<5	394	<5
	3/30/2017	<5	<20	<5	<5	<5	<5	<5	101	<5	<5	176	<5	<5	57.6	<5
	6/15/2017	<1.0	<4.0	<1.0	<1.0	<1.0	<1.0	1.2	272	1.6	<1.0	97.7	<1.0	<1.0	56.3	4.1
	9/27/2017	<1.0	<4.0	<1.0	<1.0	<1.0	<1.0	5.0	3,220	7.3	<1.0	3.3	<1.0	<1.0	1.3	25.0
	11/7/2017	<16.7	<16.7	<4.2	<4.2	<4.2	<4.2	<4.2	1,360	5.4	<4.2	<4.2	<4.2	<4.2	<4.2	25.0

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-13 (continued)	3/20/2018	<0.500	3.29	<0.500	<0.500	0.879	<0.500	2.55	1,730	5.20	<0.500	0.396 J	<0.500	<0.500	2.19	211
	7/1/2018	<0.500	<2.50	<0.500	<0.500	18.3	0.148 J	5.98	1680	26.9	<0.500	<0.500	<0.500	<0.500	0.781	2030
	9/25/2018	<1.00	10.9	<1.00	<1.00	1.91	<0.400	<0.400	9.78	1.26	<0.500	0.410	<0.400	<0.500	0.800	113
	12/5/2018	<1.00	6.7	<1.00	<1.00	<0.400	<0.400	<0.400	6.17	0.682	<0.500	0.567	<0.400	<0.500	0.413	55.2
	3/19/2019	<1.00	5.64	<1.00	<1.00	<0.400	<0.400	<0.400	2.69	<0.400	<0.500	<0.400	<0.400	<0.500	0.433	2.02
	6/6/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.62	<0.400	<0.500	<0.400	<0.400	<0.500	0.673	2.89
	9/26/2019	<1.00	<5.00	<1.00	<1.00	1.07	<0.400	<0.400	1.94	0.439	<0.500	<0.400	<0.400	<0.500	<0.400	2.01
	12/3/2019	<1.00	<5.00	<1.00	<1.00	1.50	<0.400	<0.400	1.06	0.488	<0.500	<0.400	<0.400	<0.500	<0.400	1.42
MW-14	11/12/97	<5	<10	<5	<5	5.01	<5	<5	<5	<5	<5	42.6	<5	--	394	<10
	08/10/99	<20	<100	<10	<10	<10	<10	<10	15.1	<10	<10	121	35.6	--	853	<10
	11/16/99	<2	<5	<1	<2	2.48	<1	2.48	4.2	<1	<1	186	10.8	--	313	<1
	02/28/00	<100	<500	<50	<50	<50	<50	83.2	85.1	<50	<50	711	190	--	5,300	<50
	06/27/00	<10	<50	<5	<5	10.1	<5	18.9	219	<5	<5	207	46.2	--	1,150	<5
	11/30/00	<2	<10	<1	<1	1.08	<1	1.88	2.27	<1	<1	21.3	5.54	--	157	<1
	05/30/01	<1	<50	<5	<5	6.16	<5	13.8	30.4	<5	<5	268	28.2	--	1,280	<5
	05/30/02	<10	<5	<5	<10	<5	<5	<5	8.4	<5	<5	78.3	11.9	--	303	<5
	05/28/03	<1	<0.50	<0.50	<1	0.9	<0.50	1.47	4.15	<0.50	<0.50	80.6	4.99	--	188	<0.50
	11/15/04	<25	<25	<25	<25	<25	<25	<25	96	<25	<25	480	<25	--	1,200	<25
	05/17/05	<2	<1	<1	<2	4.64	<1	2.3	41.1	<1	<1	127	9.28	--	367	<1
	09/12/07	<20	<10	<10	<20	21.6	<10	<10	162	<10	<10	180	22.2	--	963	<10
	03/05/08	<1	<0.500	0.850 J	<1	24.3	<0.500	13.9	217	3.86	<0.500	549	27.2	<0.500	1,770	<0.500
	06/25/08	<5	<5	<5	<5	15.2	<5	10.2	113	<5	<5	360	18.2	--	1,290	<5
	09/19/08	<5	<2.50	<2.50	<5	19.1	<2.50	8.6	173	<2.50	<2.50	425	16.6	<2.50	1,320	<2.50
	12/10/08	<5	<5	<5	<5	17	<5	9.6	160	<5	<5	330	17	<5	1,200	<5
	03/27/09	<2.5	<2.5	<2.5	<2.5	16	<2.5	6.7	160	2.5	<2.5	320	14	<2.5	980	<2.5
	06/17/09	<2.5	<2.5	<2.5	<2.5	21	<2.5	12	150	<2.5	<2.5	400	21	<2.5	1,400	<2.5
	09/18/09	<0.50	<0.50	0.74	<0.50	19	<0.50	8.8	150	2	<0.50	440	17	<0.50	1,300	<0.50
	12/15/09	<2.5	<2.5	<2.5	<2.5	11	<2.5	4.7	120	<2.5	<2.5	410	7.6	<2.5	820	<2.5
	03/17/10	<2.5	<2.5	<2.5	<2.5	22	<2.5	9.5	140	<2.5	<2.5	320	15	<2.5	1,300	<2.5
	07/02/10	<2.5	<2.5	<2.5	<2.5	7	<2.5	4.8	52	<2.5	<2.5	220	5.9	<2.5	610	<2.5
	09/22/10	<3	<3	<3	<3	16	<3	6.5	140	<3	<3	230	10	<3	800	<3
	12/08/10	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	0.7	11	<0.5	<0.5	82	1.5	<0.5	150	<0.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-14 (continued)	03/09/11	<3	<3	<3	<3	6.8	<3	3.8	55	<3	<3	200	5	<3	540	<3
	06/08/11	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5	1.8	<0.5	<0.5	27	1.1	<0.5	66	<0.5
	09/14/11	<2.5	<2.5	<2.5	<2.5	12	<2.5	5.7	120	<2.5	<2.5	300	8	<2.5	850	<2.5
	12/06/11	<2.5	<2.5	<2.5	<2.5	8.4	<2.5	3.9	88	<2.5	<2.5	320	5.7	<2.5	740	<2.5
	03/07/12	<2.5	<2.5	<2.5	<2.5	9.3	<2.5	4.6	87	<2.5	<2.5	270	6.1	<2.5	760	<2.5
	06/19/12	<2.5	<2.5	<2.5	<2.5	11	<2.5	5.6	70	<2.5	<2.5	200	7.4	<2.5	730	<2.5
	09/11/12	<2.5	<2.5	<2.5	<2.5	11	<2.5	5.1	110	<2.5	<2.5	280	6.6	<2.5	730	<2.5
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	16	<0.50	<0.50	27	<0.50
	03/12/13	<0.50	<0.50	0.56	<0.50	12	<0.50	4.4	100	1.7	<0.50	230	7.2	<0.50	670	<0.50
	06/12/13	<3	<3	<3	<3	11	<3	5	84	<3	<3	260	6.6	<3	770	<3
	09/18/13	<0.50	<0.50	<0.50	<0.50	13	<0.50	4.6	130	2	<0.50	240	5.9	<0.50	640	<0.50
	12/11/13	<1.5	<1.5	<1.5	<1.5	8.4	<1.5	2.8	83	<1.5	<1.5	180	3.7	<1.5	460	<1.5
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	20	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	17	<0.50	7	120	1.8	<0.50	210	0.87	<0.50	670	<0.50
	9/24/2014	<2.5	<2.5	<2.5	<2.5	10	<2.5	4	120	<2.5	<2.5	240	4	<2.5	640	<2.5
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	<0.50	29	0.61	<0.50	63	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	15.4	<0.50	5.9	128	2.2	<0.50	312	5.9	<0.50	912	<0.50
	6/16/2015	<3.1	<3.1	<3.1	<3.1	14.7	<3.1	4.9	117	<3.1	<3.1	248	4.4	<3.1	792	<3.1
	9/21/2015	<0.50	<0.50	<0.50	<0.50	15.2	<0.50	5.6	116	2.1	<0.50	201	4.7	<0.50	654	<0.50
	12/8/2015	Not sampled; well monument under water.														
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	12.5	<0.50	<0.50	29.2	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	7.2	<0.50	2.1	61.8	0.94	<0.50	100	1.7	<0.50	218	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	0.56	<0.50	<0.50	0.97	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	0.57	69.2	<0.5	<0.5	14.7	<0.5	<0.5	33.4	0.62
	6/13/2017	<2.0	<2.0	<0.50	<0.50	10	<1.0	5.3	432	2.7	<0.50	58.3	2.1	<0.50	204	2.5
	9/26/2017	<0.84	<3.3	<0.84	<0.84	6	<0.84	2.6	279	2.8	<0.84	62.4	<0.84	<0.84	265	<0.84
	11/8/2017	<3.3	<3.3	<0.84	<0.84	5	<0.84	2.1	306	2.2	<0.84	39.3	<0.84	<0.84	160	0.9

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-14 (continued)	3/20/2018	<0.500	1.67 J	<0.500	<0.500	5	<0.500	3.6	500	2.6	<0.500	36.0	0.6	<0.500	150	1.35 J
	6/28/2018	<0.500	<2.50	<0.500	<0.500	11	<0.500	2.5	255	2.5	<0.500	34.9	1.6	<0.500	247	0.7
	9/26/2018	<10.0	<50.0	<10.0	<10.0	12.1	<4.00	4.40	361	4.50	<5.00	84.3	<4.00	<5.00	484	<4.00
	12/5/2018	<10.0	<50.0	<10.0	<10.0	5	<4.00	<4.00	333	<4.00	<5.00	83.4	<4.00	<5.00	260	<4.00
	3/19/2019	<5.00	<25.0	<5.00	<5.00	5.40	<4.00	<4.00	223	2.06	<2.50	31.4	<2.00	<2.50	178	<2.00
	6/6/2019	<1.00	<5.00	<1.00	<1.00	1.74	<0.400	1.09	151	0.937	<0.500	19.1	<0.400	<0.500	76.4	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	12.5	<0.400	4.58	264	3.6	<0.500	91.8	1.47	<0.500	327	0.482
	12/4/2019	<1.00	<5.00	<1.00	<1.00	7.81	<0.400	3.17	242	2.88	<0.500	107	0.704	<0.500	351	<0.400
MW-15	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	1.1	<0.50	6.78	<0.50	<0.50	2.38	1.68	--	1.81	<1
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	967	13.7	--	63.4	<0.50
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17.9	1.55	--	1.01	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.44	1.03	--	0.565	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.32	<1	--	<0.50	<0.50
	05/31/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.59	0.63	--	<0.50	<0.50
	05/29/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	4.42	<0.50	--	1.3	<0.50
	11/02/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	--	<0.50	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	12	<0.50	--	3.1	<0.50
	03/24/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	--	1.49	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.54	<0.50	--	0.58	<0.50
	09/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54 J	<0.50	--	<0.50	<0.50
	03/07/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	2.63 J	<0.500	<0.500	<0.500	<0.500
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.86	<0.500	<0.500	<0.500	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	<0.50	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.81	<0.50	<0.50	<0.50	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.76	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	<0.50
	03/09/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50
	09/10/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-15 (continued)	03/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/30/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	<0.50	<0.50	<0.50	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.60	<0.500	<0.500	<0.500	<0.500
	6/6/2019	<1.00	<5.00	<1.00	<1.00	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.531	<0.500	<0.500	<0.500	<0.500
MW-16	11/12/97	<5	<10	<5	<5	19.8	<5	27.8	23.6	<5	<5	328	57.5	--	142	<10
	08/11/99	<5	<25	<2.5	<2.5	15.2	<2.5	<2.5	7.2	<2.5	<2.5	205	55.6	--	85.6	<2.5
	02/28/00	<2	<10	<1	<1	10.4	<1	12	7.4	<1	<1	523	54.5	--	112	<1
	06/27/00	<10	<50	<5	<5	12.4	<5	13.9	8.39	<5	<5	236	45	--	93.8	<5
	05/30/01	<10	<50	<5	<5	9.28	<5	12	8.95	<5	<5	302	30.1	--	110	<5
	05/30/02	<5	<2.5	<2.5	<5	13.5	<2.5	10.6	8.65	<2.5	<2.5	467	24	--	119	<2.5
	05/29/03	<5	<2.5	<2.5	<5	3.6	<2.5	3.35	2.85	<2.5	<2.5	412	13.4	--	76	<2.5
	11/02/04	<2	<10	<1	<1	<1	<1	<1	1.66	<1	<1	260	6.9	--	25.4	<1
	11/16/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	300	7.8	--	26	<2.5
	03/24/05	<2	<1	<1	<2	1.8	<1	1.34	1.96	<1	<1	373	11.8	--	49.4	<1
	05/17/05	<1	<0.50	<0.50	<1	4.39	<0.50	3.14	9.25	<0.50	<0.50	120	9.09	--	41.5	<0.50
	11/15/05	<1	<0.500	<0.500	<1	2.75	<0.500	1.86	2.5	<0.500	<0.500	152	8.94	--	33.4	<0.500
	02/21/06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/06/06	<2	<2	<2	<2	12.2	<2	3.38	210	<2	<2	84.6	2.56	--	25.2	5.64
	12/06/06	<2	<1	<1	<2	4.2	<1	2.12	16.7	<1	<1	176	5.88	--	45.6	<1
	05/23/07	<1	<1	<1	<1	2.57	<1	<1	14	<1	<1	98.8	3.35	--	23.8	<1
	09/13/07	<1	<0.50	<0.50	<1	3.15	<0.50	1.08	6.6	<0.50	<0.50	163	5.87	--	49.2	<0.50
	12/12/07	<2	<1	<1	<1	2.32	<1	1.44	5.9	<1	<1	110	5.92	--	28.2	<1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-16 (continued)	03/07/08	<1	<0.500	<0.500	<1	3	<0.500	1.86	5.93	<0.500	<0.500	280	6.12	<0.500	73.3	<0.500
	09/18/08	<5	<2.50	<2.50	<5	2.7	<2.50	<2.50	5.15	<2.50	<2.50	300	6.2	<2.50	65.2	<2.50
	12/09/08	<1	<1	<1	<1	2.6	<1	1.8	5.5	<1	<1	300	5.7	<1	67	<1
	03/26/09	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	0.82	3.2	<0.50	<0.50	150	5.2	<0.50	28	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	5	<0.50	0.95	29	<0.50	<0.50	54	1.8	<0.50	16	0.68
	09/17/09	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	1.1	2	<0.50	<0.50	220	4.8	<0.50	33	<0.50
	12/17/09	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	0.6	1.4	<0.50	<0.50	100	3.2	<0.50	19	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	1	2	<0.50	<0.50	110	4.5	<0.50	36	<0.50
	06/16/10	<0.50	<0.50	<0.50	<0.50	4.9	<0.50	0.91	37	<0.50	<0.50	39	0.94	<0.50	9.9	1.6
	09/23/10	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	0.94	2.8	<0.5	<0.5	240	4.2	<0.5	43	<0.5
	12/10/10	<0.5	<0.5	<0.5	<0.5	0.85	<0.5	0.54	1.6	<0.5	<0.5	94	2.4	<0.5	18	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.5	6.2	<0.50	<0.50	110	1.9	<0.50	21	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	4.9	<0.5	1.2	63	<0.5	<0.5	28	<0.5	<0.5	7.1	2.2
	09/19/11	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	5.1	<0.50	<0.50	160	2.7	<0.50	13	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	0.92	<0.50	0.61	2.2	<0.50	<0.50	210	2.9	<0.50	38	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	3.6	<0.5	0.56	24	<0.5	<0.5	60	0.98	<0.5	14	0.62
	09/13/12	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	0.61	6.5	<0.50	<0.50	190	2.4	<0.50	35	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.68	5.7	<0.50	<0.50	110	1.1	<0.50	24	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	0.7	4.7	<0.50	<0.50	200	2	<0.50	50	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	6	<0.50	<0.50	84	0.96	<0.50	18	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.92	<0.50	0.75	7.1	<0.50	<0.50	180	1.4	<0.50	57	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	0.68	5.9	<0.50	<0.50	160	1.4	<0.50	52	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.89	19	<0.50	<0.50	52	<0.50	<0.50	13	0.55
	6/24/2014	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	10	<0.50	<0.50	70	0.7	<0.50	12	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	0.66	8.8	<0.50	<0.50	200	1.4	<0.50	47	<0.50
	12/11/2014	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	4	<0.50	<0.50	76	0.96	<0.50	17	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	6	<0.50	<0.50	157	0.94	<0.50	31	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	0.61	<0.50	<0.50	10.5	<0.50	<0.50	179	1	<0.50	41.6	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	0.65	10.4	<0.50	<0.50	173	1.2	<0.50	43.5	<0.50
	12/7/2015	Not sampled; well monument under water.														

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-16 (continued)	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	144	0.66	<0.50	35.6	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	51.5	<0.50	<0.50	11.6	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	1.6	<0.5	<0.5	19	<0.5	<0.5	27	<0.5	<0.5	6.4	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.4	<0.50	<0.50	53.7	0.66	<0.50	5.4	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.3	<0.50	<0.50	148.0	1.00	<0.50	11.1	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	150.0	0.96	<0.50	17.4	<0.50
	3/19/2018	<0.500	<2.50	<0.500	<0.500	0.232 J	<0.500	0.190 J	3.8	<0.500	<0.500	99.7	0.82	<0.500	12.6	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	0.500 J	<0.500	0.209 J	9.6	<0.500	<0.500	72.5	0.86	<0.500	7.4	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	15.8	<0.400	<0.500	171	0.580	<0.500	33.9	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.5	<0.400	<0.500	130.0	0.76	<0.500	20.8	<0.400
	3/22/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	7.90	<0.400	<0.500	136	0.771	<0.500	24.3	<0.400
	6/4/2019	<1.00	<5.00	<1.00	<1.00	0.810	<0.400	<0.400	14.3	<0.400	<0.500	30.1	<0.400	<0.500	5.34	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	14.4	<0.400	<0.500	136	0.658	<0.500	23.9	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	8.75	<0.400	<0.500	102	0.598	<0.500	19.9	<0.400
MW-17	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	--	<0.50	<1
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	127	1.5	--	9.54	<0.50
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.85	<1	--	2.51	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.27	<1	--	<0.50	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.82	<0.50	--	<0.50	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.75	<0.50	--	0.92	<0.50
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	--	<0.50	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.06	<0.50	--	6.68	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	8.82	<1	<1	37.8	<1	--	28.2	<1
	09/11/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50 J	<0.50	--	<0.50	<0.50
	03/05/08	<1	<0.500	<0.500	<1	0.9	<0.500	<0.500	0.96	<0.500	<0.500	1.05	<0.500	<0.500	3.62	<0.500
	09/19/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.8	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	1	<0.50	<0.50	0.69	<0.50	<0.50	3	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	0.72	<0.50	<0.50	3.2	<0.50
	03/23/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	3.9	<0.50	<0.50	3.2	0.58	<0.50	18	<0.50
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.69	<0.5	<0.5	0.71	<0.5	<0.5	3	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	0.65	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	8.2	<0.50
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	0.71	<0.50	<0.50	3.1	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-17 (continued)	03/07/12	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	5.4	<0.50	<0.50	6.8	0.56	<0.50	25	<0.50
	09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	0.66	<0.50	<0.50	2.5	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	4.1	<0.50	<0.50	11	<0.50
	09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	4.2	<0.50	<0.50	8.9	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	3.2	<0.50	<0.50	6.8	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.71	<0.50	<0.50	2.4	<0.50	<0.50	3.9	<0.50	<0.50	12.6	<0.50
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	2.5	<0.50	<0.50	4.2	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	0.83	<0.50	<0.50	3.3	<0.50	<0.50	9.4	<0.50	<0.50	22.7	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	4.2	<0.50	<0.50	10.4	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	9/29/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.7	<0.50	<0.50	4.6	<0.50	<0.50	11.4	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	9.9	<0.50	<0.50	21.9	<0.50
	6/28/2018	<0.500	<2.50	<0.500	<0.500	0.516	<0.500	<0.500	2.7	<0.500	<0.500	3.7	<0.500	<0.500	9.0	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.6	<0.400	<0.500	2.2	<0.400	<0.500	4.6	<0.400
	3/19/2019	<1.00	<5.00	<1.00	<1.00	0.623	<0.400	<0.400	10.5	<0.400	<0.500	6.91	<0.400	<0.500	15.2	<0.400
	6/6/2019	<1.00	<5.00	<1.00	<1.00	0.413	<0.400	<0.400	4.34	<0.400	<0.500	4.34	<0.400	<0.500	10.0	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.87	<0.400	<0.500	2.41	<0.400	<0.500	4.6	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	0.829	<0.400	<0.400	26.8	<0.400	<0.500	5.54	<0.400	<0.500	15.1	<0.400
MW-18i	09/29/00	ND	ND	0.694	ND	0.843	ND	ND	16.5	ND	ND	11.7	ND	--	8.32	ND
	11/30/00	<1	<5	<0.50	<0.50	0.907	<0.50	<0.50	11.6	<0.50	<0.50	12.4	<1	--	17.6	<0.50
	02/27/01	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	10.2	<2.5	<2.5	15.2	<5	--	10	<2.5
	05/30/01	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	6.47	<2.5	<2.5	29.5	<5	--	8.06	<2.5
	09/25/01	<1	<1	<1	<1	1.8	<1	<1	23	<1	<1	62	2.3	--	39	<1
	03/29/02	<1	<0.50	<0.50	<1	1.2	<0.50	<0.50	17.3	<0.50	<0.50	71.1	1.22	--	31	<0.50
	05/30/02	<1	<0.50	<0.50	<1	1.18	<0.50	<0.50	18.6	<0.50	<0.50	53.2	1.14	--	19.3	<0.50
	08/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	6.91	<0.50	<0.50	18.2	<0.50	--	7.34	<0.50
	11/07/02	<1	<0.50	<0.50	<1	0.56	<0.50	<0.50	10.1	<0.50	<0.50	23.3	<0.50	--	9.7	<0.50
	01/23/03	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	12.3	<0.50	<0.50	27.6	0.5	--	12.5	<0.50
	05/29/03	<1	<0.50	<0.50	<1	0.59	<0.50	<0.50	10.4	<0.50	<0.50	23.9	0.5	--	10.8	<0.50
	11/11/03	<1	<1	<1	<1	<1	<1	<1	16.1	<1	<1	31.5	<1	--	16.3	<1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-18i (continued)	01/27/04	<1	<0.50	<0.50	<1	0.67	<0.50	<0.50	14.2	<0.50	<0.50	69.7	0.53	--	12	<0.50
	05/04/04	<1	<1	<1	<1	<1	<1	<1	15.6	<1	<1	112	<1	--	12.1	<1
	08/17/04	<1	<0.50	3.76	<0.50	0.81	1.86	<0.50	22.6	0.78	<0.50	43.8	0.96	--	24	<1
	11/02/04	<0.50	<0.50	<0.50	<0.50	1.09	<0.50	<0.50	21.8	<0.50	<0.50	32.2	0.6	--	17.8	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	24	<0.50	<0.50	42	0.69	--	21	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	8.92	<0.50	<0.50	13	<0.50	--	6.01	<0.50
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	11	<0.50	<0.50	9.69	<0.50	--	7.3	<0.50
	08/18/05	<1	<0.500	<0.500	<1	1.17	<0.500	<0.500	18 B	<0.500	<0.500	21.4 B	0.58	--	16.3 B	<0.500
	08/18/05 DUP	<1	<0.500	<0.500	<1	1.17	<0.500	<0.500	18.5 B	<0.500	<0.500	21.8 B	0.57	--	16.2 B	<0.500
	11/15/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	7.31	<0.500	<0.500	11.4	<0.500	--	6.31	<0.500
	02/21/06	<1	<0.500	<0.500	<1	0.93	<0.500	<0.500	14.8	<0.500	<0.500	24.3	0.52	--	15.2	<0.500
	06/06/06	<1	<1	<1	<1	<1	<1	<1	5.88	<1	<1	8.46	<1	--	4.47	<1
	09/06/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	5.79	<0.50	<0.50	7.89	<0.50	--	4.23	<0.50
	12/06/06	<1	<0.50	<0.50	<1	0.56	<0.50	<0.50	11.6	<0.50	<0.50	11.2	<0.50	--	6.91	<0.50
	02/07/07	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	12	<0.50	<0.50	15	<0.50	--	9.32	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	14.6	<1	<1	17.2	<1	--	11.3	<1
	09/11/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.87	<0.50	<0.50	1.13	<0.50	--	1.46	<0.50
	12/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.99	<0.50	<0.50	5.57	<0.50	--	3.32	<0.50
	03/06/08	<1	<0.500	<0.500	<1	0.82	<0.500	<0.500	13.2	<0.500	<0.500	13.2	<0.500	<0.500	9.78	<0.500
	06/10/08	<1	1	1	<1	<1	<1	<1	4.17	<1	<1	4.31	<1	--	2.18	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	3.95	<0.500	<0.500	3.1	<0.500	<0.500	2.55	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	12	<0.50	<0.50	8.5	<0.50	<0.50	7.4	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	8	<0.50	<0.50	4.8	<0.50	<0.50	4.7	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	2.5	<0.50	<0.50	1.7	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.2	<0.50	<0.50	5.9	<0.50	<0.50	4.5	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	2.5	<0.50	<0.50	1.6	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	11	<0.50	<0.50	9.7	<0.50	<0.50	6	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	3.6	<0.50	<0.50	1.8	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	0.5	15	<0.5	<0.5	9.8	<0.5	<0.5	7.4	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	0.66	<0.5	0.5	15	<0.5	<0.5	12	<0.5	<0.5	8	<0.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-18i (continued)	03/10/11	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	12	<0.50	<0.50	9.4	<0.50	<0.50	5.2	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	2.1	<0.5	<0.5	1	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	2.9	<0.50	<0.50	1.9	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.8	<0.50	<0.50	8.5	<0.50	<0.50	4.8	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	15	<0.50	<0.50	12	<0.50	<0.50	6.4	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	1.5	<0.5	<0.5	0.97	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	1.7	<0.50	<0.50	1	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	3.9	<0.50	<0.50	2.1	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.2	<0.50	<0.50	3.8	<0.50	<0.50	2.1	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	2.4	<0.50	<0.50	1.3	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	2.2	<0.50	<0.50	1.3	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	5.3	<0.50	<0.50	3.6	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1	<0.50	<0.50	0.7	<0.50
	6/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.63	<0.50	<0.50	0.19	<0.50	<0.50	1	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	1.5	<0.50	<0.50	0.93	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	2	<0.50	<0.50	1.3	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	<0.50	3.4	<0.50	<0.50	1.8	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	4	<0.50	<0.50	2.6	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	1	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	<0.50	0.73	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	0.85	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	1.5	<0.50	<0.50	1.2	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	1.4	<0.5	<0.5	1.2	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	0.66	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.40	<0.50	<0.50	1.9	<0.50	<0.50	1.30	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.43	<0.500	<0.500	1.5	<0.500	<0.500	0.82	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.63	<0.500	<0.500	0.6	0.320 J	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	0.7	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.96	<0.400	<0.500	1.3	<0.400	<0.500	0.70	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-18i (continued)	3/21/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2.53	<0.400	<0.500	1.38	<0.400	<0.500	1.03	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.31	<0.400	<0.500	0.970	<0.400	<0.500	0.560	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.63	<0.400	<0.500	0.920	<0.400	<0.500	0.647	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.300	<0.400	<0.500	0.589	<0.400
MW-19	11/07/02	<20	<10	<10	<20	252	<10	66.2	2,450	23	<10	3,100	139	--	1,810	79.2
	05/30/03	<50	<25	<25	<50	109	<25	36	1,300	<25	<25	7,160	104	--	2,070	35.5
	11/16/04	<50	<50	<50	<50	<50	65	<50	490	<50	<50	7,300	130	--	1,400	<50
	05/18/05	<10	<5	<5	<10	19.3	<5	<5	161	<5	<5	1,500	33.8	--	205	24.6
	11/15/05	<20	<10	<10	<20	27	<10	18.8	230	<10	<10	3,080	67.2	--	785	14.6
	11/15/05 DUP	<20	<10	<10	<20	25	<10	20.2	221	<10	<10	2,860	64.4	--	762	15.2
	06/05/06	<10	<10	<10	<10	<10	<10	<10	80.9	<10	<10	1,280	13.1	--	237	<10
	12/06/06	<20	<10	<10	<20	<10	<10	<10	76.2	<10	<10	2,060	17.2	--	304	<10
	05/22/07	<20	<20	<20	<20	<20	<20	<20	114	<20	<20	2,720	51.4	--	504	<20
	09/11/07	<50	<25	<25	<50	<25	<25	<25	85.5	<25	<25	3,370	62.5	--	608	<25
	12/12/07	<50	<25	<25	<50	<25	<25	<25	80	<25	<25	2,070	38.5	--	326	<25
	03/05/08[7.]	<1	<0.500	<0.500	<1	12.5	<0.500	20.5	149	4.53	<0.500	4,060	66	<0.500	1,030	6.41
	06/25/08	<20	<20	<20	<20	45.8	<20	29.6	435	<20	<20	2,790	46.6	--	1,410	<20
	09/19/08	<50	<25	<25	<50	62	<25	37.5	715	<25	<25	4,990	56.5	<25	2,870	39.5
	12/10/08	<25	<25	<25	<25	51	<25	<25	500	<25	<25	6,600	110	<25	1,100	<25
	03/27/09	<15	<15	<15	<15	53	<15	39	650	<15	<15	4,500	120	<15	1,900	25
	03/27/09 DUP	<15	<15	<15	<15	56	<15	39	670	<15	<15	4,800	130	<15	1,900	25
	06/18/09	<2.5	<2.5	<2.5	<2.5	5.4	<2.5	5.3	82	<2.5	<2.5	680	8.6	<2.5	240	<2.5
	06/18/09 DUP	<2.5	<2.5	<2.5	<2.5	5.1	<2.5	5.4	80	<2.5	<2.5	660	8.4	<2.5	240	<2.5
	09/18/09	<2.5	<2.5	<2.5	<2.5	12	<2.5	36	170	4.6	<2.5	9,400	140	<2.5	2,000	11
	09/18/09 DUP	<2.5	<2.5	<2.5	<2.5	12	<2.5	36	170	4.4	<2.5	9,700	140	<2.5	2,000	12
	12/18/09	<10	<10	<10	<10	87	<10	29	780	13	<10	3,200	57	<10	1,200	35
	12/18/09 DUP	<10	<10	<10	<10	84	<10	27	740	12	<10	3,100	53	<10	1,200	32
	03/19/10	<5	<5	<5	<5	<5	<5	8.3	45	<5	<5	1,900	19	<5	380	<5
	03/19/10 DUP	<7	<7	<7	<7	<7	<7	8.3	44	<7	<7	1,800	18	<7	360	<7
	06/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.7	<0.50	<0.50	67	<0.50	<0.50	25	<0.50
	06/17/10 DUP	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	6.9	<0.50	<0.50	65	0.52	<0.50	24	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-19 (continued)	09/23/10	<2.5	<2.5	<2.5	<2.5	8.7	<2.5	21	110	3.6	<2.5	3,400	50	<2.5	920	12
	09/23/10 DUP	<2.5	<2.5	<2.5	<2.5	8.5	<2.5	21	110	3.4	<2.5	3,700	49	<0.25	890	13
	12/09/10	<15	<15	<15	<15	59	<15	38	590	<15	<15	6,200	68	<15	1,500	48
	12/09/10 DUP	<1.5	<1.5	<1.5	<1.5	58	<1.5	37	590	<1.5	<1.5	6,000	67	<1.5	1,500	48
	03/08/11	<5	<5	<5	<5	23	<5	12	280	<5	<5	1,500	18	<5	590	13
	06/10/11	<0.9	<0.9	<0.9	<0.9	22	<0.9	2.7	160	1.4	<0.9	240	3.6	<0.9	130	5.6
	06/10/11 DUP	<0.9	<0.9	<0.9	<0.9	19	<0.9	2.3	140	1.3	<0.9	220	3.3	<0.9	120	5
	09/19/11	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	53	<1.5	<1.5	400	3	<1.5	78	<1.5
	09/19/11 DUP	<2	<2	<2	<2	<2	<2	<2	53	<2	<2	410	3.2	<2	80	<2
	12/09/11	<1.5	<1.5	<1.5	<1.5	5	<1.5	4.3	110	<1.5	<1.5	730	10	<1.5	220	3.9
	12/09/2011 DUP	<2	<2	<2	<2	5.4	<2	4.7	120	<2	<2	770	10	<2	230	3.9
	03/09/12	<2.5	<2.5	<2.5	<2.5	46	<2.5	26	820	1	<2.5	2,400	50	<2.5	1,200	67
	03/09/12 DUP	<4	<4	<4	<4	43	<4	24	770	8.8	<4	2,400	46	<4	1,200	62
	06/22/2012	<5	<5	<5	<5	74	<5	17	1,000	14	<5	1,300	21	<5	1,000	57
	06/22/12 DUP	<5	<5	<5	<5	74	<5	18	1,000	13	<5	1,300	22	<5	1,000	57
	09/14/12	<5	<5	<5	<5	<5	<5	5.7	300	<5	<5	2,200	31	<5	340	8
	09/14/12 DUP	<5	<5	<5	<5	<5	<5	5.9	300	<5	<5	2,300	31	<5	340	<5
	12/14/12	<1.5	9.8	<1.5	<1.5	21	<1.5	1.8	330	3.6	<1.5	290	3.2	<1.5	140	3.1
	12/14/12 DUP	<1	9.3	<1	<1	21	<1	1.7	340	3.7	<1	300	3.1	<1	140	3
	03/15/13	<1.5	4.7	<1.5	<1.5	29	<1.5	21	870	5.5	<1.5	3,200	67	<1.5	1,600	9
	03/15/13 DUP	<1.5	4.7	<1.5	<1.5	30	<1.5	20	820	6.1	<1.5	3,200	68	<1.5	1,500	9.2
	06/14/13	<9	<9	<9	<9	25	<9	13	730	<9	<9	2,500	29	<9	1,000	<9
	06/14/13 DUP	<9	<9	<9	<9	25	<9	11	720	<9	<9	2,400	26	<9	1,000	<9
	09/20/13	<0.50	1.2	<0.50	<0.50	14	<0.50	25	520	4.5	<0.50	3,000	61	<0.50	1,100	10
	09/20/13 DUP	<1	1.1	<1	<1	12	<1	21	490	3.8	<1	3,200	52	<1	1,200	9
	12/16/13	<15	<15	<15	<15	37	<15	22	680	<15	<15	3,000	36	<15	1,100	<15
	12/16/13 DUP	<15	<15	<15	<15	36	<15	22	660	<15	<15	2,900	37	<15	1,100	<15
	3/21/2014	<0.50	1.4	<0.50	<0.50	4.8	<0.50	2.4	130	1.2	<0.50	180	1.6	<0.50	51	4.3
	3/21/2014 DUP	<0.50	1.4	<0.50	<0.50	4.8	<0.50	2.2	130	1.1	<0.50	180	1.6	<0.50	51	4.3

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-19 (continued)	6/26/2014	<5	0.89	<0.50	<0.50	0.54	110	38	2,000	21	<0.50	1,900	36	0.8	1,500	6.2
	6/26/14 DUP	<5	1.1	<0.50	<0.50	110	<0.50	38	1,900	21	<0.50	1,900	36	0.74	1,600	6.1
	9/30/2014	<15	<15	<15	<15	18	<15	38	520	<15	<15	4,400	61	<15	1,700	32
	9/30/2014 DUP	<15	<15	<15	<15	18	<15	37	510	<15	<15	4,400	60	<15	1,700	30
	12/12/2014	<5	<5	<5	<5	96	<5	20	1,500	12	<5	1,400	19	<5	790	60
	12/12/2014 DUP	<5	<5	<5	<5	110	<5	21	1,500	14	<5	1,500	21	<5	890	68
	3/18/2015	<4.2	<4.2	<4.2	<4.2	72.5	<4.2	48	1,460	17.5	<4.2	5,920	56.5	<4.2	3,970	53.7
	3/18/2015 DUP	<4.2	<4.2	<4.2	<4.2	82.9	<4.2	47.9	1,410	17.8	<4.2	4,930	56.2	<4.2	3,500	46.6
	6/18/2015	<0.50	<0.50	<0.50	<0.50	21.5	<0.5	48.5	628	6.6	<0.50	8,080	94.3	<0.50	2,200	28
	6/18/2015 DUP	<0.50	<0.50	<0.50	<0.50	22.7	<0.50	48.8	614	7.5	<0.50	7,990	985	<0.50	2,090	30.7
	9/22/2015	<0.50	<0.50	<0.50	<0.50	4.9	<0.5	31.7	185	2	<0.50	7,200	74.8	<0.50	791	6.8
	12/8/2015	<0.50	<0.50	<0.50	<0.50	150	<0.5	33.5	1,640	16.4	<0.50	2,900	36	<0.50	1,550	87.3
	12/8/15 DUP	<0.50	<0.50	<0.50	<0.50	155	<0.50	35.1	1,680	17.2	<0.50	3,020	37.1	<0.50	1,600	89.8
	3/8/2016	<10	<40	<10	<10	96.6	<10	42	1,520	20.2	<10	4,080	40.8	<10	2,610	64.8
	3/8/16 DUP	<10	<40	<10	<10	93	<10	42.8	1,460	18.2	<10	3,760	40.4	<10	2,560	72.4
	6/16/2016	<10	<40	<10	<10	<10	<10	22.2	507	<10	<10	3,250	29.2	<10	1,030	18.3
	6/16/2016 DUP	<12.5	<50	<12.5	<12.5	19.5	<12.5	23.8	505	<12.5	<12.5	3,460	28.1	<12.5	1,020	17.6
	9/26/2016	<5	<20	<5	<5	10.4	<5	11	235	<5	<5	1,520	14.5	<5	592	10.1
	12/12/2016	<5	<20	<5	<5	72.8	<5	11.2	1,030	10.7	<5	1,730	10.9	<5	812	28.2
	12/12/2016 DUP	<2.5	<10	<2.5	<2.5	78.7	<2.5	14.2	1,010	11.6	<2.5	1,530	15.5	<2.5	975	31.9
	3/28/2017	<5	<20	<5	<5	197	<5	25.5	1,930	19.7	<5	664	17	<5	826	58.5
	3/28/2017 DUP	<5	<20	<5	<5	214	<5	26.7	1,990	21.5	<5	755	19.9	<5	896	63.2
	6/14/2017	<2.5	<10	<2.5	<2.5	40.6	<2.5	15.4	481	6.1	<2.5	531	8.1	<2.5	481	16.5
	6/14/2017 DUP	<2.5	<10	<2.5	<2.5	41.8	<2.5	15.8	486	6.2	<2.5	566	8.2	<2.5	506	17.2
	9/26/2017	<2.5	<10	<2.5	<2.5	<2.5	<2.5	26.5	1,160	5.4	<2.5	3,620	38.9	<2.5	1,450	111.0
	9/26/2017 DUP	<2.5	<10	<2.5	<2.5	11.1	<2.5	28.9	1,150	5.4	<2.5	3,710	40.4	<2.5	1,480	111.0
	11/9/2017	<20	<20	<5.0	<5.0	104.0	<5.0	24.9	1,660	24.0	<5.0	1,530	20.2	<5.0	1,020	109.0
	11/9/2017 DUP	<2.0	<2.0	<0.50	<0.50	56.5	<0.50	14.7	1,040	14.7	<0.50	970	13.0	0.75	790	115.0
	3/21/2018	<0.500	3.90	<0.500	<0.500	59.0	0.225 J	31.4	2,430	11.2	<0.500	1,250	17.0	0.339 J	1,340	413.0
	3/21/2018 DUP	<0.500	4.26	<0.500	<0.500	58.2	0.242 J	30.7	2,470	10.8	<0.500	996	17.0	0.277 J	1,180	412.0

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Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-19	6/28/2018	<0.500	<2.50	<0.500	<0.500	81.6	<0.500	35.6	3,890	16.4	<0.500	163	10.9	0.210 J	148	773.0
	6/28/2018 DUP	<0.500	<2.50	<0.500	<0.500	80.2	<0.500	36.3	4,190	18.4	<0.500	177	11.7	0.244 J	191	799.0
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1,900	<0.400	<0.500	3,720	<0.400	<0.500	2,190	115.0
	9/25/2018 DUP	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1,960	<0.400	<0.500	3,830	<0.400	<0.500	2,270	116.0
	12/5/2018	<1.00	<500	<1.00	<1.00	91.8	0.453	39.3	1,750	18.2	<0.500	3,090	21.8	0.67	1,490	79.0
	12/5/2018 DUP	<1.00	<500	<1.00	<1.00	90.1	<0.400	39.2	1,610	18.4	<0.500	2,460	21.3	0.67	1,290	77.1
	3/20/2019	<40.0	<100	<20.0	<20.0	49.7	<8.00	39.5	1,910	13.9	<10.0	2,970	22.7	<10.0	2,090	75.8
	3/20/19 DUP	<40.0	<100	<20.0	<20.0	46.9	<8.00	37.6	1,820	13.5	<10.0	2,960	23.7	<10.0	2,040	70.2
	06/07/19	<80.0	<100	<20.0	<20.0	108	<10.0	52.6	1,910	20.4	<12.5	894	<10.0	<12.5	793	70.1
	6/7/2019 DUP	<80.0	<100	<20.0	<20.0	89.6	<8.0	41.6	1,810	16.8	<10.0	772	8.60	<10.0	698	80.8
	9/26/2019	<10.0	<50.0	<10.0	<10.0	33.3	<4	35.1	958	9.59	<5	4340	26.90	<5	1430	35.4
	9/26/2019 DUP	<10.0	<50.0	<10.0	<10.0	41.9	<4	40.2	1,160	12.1	<5	4010	30.60	<5	1620	39.1
	12/3/2019					57.4	<20.0	28.6	1,250	<20.0	<25.0	1670	<20.0	<25.0	1190	25.6
	12/3/19 DUP					53.4	<20.0	27.2	1,190	<20.0	<25.0	1650	<20.0	<25.0	1200	23.2
MW-19i	06/10/08	<1	<1	<1	<1	<1	<1	<1	8.46	<1	<1	<1	<1	<1	1.28	<1
	09/17/08	<1	<0.500	<0.500	<1	1.93	0.53	<0.500	27.1	<0.500	<0.500	1.72	<0.500	<0.500	5.77	<0.500
	12/10/08	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	28	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	25	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	10	<0.50	<0.50	0.67	<0.50	<0.50	1.5	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	1.7	0.64	<0.50	28	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	0.79
	12/15/09	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	10	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	1.1	0.53	<0.50	15	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	1.2	0.58	<0.5	20	<0.5	<0.5	<0.5	<0.5	<0.5	2.4	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	14	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	14	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.88	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50
	12/09/11	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	8.8	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50
	03/12/12	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	13	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-19i (continued)	03/14/13	<0.50	<0.50	<0.50	<0.50	0.65	<0.50	<0.50	9.5	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	6.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	6.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	0.83	<0.50	<0.50	1.6	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	6.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2016	<5	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	0.83	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.228 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.212 J	<0.500	<0.500	0.223 J	<0.500	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	3/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.43	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-20i	06/10/08	<1	<1	<1	<1	<1	<1	<1	18	<1	<1	5.77	<1	<1	3.2	<1
	09/17/08	<1	<0.500	<0.500	<1	2.12	<0.500	<0.500	42.3	<0.500	<0.500	12.8	<0.500	<0.500	11	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	47	<0.50	<0.50	11	<0.50	<0.50	9.3	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	36	<0.50	<0.50	8.4	<0.50	<0.50	6.4	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	30	<0.50	<0.50	6.3	<0.50	<0.50	5.1	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	34	<0.50	<0.50	7.4	<0.50	<0.50	5	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	1.1	<0.50	<0.50	0.69	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	47	<0.50	<0.50	11	<0.50	<0.50	6.9	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	13	<0.50	<0.50	4.3	<0.50	<0.50	2.3	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	43	<0.5	<0.5	17	<0.5	<0.5	10	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	3.7	<0.5	<0.5	2	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.6	<0.50	<0.50	2.4	<0.50	<0.50	2.3	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	21	<0.50	<0.50	7.6	<0.50	<0.50	4.5	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	26	<0.50	<0.50	6.4	<0.50	<0.50	4.2	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	32	<0.50	<0.50	11	<0.50	<0.50	5.9	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.3	<0.5	<0.5	2.6	<0.5	<0.5	1.5	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	0.83	<0.50	<0.50	18	<0.50	<0.50	6.1	<0.50	<0.50	3.8	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.9	<0.50	<0.50	1.4	<0.50	<0.50	0.84	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	28	<0.50	<0.50	9.2	<0.50	<0.50	6	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	14	<0.50	<0.50	7.3	<0.50	<0.50	3.7	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	11	<0.50	<0.50	3.9	<0.50	<0.50	2.4	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	16	<0.50	<0.50	2.4	<0.50	<0.50	1.9	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50
	6/30/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	1.1	<0.50	<0.50	0.58	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.68	<0.50	<0.50	12	<0.50	<0.50	4.3	<0.50	<0.50	2.6	<0.50
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	0.68	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.3	<0.50	<0.50	3	<0.50	<0.50	1.7	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.8	<0.50	<0.50	3.7	<0.50	<0.50	2.2	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.69	<0.50	<0.50	13.8	<0.50	<0.50	4.1	<0.50	<0.50	2.1	<0.50
	12/7/2015	Not sampled; well monument under water.														

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-20i (continued)	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.8	<0.50	<0.50	3.4	<0.50	<5	1.8	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.4	<0.50	<0.50	2.1	<0.50	<0.50	1.5	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.7	<0.50	<0.50	4	<0.50	<0.50	2.2	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	0.54	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	5.6	<0.50	<0.50	1.5	<0.50	<0.50	0.84	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	2.8	<0.50	<0.50	1.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	0.303 J	<0.500	<0.500	5.7	<0.500	<0.500	1.4	<0.500	<0.500	0.90	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	0.436 J	<0.500	<0.500	9.7	<0.500	<0.500	2.3	<0.500	<0.500	1.60	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	7.7	<0.400	<0.500	2.1	<0.400	<0.500	1.39	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	0.43	<0.400	<0.400	10.7	<0.400	<0.500	2.2	<0.400	<0.500	1.55	<0.400
	3/22/2019	<1.00	<5.00	<1.00	<1.00	0.492	<0.400	<0.400	10.5	<0.400	<0.500	2.04	<0.400	<0.500	1.65	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.58	<0.400	<0.500	0.950	<0.400	<0.500	0.590	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	0.461	<0.400	<0.400	9.43	<0.400	<0.500	2.340	<0.400	<0.500	1.440	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	8.68	<0.400	<0.500	1.370	<0.400	<0.500	0.897	<0.400
MW-21i-105	06/10/08	<2	<2	<2	<2	2	<2	<2	15.8	<2	<2	53.2	<2	<0.50	25.1	<2
	09/18/08	<1	<0.500	<0.500	<1	0.78	<0.500	<0.500	5.42	<0.500	<0.500	2.97	<0.500	<0.50	1.77	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	0.88	61	<0.50	<0.50	33	0.87	<0.50	17	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	61	<0.50	<0.50	0.76	<0.50	<0.50	0.7	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	76	<0.50	<0.50	4.3	0.6	<0.50	3.4	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	73	<0.50	<0.50	11	0.59	<0.50	6.7	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	60	<0.50	<0.50	14	0.65	<0.50	9.3	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	64	<0.50	<0.50	6.2	0.58	<0.50	7.6	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	0.63	60	<0.50	<0.80	29	0.84	<0.50	22	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	75	<0.5	<0.5	5.2	0.55	<0.50	5.1	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	2	<0.5	0.52	72	<0.5	<0.5	27	0.91	<0.50	14	<0.50
	03/09/11	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	0.69	61	<0.50	<0.50	32	1.1	<0.50	17	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	0.61	63	<0.5	<0.5	29	0.7	<0.5	17	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	88	<0.50	<0.50	12	0.59	<0.50	12	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	73	<0.50	<0.50	15	0.58	<0.50	9.3	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-21i-105	03/07/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	38	<0.50	<0.50	5.6	<0.50	<0.50	5.7	<0.50
(continued)	06/20/12	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	52	<0.5	<0.5	1.4	<0.5	<0.5	3	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	0.82	<0.50	<0.50	34	<0.50	<0.50	5	<0.50	<0.50	6.3	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	60	1	<0.50	13	<0.50	<0.50	15	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	42	<0.50	<0.50	2.4	<0.50	<0.50	3.7	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	48	<0.50	<0.50	1.2	<0.50	<0.50	9.9	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	51	<0.50	<0.50	2.8	<0.50	<0.50	4.2	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	61	1.6	<0.50	4	<0.50	<0.50	5.4	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	52	<0.50	<0.50	4.4	<0.50	<0.50	6.8	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	5.4	<0.50	<0.50	3.3	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	37	<0.50	<0.50	5.4	<0.50	<0.50	9.6	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13.3	<0.50	<0.50	6.6	<0.50	<0.50	5.4	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20.8	<0.50	<0.50	3.5	<0.50	<0.50	4	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	41.4	<0.50	<0.50	3.4	<0.50	<0.50	5.4	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	0.79	<0.50	<0.50	28.5	<0.50	<0.50	4.9	<0.50	<0.50	8.1	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11.7	<0.50	<0.50	5.8	<0.50	<0.50	5.1	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	<0.5	5.7	<0.5	<0.5	2.9	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.7	<0.50	<0.50	7.6	<0.50	<0.50	4.1	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.3	<0.50	<0.50	5.7	<0.50	<0.50	3.9	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	13.0	<0.50	<0.50	7.4	<0.50	<0.50	6.4	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.7	<0.500	<0.500	0.5	<0.500	<0.500	0.477 J	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.9	<0.500	<0.500	1.8	<0.500	<0.500	1.3	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	0.82	<0.400	<0.400	36.4	<0.400	<0.500	8.6	<0.400	<0.500	11.0	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	8.6	<0.400	<0.500	9.5	<0.400	<0.500	5.9	<0.400
	3/21/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.04	<0.400	<0.500	1.08	<0.400	<0.500	0.760	<0.400
	6/6/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.11	<0.400	<0.500	3.90	<0.400	<0.500	2.38	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.08	<0.400	<0.500	4.93	<0.400	<0.500	2.62	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.09	<0.400	<0.500	5.61	<0.400	<0.500	2.79	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-21i-40	09/18/08	<1	<0.500	<0.500	<1	7.48	<0.500	4.38	124	0.77	<0.500	107	2.01	<0.500	133	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	3.6	130	0.84	<0.50	100	1.6	<0.50	110	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	6.2	<0.50	3.6	130	0.63	<0.50	77	1.3	<0.50	88	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	3.1	120	0.79	<0.50	71	1.5	<0.50	88	<0.50
	09/18/09	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	3.2	120	1	<0.50	75	1.3	<0.50	92	0.55
	12/16/09	<0.50	<0.50	<0.50	<0.50	5.7	<0.50	2.6	120	1	<0.50	90	1.2	<0.50	89	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	5.5	<0.50	2.8	120	0.74	<0.50	84	1.1	<0.50	91	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	2.4	120	0.89	<0.50	62	1.2	<0.50	64	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	4.9	<0.5	2.2	110	0.73	<0.5	68	0.93	<0.5	75	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	5.1	<0.5	2.3	110	0.77	<0.5	72	1	<0.5	69	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.9	100	0.64	<0.50	53	1	<0.50	57	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	4.7	<0.5	2.1	110	0.7	<0.5	50	0.96	<0.5	55	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	5	<0.50	1.9	110	0.65	<0.50	54	1.1	<0.50	57	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	2.1	110	0.66	<0.50	61	0.96	<0.50	60	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	2.1	110	0.76	<0.50	74	1.5	<0.50	58	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	5	<0.5	2	160	0.84	<0.5	19	0.81	<0.5	23	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	5	<0.50	1.8	110	0.63	<0.50	50	1.1	<0.50	48	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	2	120	0.69	<0.50	74	1.1	<0.50	53	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.8	120	0.6	<0.50	43	0.83	<0.50	42	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	48	<0.50	<0.50	12	<0.50	<0.50	9.9	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	1.4	100	0.53	<0.50	38	0.68	<0.50	33	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.3	100	1	<0.50	41	0.73	<0.50	37	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	1.5	100	0.61	<0.50	40	0.76	<0.50	34	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	1.3	100	0.51	<0.50	33	0.65	<0.50	29	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	4	<0.50	1.4	100	86	<0.50	31	0.51	<0.50	32	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	1.4	100	0.6	<0.50	30	0.51	<0.50	32	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	1.5	102	0.51	<0.50	43.6	<0.50	<0.50	37.2	<0.50
	6/19/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.76	61.6	<0.50	<0.50	24.7	<0.50	<0.50	21.8	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	0.95	84.2	<0.50	<0.50	26.3	<0.50	<0.50	26.6	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	0.7	63.6	<0.50	<0.50	24.7	<0.50	<0.50	21.1	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-21i-40 (continued)	3/9/2016	<0.50	<2	<0.50	<0.50	2.1	<0.50	<0.50	58.6	<0.50	<0.50	14.2	<0.50	<0.50	15.1	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	2.3	<0.50	0.8	67.8	<0.50	<0.50	18.1	<0.50	<0.50	17.1	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	2.6	<0.50	0.87	77.2	<0.50	<0.50	20.1	<0.50	<0.50	19.8	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	2.4	<0.50	0.83	74.2	<0.50	<0.50	21.4	<0.50	<0.50	19.4	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	2.6	<0.5	0.91	87.6	0.58	<0.5	21.8	<0.5	<0.5	16.2	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	2.3	<1.0	0.63	63.6	0.56	<0.50	24.1	<0.50	<0.50	15.1	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	2.3	<1.0	0.70	60.0	<0.50	<0.50	18.1	<0.50	<0.50	15.0	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	2.6	<0.50	0.84	65.4	0.63	<0.50	17.4	<0.50	<0.50	14.6	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	2.1	<0.500	0.64	55.1	0.391 J	<0.500	22.5	<0.500	<0.500	16.5	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	2.6	<0.500	0.75	63.2	0.53	<0.500	26.0	0.145 J	<0.500	17.0	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	2.5	<0.400	0.70	62.1	0.69	<0.500	24.5	<0.400	<0.500	17.1	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	2.4	<0.400	0.67	59.1	0.48	<0.500	32.7	<0.400	<0.500	19.3	<0.400
	3/21/2019	<1.00	<5.00	<1.00	<1.00	2.48	<0.400	0.700	48.8	0.500	<0.500	24.6	<0.400	<0.500	16.2	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	2.23	<0.400	0.730	60.9	0.470	<0.500	24.1	<0.400	<0.500	16.9	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	2.48	<0.400	0.768	55.5	0.657	<0.500	22.5	<0.400	<0.500	14.9	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	2.5	<0.400	0.614	56.3	0.521	<0.500	32.1	<0.400	<0.500	19.1	<0.400
MW-22i	06/10/08	<1	<1	<1	<1	1.02	<1	<1	30	<1	<1	10.3	<1	<1	30	<1
	09/17/08	<1	<0.500	<0.500	<1	7.48	<0.500	4.38	124	0.77	<0.500	107	2.01	<0.500	133	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.73	63	<0.50	<0.50	1.1	<0.50	<0.50	6.8	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	0.64	50	<0.50	<0.50	2.5	<0.50	<0.50	14	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.52	39	<0.50	<0.50	8.5	<0.50	<0.50	24	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	0.57	40	<0.50	<0.50	3.3	<0.50	<0.50	21	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	28	<0.50	<0.50	3.8	<0.50	<0.50	20	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	34	<0.50	<0.50	2.6	<0.50	<0.50	16	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	17	<0.50	<0.50	4	<0.50	<0.50	18	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	0.75	<0.5	<0.5	24	<0.5	<0.5	3.6	<0.5	<0.5	18	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	0.73	<0.5	<0.5	21	<0.5	<0.5	3.5	<0.5	<0.5	18	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	17	<0.50	<0.50	3.6	<0.50	<0.50	17	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	18	<0.5	<0.5	1.8	<0.5	<0.5	12	<0.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-22i (continued)	09/14/11	<0.50	<0.50	<0.50	<0.50	0.55	<0.50	<0.50	18	<0.50	<0.50	1.3	<0.50	<0.50	11	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	17	<0.50	<0.50	2.5	<0.50	<0.50	14	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	13	<0.50	<0.50	2.4	<0.50	<0.50	13	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	12	<0.5	<0.5	1.9	<0.5	<0.5	11	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	16	<0.50	<0.50	1.5	<0.50	<0.50	10	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13	<0.50	<0.50	1.8	<0.50	<0.50	11	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	2.2	<0.50	<0.50	11	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	1.1	<0.50	<0.50	9.6	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	1.4	<0.50	<0.50	8.2	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	1.3	<0.50	<0.50	9.6	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9	<0.50	<0.50	1.1	<0.50	<0.50	5.7	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.8	<0.50	<0.50	1.7	<0.50	<0.50	9.8	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.2	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.2	<0.50	<0.50	1.8	<0.50	<0.50	8.7	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.6	<0.50	<0.50	1.6	<0.50	<0.50	9	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	10	<0.50	<0.50	2.1	<0.50	<0.50	1.15	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8	<0.50	<0.50	2.2	<0.50	<0.50	12	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	1	<0.50	<0.50	7.9	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.1	<0.50	<0.50	1.3	<0.50	<0.50	9	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.6	<0.50	<0.50	2	<0.50	<0.50	10.2	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	10	<0.5	<0.5	1.1	<0.5	<0.5	9.7	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	9.6	<0.50	<0.50	0.63	<0.50	<0.50	6.2	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	8.8	<0.50	<0.50	0.88	<0.50	<0.50	6.3	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	9.7	<0.50	<0.50	1.20	<0.50	<0.50	6.4	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	0.330 J	<0.500	<0.500	9.6	<0.500	<0.500	1.76	<0.500	<0.500	7.8	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.52	<0.500	<0.500	12.4	<0.500	<0.500	2.77	<0.500	<0.500	8.1	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	0.42	<0.400	<0.400	12.5	<0.400	<0.500	2.42	<0.400	<0.500	6.8	<0.400
	12/5/2018	<1.00	<5.00	<1.00	<1.00	0.47	<0.400	<0.400	11.7	<0.400	<0.500	3.34	<0.400	<0.500	8.2	<0.400

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-22i (continued)	3/21/2019	<1.00	<5.00	<1.00	<1.00	0.510	<0.400	<0.400	12.2	<0.400	<0.500	1.24	<0.400	<0.500	4.92	<0.400
	6/6/2019	<1.00	<5.00	<1.00	<1.00	0.584	<0.400	<0.400	15.5	<0.400	<0.500	2.22	<0.400	<0.500	7.22	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	0.577	<0.400	<0.400	15.5	<0.400	<0.500	3.12	<0.400	<0.500	6.88	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	0.461	<0.400	<0.400	15.2	<0.400	<0.500	1.94	<0.400	<0.500	7.35	<0.400
MW-23i	06/10/08	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	06/10/08 DUP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	07/02/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/06/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/19/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	<0.50	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-23i (continued)	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.78	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.207 J	<0.500	<0.500	0.402 J	<0.500	<0.500	0.215 J	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.202 J	<0.500	<0.500	0.247 J	<0.500	<0.500	0.212 J	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	3/22/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	0.59	<0.400	<0.500	<0.400	<0.400
	12/5/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-24i	10/01/10	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	0.94	52	<0.50	<0.50	52	1.9	<0.50	29	<0.50
	12/10/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	6.3	<0.5	<0.5	2	<0.5
	03/14/11	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	15	<0.50	<0.50	23	1	<0.50	7.4	<0.50
	06/07/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	6.6	<0.5	<0.5	1.4	<0.5
	09/16/11	<0.50	<0.50	<0.50	<0.50	13	<0.50	2.5	270	1.7	<0.50	27	5.6	<0.50	24	19
	12/07/11	<0.50	<0.50	<0.50	<0.50	5	<0.50	0.84	100	<0.50	<0.50	19	2.9	<0.50	14	7.5
	03/12/12	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	79	<0.50	<0.50	30	2.3	<0.50	11	4.5
	06/22/12	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	14	<0.5	<0.5	0.85	<0.5	<0.5	<0.5	2.6
	09/14/12	<0.50	<0.50	<0.50	<0.50	4.4	<0.50	0.87	58	<0.50	<0.50	31	0.79	<0.50	20	<0.50
	12/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	2.1	<0.50	<0.50	0.65	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-24i (continued)	03/15/13	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	48	<0.50	<0.50	23	0.57	<0.50	15	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	28	<0.50	<0.50	6.2	<0.50	<0.50	3.6	<0.80
	09/20/13	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	15	<0.50	<0.50	15	<0.50	<0.50	5.9	<0.80
	12/16/13	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	8.4	<0.50	<0.50	6.7	<0.50	<0.50	3.4	<0.50
	3/24/2014	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	16	<0.50	<0.50	10	<0.50	<0.50	5.5	<0.80
	6/23/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	13	<0.50	<0.50	1.3	<0.50	<0.50	5.2	2.1
	9/30/2014	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	21	<0.50	<0.50	20	<0.50	<0.50	10	<0.50
	12/15/2014	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	12	<0.50	<0.50	2.4	<0.50	<0.50	1.1	<0.50
	3/20/2015	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	5.9	<0.50	<0.50	6.1	<0.50	<0.50	3.1	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	4.7	<0.50	<0.50	2.2	<0.50	<0.50	0.8	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	18	<0.50	<0.50	189	<0.50	<0.50	36.4	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	<0.50	4.1	<0.50	<0.50	1.6	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	0.99	<0.50	<0.50	7.8	<0.50	<0.50	11.5	<0.50	<0.50	6.3	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	0.53	<0.50	<0.50	5.4	<0.50	<0.50	5.8	<0.50	<0.50	3.1	<0.50
	12/12/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	3.2	<0.50	<0.50	6.6	<0.50	<0.50	2.8	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	2.10	<1.0	<0.50	24.5	<0.50	<0.50	30.1	<0.50	<0.50	16.6	<0.50
	11/9/2017	<2.0	<2.0	<0.50	<0.50	1.10	<0.50	<0.50	9.6	<0.50	<0.50	12.7	<0.50	<0.50	5.9	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	1.42	<0.500	<0.500	13.5	<0.500	<0.500	19.1	<0.500	<0.500	10.2	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	1.44	<0.500	<0.500	13.6	1.09	<0.500	10.3	<0.500	<0.500	5.9	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	2.18	<0.400	<0.400	25.0	<0.400	<0.500	24.8	<0.400	<0.500	14.3	<0.400
	12/4/2018	<1.00	<5.00	<1.00	<1.00	0.80	<0.400	<0.400	5.1	<0.400	<0.500	10.2	<0.400	<0.500	3.8	<0.400
	3/25/2019	<1.00	<5.00	<1.00	<1.00	0.888	<0.400	<0.400	8.46	<0.400	<0.500	11.7	<0.400	<0.500	5.91	<0.400
	6/7/2019	<1.00	<5.00	<1.00	<1.00	0.601	<0.400	<0.400	4.99	<0.400	<0.500	7.39	<0.400	<0.500	3.55	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	0.775	<0.400	<0.400	3.82	<0.400	<0.500	8.78	<0.400	<0.500	3.72	<0.400
MW-24d	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-24d (continued)	09/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	4	<0.50	<0.50	1.6	<0.50
	6/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	10/2/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	3.8	<0.50	<0.50	1.7	<0.50
	9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.259 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.199 J
	6/27/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.275 J
	9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/10/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	3/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/4/2019	<4.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	0.42	<0.400	<0.400	1.00	<0.400	<0.500	1.62	<0.400	<0.500	0.85	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-25i	09/16/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/15/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/29/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.81	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.245 J	<0.500	<0.500	0.248 J	<0.500	<0.500	<0.500	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.274 B J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-25i (continued)	3/22/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/4/2019	<4.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/3/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.54	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-26	09/16/11	<2	<2	<2	<2	7	<2	2.2	120	2.6	<2	250	5.7	<2	490	<2
	12/08/11	<2	<2	<2	<2	7.1	<2	2.5	110	2.2	<2	300	5.8	<2	500	<2
	03/06/12	<2	<2	<2	<2	8.2	<2	2.2	99	<2	<2	210	4.6	<2	450	<2
	06/19/12	<2	<2	<2	<2	14	<2	3	90	<2	<2	160	5.2	<2	460	<2
	09/11/12	<2	<2	<2	<2	6.3	<2	2.3	110	3	<2	280	4.3	<2	460	<2
	12/12/12	<2	<2	<2	<2	5.6	<2	<2	120	3.7	<2	300	3.8	<2	470	<2
	03/13/13	<2	<2	<2	<2	4.9	<2	<2	83	<2	<2	210	2.9	<2	390	<2
	06/12/13	<2	<2	<2	<2	8.2	<2	<2	80	<2	<2	170	4.5	<2	360	<2
	09/18/13	<2	<2	<2	<2	5.7	<2	<2	96	2.4	<2	210	3.2	<2	410	<2
	12/11/13	<2	<2	<2	<2	7.8	<2	<2	75	<2	<2	150	3.9	<2	370	<2
	3/19/2014	<2	<2	<2	<2	4.9	<2	<2	95	2.1	<2	220	2.9	<2	350	<2
	6/24/2014	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	6.4	49	0.86	<0.50	150	2.1	<0.50	200	<0.50
	9/24/2014	<2	<2	<2	<2	3.9	<2	<2	68	<2	<2	220	3.1	<2	340	<2
	12/9/2014	<0.90	<0.90	<0.90	<0.90	3.8	<0.90	0.96	55	1.3	<0.90	160	2.8	<0.90	280	<0.90
	3/17/2015	<1	<1	<1	<1	5.8	<1	1.7	75.7	1.8	<1	265	3.7	<1	458	<1
	6/16/2015	<1.7	<1.7	<1.7	<1.7	5	<1.7	<1.7	77.9	<1.7	<1.7	205	2.8	<1.7	385	<1.7
	9/21/2015	<1.7	<1.7	<1.7	<1.7	4.3	<1.7	<1.7	72.4	1.7	<1.7	176	2.7	<1.7	326	<1.7
	12/7/2015	<1.2	<1.2	<1.2	<1.2	8.5	<1.2	1.7	75	1.6	<1.2	179	3.5	<1.2	393	<1.2
	3/8/2016	<1.2	<5	<1.2	<1.2	8	<1.2	1.5	76.1	1.8	<1.2	171	3.7	<1.2	370	<1.2
	6/15/2016	<1	<4	<1	<1	4.6	<1	1.4	83.1	2.2	<1	192	2.2	<1	343	<1
	9/27/2016	<0.50	<2	<0.50	<0.50	3.9	<0.50	1.1	61.1	1.6	<0.50	160	2.4	<0.50	288	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	8.9	<0.50	2.4	85.9	2	<0.50	167	3.3	<0.50	410	<0.50
	3/29/2017	<5	<20	<5	<5	<5	<5	<5	170	<5	<5	214	<5	<5	452	<5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	6.7	<1.0	1.9	113	2.0	<0.50	160	2.1	<0.50	311 E, J	0.65
	9/26/2017	<2.0	<2.0	<0.50	<0.50	5.1	<1.0	1.0	192	2.1	<0.50	68	0.8	<0.50	192	0.98
	11/8/2017	<2.0	2	<0.50	<0.50	4.8	<0.50	1.5	204	2.3	<0.50	88	1.0	<0.50	170	1.80

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-26 (continued)	3/20/2018	<0.500	0.633 J	0.149 J	<0.500	4.9	<0.500	1.4	157	1.9	<0.500	108	1.2	<0.500	190	1.75
	6/29/2018	<0.500	<2.50	<0.500	<0.500	5.1	<0.500	1.5	114	1.9	<0.500	138	1.9	<0.500	221	1.02
	9/24/2018	<1.00	<5.00	<1.00	<1.00	4.2	<0.400	1.2	141	2.1	<0.500	117	1.2	<0.500	233	1.18
	12/5/2018	<2.00	<10.0	<2.00	<2.00	3.0	<0.800	1.1	147	1.9	<1.00	139	0.8	<1.00	210	0.85
	3/22/2019	<2.00	<10.0	<2.00	<2.00	7.74	<0.800	2.18	142	3.18	<1.00	139	2.09	<1.00	383	<0.800
	6/3/2019	<20.0	<25.0	<5.00	<5.00	5.75	<2.00	<2.00	92.2	2.35	<2.50	148	2.10	<2.50	336	<2.00
	9/26/2019	<5.00	<25.0	<5.00	<5.00	5.14	<2.00	<2.00	104	2.6	<2.50	133	<2.00	<2.50	272	<2.00
	12/3/2019					2.63	<2.00	<2.00	95	<2.00	<2.50	137	<2.00	<2.50	216	<2.00
MW-32s	03/24/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.79	<0.50	--	<0.50	<0.50
	08/18/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/14/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	07/02/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/07/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	0.94	<0.5	<0.5	1.1	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-32s (continued)	3/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2015	<0.50	<0.50	0.77	<0.50	1.5	<0.50	<0.50	73.5	2.5	<0.50	<0.50	3.5	<0.50	52	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	10/1/2018	<2.0	<2.0	<0.50	<0.50	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/10/2018	<0.500	<2.50	<0.500	<0.500	0.860	<0.400	<0.400	16.5	<0.400	<0.500	14.7	<0.400	<0.500	5.99	<0.400
	3/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	9/26/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-32i	11/10/17	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	8.2	<0.50	<0.50	3.4	<0.50
MW-F	06/14/95	--	<10	<5	<5	<5	5	<5	15	<5	--	<5	<5	--	<5	<10
	02/27/01	<1	<5	<0.50	<0.50	0.754	<0.50	<0.50	5.99	<0.50	<0.50	0.506	<1	--	1.18	<0.50
	05/29/01	<1	<5	<0.50	<0.50	0.58	<0.50	<0.50	6.47	<0.50	<0.50	<0.50	<1	--	0.585	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	6.5	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	12/18/01	<1	<5	<0.50	<0.50	1.44	<0.50	<0.50	17.9	<0.50	<0.50	<0.50	<1	--	0.709	<0.50
	03/18/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/31/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/28/02	<1	<0.50	<0.50	<1	1.12	0.65	<0.50	9.54	<0.50	<0.50	<0.50	<0.50	--	0.69	<0.50
	11/08/02	<1	<0.50	<0.50	<1	1.15	0.81	<0.50	9.86	<0.50	<0.50	<0.50	<0.50	--	0.65	<0.50
	01/23/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/29/03	<1	<0.50	<0.50	<1	1.11	0.83	<0.50	10.6	<0.50	<0.50	<0.50	<0.50	--	0.62	<0.50
	11/10/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MW-F (continued)	01/26/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/04/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/15/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/24/05	<1	<0.50	<0.50	<1	0.87	0.64	<0.50	8.31	<0.50	<0.50	0.52	<0.50	--	0.74	<0.50
	05/17/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/18/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/14/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/13/07	<1	<0.50	<0.50	<1	0.5	0.52	<0.50	5.93	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	09/18/08	<1	<0.500	<0.500	<1	0.85	0.72	<0.500	8.57	<0.500	<0.500	<0.500	<0.500	<0.500	0.57	<0.500
EW-1	04/25/91	--	<2	--	--	35	20	--	750	--	--	9,100	280	--	440	9.3
	11/17/93	--	<200	---	--	<100	<100	--	1,700	--	--	8,600	<100	--	480	<200
	09/01/95	<25	<50	<25	<25	<25	<25	<25	140	<25	<25	2,400	74	--	340	<50
	09/24/96	<1	<4	3	<0.4	8.5	2.1	<0.40	260	6.2	<0.40	49	34	--	29	89
	12/02/96	0.7	<0.50	1.9	<0.20	5.7	5	1	530	3.3	<0.20	310	86	--	98	10
	11/12/97	<2.5	<5	<2.5	<2.5	5.05	3.38	<2.5	68.5	4.91	<2.5	111	5.1	--	47.4	9.2
	08/11/99	<10	<50	<5	<5	<5	<5	<5	14.5	<5	<5	369	<10	--	39.9	<5
	11/16/99	<5	<12.5	<2.5	<5	<2.5	3.15	<2.5	41.7	3	<2.5	314	6.9	--	35.5	5.1
	02/29/00	<2	<10	<1	<1	<1	6.42	<1	13.7	<1	<1	97.3	3.48	--	20.8	<1
	06/27/00	<2	<10	2.12	<1	<1	6.42	<1	17.5	<1	<1	293	5.37	--	35.1	<1
	08/31/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	31.9	<2.5	<2.5	325	<5	--	38.4	<2.5
	01/30/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	45.6	<2.5	<2.5	380	5.86	--	53.9	<2.5
	02/27/01	<2	<10	1.42	<1	2.51	2.83	<1	35	<1	<1	240	7.98	--	47.5	2.43
	05/29/01	<10	<50	<5	<5	<5	<5	<5	22.4	<5	<5	338	<10	--	61.1	<5
	09/25/01	<5	<5	<5	<5	<5	<5	<5	14	<5	<5	320	9.5	--	61	<5
	12/17/01	<2	<10	<1	<1	1.19	<1	<1	25.8	<1	<1	217	12.8	--	47.1	<1
	03/19/02	<2	<1	<1	<2	1.04	<1	<1	17.5	<1	<1	323	5.66	--	46.1	<1
	05/30/02	<2	<1	1.38	<2	1	1.68	<1	23.5	<1	<1	319	6.46	--	39.9	<1
	08/29/02	<2	<1	1.36	<2	2.44	1.24	<1	20.4	<1	<1	307	3.38	--	37.8	<1
	11/08/02	<2	<1	1.46	<2	3.02	3.96	<1	28.4	<1	<1	274	5.54	--	50.2	<1

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
EW-1 (continued)	01/23/03	<2	<1	1.36	<2	2.34	<1	<1	17	<1	<1	252	5.06	--	51.9	<1
	05/30/03	<2	<1	5.22	<2	<1	<1	<1	6.12	<1	<1	255	5.06	--	41.1	<1
	11/10/03	<5	<5	<5	<5	<5	<5	<5	9	<5	<5	85.8	<5	--	16.2	<5
	01/27/04	<1	<0.50	2.07	<1	0.87	0.78	<0.50	5.2	<0.50	<0.50	151	4.26	--	37.6	<0.50
	05/04/04	<1	<1	4.73	<1	<1	1.25	<1	4.36	<1	<1	168	3.09	--	30.8	<1
	08/17/04	<1	<0.50	3.76	<0.50	0.81	1.86	<0.50	6.83	<0.50	<0.50	144	1.73	--	23.2	<0.50
	11/17/04	<2.5	<2.5	4	<2.5	<2.5	<2.5	<2.5	9.6	<2.5	<2.5	180	3.6	--	33	<2.5
	05/18/05	<2	<1	<1	<2	<1	<1	<1	8.28	<1	<1	207	<1	--	23.2	2.3
	11/14/05	<2	<1	1.06	<2	1.36	2.7	<1	11.1	<1	<1	187	<1	--	26.1	<1
	06/05/06	<1	<1	2.4	<1	<1	<1	<1	6.18	<1	<1	102	3.55	--	19.1	<1
	12/06/06	<1	<0.50	2.07	<1	1.13	<0.50	<0.50	8.98	<0.50	<0.50	133	2.1	--	28.3	<0.50
	09/12/07	<1	<0.50	2.66	<1	0.51	1.14	<0.50	6.28	<0.50	<0.50	76.9	1.47	--	18.3	<0.50
	03/06/08	<1	<0.500	1.71 J	<1	0.64	1.04	<0.500	5.75	<0.500	<0.500	80.9	1.45	<0.500	19.9	<0.500
	09/19/08	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	14.6	<2.50	<2.50	86.1	<2.50	<2.50	20.8	<2.50
	03/26/09	<0.50	<0.50	3.6	<0.50	<0.50	0.76	<0.50	3.8	<0.50	<0.50	81	1	<0.50	14	<0.50
	09/17/09	<0.50	<0.50	3.4	<0.50	0.63	<0.50	<0.50	8.3	<0.50	<0.50	100	0.74	<0.50	17	<0.50
	03/19/10	<0.50	<0.50	3.5 BE	<0.50	<0.50	<0.50	0.52	4.1	<0.50	<0.50	89	1.5	<0.50	22	<0.50
	09/23/10	<0.50	<0.50	1.7 BE	<0.50	0.86	0.94	<0.50	10	<0.50	<0.50	87	0.64	<0.50	17	<0.50
	03/10/11	<0.50	<0.50	5.2	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	67	0.89	<0.50	13	<0.50
	09/16/11	<0.50	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	75	0.69	<0.50	9.9	<0.50
	03/12/12	<0.50	<0.50	4.4	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	52	0.68	<0.50	13	<0.50
	09/13/12	<0.50	<0.50	1.7	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	60	0.58	<0.50	8.6	<0.50
	03/15/12	<0.50	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	78	0.63	<0.50	12	<0.50
	09/19/13	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	63	0.57	<0.50	14	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	32	1.6	<0.50	12	<0.50
	9/27/2014	Insufficient water for sampling during monitoring event.														
	9/21/2015	<0.50	<0.50	2	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	45.3	0.56	<0.50	12.5	<0.50
	3/8/2016	<0.50	<2	2	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	62.6	0.83	<0.50	14.3	<0.50
	9/29/2016	<0.50	<2	1.1	<0.50	<0.50	1.5	<0.50	5.4	<0.50	<0.50	38.6	<0.50	<0.50	10.5	<0.50
	3/30/2017	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.7	<0.50	<0.50	2.4	<0.50
	9/28/2017	<2.0	<2.0	2.4	<0.50	<0.50	<1.0	<0.50	1.8	<0.50	<0.50	32.4	<0.50	<0.50	7.2	<0.50
	11/9/2017	<2.0	<2.0	0.91	<0.50	<0.50	<0.50	<0.50	3.30	<0.50	<0.50	33.0	0.66	<0.50	7.3	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
EW-1 (continued)	7/1/2018	<0.500	<2.50	1.94	<0.500	0.134 J	<0.500	<0.500	1.15 B	<0.500	<0.500	30.7	0.56	<0.500	7.6	<0.500
	9/27/2018	<1.00	<5.00	1.15	<1.00	0.41	1.03	<0.400	3.18	<0.400	<0.500	29.7	0.41	<0.500	8.4	<0.400
	3/25/2019	<1.00	<5.00	1.85	<1.00	<0.400	<0.400	<0.400	1.70	<0.400	<0.500	30.7	0.676	<0.500	11.2	<0.400
	6/4/2019	<1.00	<5.00	1.45	<1.00	<0.400	0.590	<0.400	2.56	<0.400	<0.500	27.4	0.690	<0.500	9.53	<0.400
	9/26/2019	<1.00	<5.00	1.54	<1.00	<0.400	<0.4	<0.400	2.39	<0.400	<0.500	24.4	0.482	<0.500	7.4	<0.400
	12/4/2019					<0.400	0.552	<0.400	3.34	<0.400	<0.500	28.3	0.488	<0.500	9.99	<0.400
S-1	08/10/99	<1	<5	<0.50	<1	<0.50	<0.50	<0.50	2.63	<0.50	<0.50	7.81	1.3	--	20.6	<0.50
	02/29/00	<1	<5	<0.50	<0.50	0.761	<0.50	<0.50	2.21	<0.50	<0.50	60.6	2.98	--	24.4	<0.50
	06/28/00	<5	<25	<2.5	<2.5	<2.5	<2.5	2.7	58.2	<2.5	<2.5	749	14.5	--	232	<2.5
	08/31/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	4.98	<2.5	<2.5	313	5.14	--	60.4	<2.5
	11/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.61	<0.50	<0.50	9.78	1.95	--	29.8	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.551	1.66	<0.50	<0.50	13.5	2.26	--	45.2	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	0.974	<0.50	<0.50	7.38	<1	--	12.6	<0.50
	09/25/01	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	4	2.7	<2.5	<2.5	39	18	--	210	<2.5
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.21	<0.50	--	3.73	<0.50
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.45	<0.50	--	10.4	<0.50
	11/07/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.34	<0.50	<0.50	8.71	1.02	--	19.7	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.78	<0.50	<0.50	6.15	0.56	--	13	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.500	--	8.67	<0.50
	11/11/03	<1	<1	<1	<1	<1	<1	<1	1.85	<1	<1	4.22	<1	--	13.2	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.57	0.67	--	15.5	<0.50
	05/04/04	<1	<1	<1	<1	<1	<1	<1	1.17	<1	<1	4.07	<1	--	10.6	<1
	11/15/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	8.4	0.82	--	18	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	1.89	<0.50	--	2.87	<0.50
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.24	<0.50	<0.50	3.73	<0.50	--	8.39	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	3.63	<1	<1	4.02	<1	--	6.85	<1
	12/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.61	<0.50	<0.50	4.87	<0.50	--	8.44	<0.50
	03/05/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	5.15	<0.500	<0.500	<0.500	4.14	<0.500	<0.500	<0.500
	06/25/08	<1	<1	<1	<1	<1	<1	<1	1.67	<1	<1	<1	1.37	<1	<1	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	5.55	<0.500	<0.500	2.81	<0.500	<0.500	6.07	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	0.62	<0.50	<0.50	1.4	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
S-1 (continued)	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.4	<0.50	<0.50	2.7	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	0.81	<0.50	<0.50	1.8	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.7	<0.50	<0.50	5	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.7	<0.50	<0.50	6.1	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1	<0.50
	07/02/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.66	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	0.77	<0.5	<0.5	3	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.66	<0.5
	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1.4	<0.50	<0.50	4	<0.50
	12/06/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	1.3	<0.50	<0.50	3.1	<0.50
	03/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	<0.50	<0.50	0.74	<0.50	<0.50	1.8	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.98	<0.5	<0.5	0.94	<0.5	<0.5	3.5	<0.5
	09/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	0.88	<0.50	<0.50	2.6	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	0.96	<0.50	<0.50	3.8	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.78	<0.50	<0.50	1.5	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	2.2	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1.8	<0.50	<0.50	5.4	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	1.2	<0.50	<0.50	5.1	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.82	<0.50	<0.50	2.1	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1.3	<0.50	<0.50	4.3	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	1.3	<0.50	<0.50	4.9	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	1.4	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1.6	<0.50	<0.50	5.1	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
S-1 (continued)	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	0.73	<0.50	<0.50	3	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	0.54	<0.50	<0.50	1.6	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	1.01	<0.500	0.336 J	3.62	<0.500	<0.500	3.16	0.90	<0.500	24.20	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	0.51	<0.400	<0.400	2.58	<4.00	<0.500	2.11	0.41	<0.500	10.40	<0.400
	12/5/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.10	<4.00	<0.500	1.94	<0.400	<0.500	7.39	<0.400
	3/19/2019	<1.00	<5.00	<1.00	<1.00	0.764	<0.400	<0.400	6.27	<0.400	<0.500	0.921	<0.400	<0.500	3.60	<0.400
	6/5/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.11	<0.400	<0.500	0.783	<0.400	<0.500	2.17	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.86	<0.400	<0.500	1.1	<0.400	<0.500	2.71	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.988	<0.400	<0.500	0.971	<0.400	<0.500	2.86	<0.400
S-2	08/11/99	<1	<5	<0.50	<0.50	2.37	<0.50	<0.50	<0.50	<0.50	<0.50	1.7	<1	--	0.843	<0.50
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	4.4	<0.50	--	1.6	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	1.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	3.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	4.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	5.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
S-2 (continued)	6/16/2016	<0.50	<2	<0.50	<0.50	4.3	<0.50	<0.50	6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	6.2	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	3.5	<0.50	<0.50	4.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	2.6	<0.5	<0.5	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	3.3	<1.0	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	8.0	<1.0	<0.50	13.2	<0.50	<0.50	<0.50	0.86	<0.50	0.51	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	7.1	<0.50	<0.50	12.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2018	<0.500	<2.50	<0.500	<0.500	3.7	<0.500	<0.500	5.9	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	4.1	<0.500	<0.500	23.2	0.56	<0.500	<0.500	1.00	<0.500	2.34	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	10.0	<0.400	<0.400	50.9	0.70	<0.500	<4.00	1.74	<0.500	4.00	0.42
	12/5/2018	<1.00	<5.00	<1.00	<1.00	7.0	<0.400	<0.400	28.5	<4.00	<0.500	<0.400	<0.400	<0.500	2.18	<0.400
	3/19/2019	<1.00	<5.00	<1.00	<1.00	2.65	<0.400	<0.400	8.23	<4.00	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	6/5/2019	<1.00	<5.00	<1.00	<1.00	5.38	<0.400	<0.400	19.8	<0.400	<0.500	<0.400	<0.400	<0.500	0.925	<0.400
	9/25/2019	<1.00	<5.00	<1.00	<1.00	8.88	<0.400	<0.400	49.6	0.64	<0.500	<0.400	0.94	<0.500	2.85	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	7.12	<0.400	<0.400	30.5	<0.400	<0.500	<0.400	<0.400	<0.500	1.75	<0.400
MGMS1-3(43)	06/28/00	<50	<250	<25	<25	278	<25	55.9	4,270	<25	<25	734	<50	--	1,840	<25
	08/30/00	<200	<1	<100	<100	420	<100	116	8,850	<100	<100	5,940	<200	--	3,040	<100
	11/29/00	<100	<500	<50	<50	249	<50	76.2	4,560	<50	<50	1,210	<100	--	1,140	<50
	02/27/01	<100	<500	<50	<50	697	<50	164	14,000	<50	<50	148	<100	--	1,390	133
	05/31/01	<100	<500	<50	<50	<50	<50	<50	5,870	<50	<50	130	<100	--	599	<50
	09/24/01	<13	<13	<13	<13	150	<13	32	4,700	<13	<13	310	<13	--	450	25
	12/18/01	<50	<250	<25	<25	153	<25	33.3	3,600	<25	<25	276	<50	--	568	<25
	03/19/02	<100	<50	<50	<100	310	<50	103	6,700	<50	<50	2,090	<50	--	1,720	86
	05/29/02	<50	<25	<25	<50	188	<25	39	4,700	<25	<25	470	<25	--	624	37.5
	08/29/02	<1	<0.50	<0.50	<1	3.72	<0.50	0.84	94.7	0.54	<0.50	34.9	0.75	--	35.7	1.46
	11/11/02	<100	<50	<50	<100	183	<50	<50	4,810	<50	<50	757	<50	--	831	51
	01/23/03	<100	<50	<50	<100	378	<50	76	10,500	<50	<50	782	<50	--	1,290	109
	05/28/03	<100	<50	<50	<100	402	<50	72	9,510	<50	<50	270	<50	--	841	114
	11/11/03	<50	<50	<50	<50	252	<50	<50	9,710	<50	<50	516	<50	--	1,020	58

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-3(43) (continued)	01/27/04	<50	<25	<25	<50	290	<25	54.5	8,160	53.5	<25	393	<25	--	808	95
	05/03/04	<100	<100	<100	<100	370	<100	<100	12,300	<100	<100	830	<100	--	1,520	111
	08/17/04	<100	<50	<50	<100	401	<50	114	12,700	109	<50	1,540	<50	--	2,340	151
	11/15/04	<120	<120	<120	<120	270	<120	<120	9,600	<120	<120	1,400	<120	--	1,600	<120
	03/24/05	<100	<50	<50	<100	481	<50	148	15,600	135	<50	1,390	<50	--	2,090	266
	05/16/05	<50	<25	<25	<50	327	<25	89	9,670	83	<25	802	<25	--	1,410	157
	05/17/05	<100	<50	<50	<100	353	<50	86	10,600	94	<50	920	<50	--	1,660	173
	11/17/05	<100	<50	<50	<100	392	<50	121	13,400	133	<50	1,310	<50	--	2,280	186
	06/06/06	<100	<100	<100	<100	385	<100	<100	11,800	115	<100	628	<100	--	1,370	192
	12/06/06	<100	<50	<50	<100	256	<50	72	9,960	92	<50	843	<50	--	1,260	155
	05/22/07	<100	<100	<100	<100	439	<100	119	14,200	152	<100	910	<100	--	1,920	245
	09/11/07	<100	<50	<50	<100	303	<50	109	11,700	128	<50	1,100	<50	--	2,060	189
	12/12/07	<100	<50	<50	<100	270	<50	75	8,740	93	<50	1,010	<50	--	1,540	167
	03/05/08	<50	<25	<25	<50	370	<25	128	6,740	220	<25	1,480	36	<25	2,350	234
	09/16/08	<100	<50	<50	<100	302	<50	112	10,400	139	<50	2,700	<50	<50	2,500	171
	12/08/08	<4	<4	<4	<4	190	<4	63	6,000	78	<4	1,300	19	<4	1,200	100
	03/25/09	<15	<15	<15	<15	110	<15	66	3,500	34	<15	3,600	49	<15	2,100	49
	09/15/09	<15	<15	<15	<15	140	<15	74	4,200	45	<15	4,300	44	<15	2,300	84
	12/14/09	<15	<15	<15	<15	140	<15	46	4,000	55	<15	1,500	15	<15	1,100	67
	03/17/10	<15	<15	<15	<15	160	<15	63	4,600	44	<15	2,800	32	<15	1,900	78
	06/14/10	<25	<25	<25	<25	220	<25	46	5,400	69	<25	790	<25	<25	900	85
	09/21/10	<15	<15	<15	<15	130	<15	55	3,800	43	<15	2,900	37	<15	1,900	68
	12/07/10	<15	<15	<15	<15	190	<15	63	5,500	69	<15	2,500	23	<15	1,800	96
	03/08/11	<20	<20	<20	<20	170	<20	52	4,600	56	<20	1,400	<20	<20	1,300	86
	06/06/11	<15	<15	<15	<15	190	<15	36	4,700	71	<15	610	<15	<15	790	97
	09/13/11	<20	<20	<20	<20	290	<20	78	8,000	160	<20	900	<20	<20	1,800	160
	03/08/12	<4	<40	<40	<40	340	<40	62	9,500	150	<40	240	<40	<40	690	890
	06/21/12	<20	<20	<20	<20	220	<20	25	4,400	76	<20	74	<20	<20	260	1,100
	09/12/12	<20	<20	<20	<20	280	<20	72	8,800	180	<20	360	<20	<20	970	890
	12/11/12	<20	<20	<20	<20	220	<20	40	6,100	110	<20	160	<20	<20	430	680

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-3(43) (continued)	03/12/13	<20	<20	<20	<20	220	<20	21	4,700	74	<20	110	<20	<20	340	1,600
	06/11/13	<20	<20	<20	<20	190	<20	<20	3,900	56	<20	78	<20	<20	260	1,100
	09/17/13	<15	<15	<15	<15	190	<15	21	4,600	66	<15	100	<15	<15	350	1,100
	12/10/13	<15	<15	<15	<15	210	<15	18	3,600	54	<15	95	<15	<15	270	1,800
	3/18/2014	<20	<20	<20	<20	150	<20	<20	3,600	40	<20	93	<20	<20	260	440
	6/26/2014	<7	<7	<7	<7	120	<7	14	2,000	14	<7	21	<7	<7	57	480
	9/23/2014	<15	<15	<15	<15	190	<15	35	4,700	69	<15	120	<15	<15	420	550
	12/12/2014	<7	<7	<7	<7	200	<7	23	4,000	52	<7	100	<7	<7	350	810
	3/19/2015	<12.5	<12.5	<12.5	<12.5	131	<12.5	<12.5	2,450	16.6	<12.5	31.7	<12.5	<12.5	129	249
	6/18/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	59.1	<0.50	<0.50	0.84	<0.50	<0.50	2.8	3.1
	9/21/2015	<10	<10	<10	<10	124	<10	14.1	2,810	24.8	<10	53.5	<10	<10	171	129
	12/8/2015	<0.50	<0.50	<0.50	<0.50	92	<0.50	<0.50	1,580	11.5	<0.50	26.2	<0.50	<0.50	88	230
	3/9/2016	<10	<40	<10	<10	93.9	<10	<10	1,700	12.4	<10	24.1	<10	<10	81.9	209
	6/17/2016	<8.3	<33.3	<8.3	<8.3	163	<8.3	26.6	3,130	36.1	<8.3	64.6	<8.3	<8.3	248	288
	9/30/2016	<8.3	<33.3	<8.3	<8.3	81.9	<8.3	13.5	1,980	24.2	<8.3	230	<8.3	<8.3	366	52
	12/16/2016	<8.4	<33.4	<8.4	<8.4	92.6	<8.4	9.5	1,810	20.1	<8.4	64.1	<8.4	<8.4	171	239
	3/31/2017	<8.4	<33.4	<8.4	<8.4	90.8	<8.4	12.5	1,430	15.2	<8.4	45.8	<8.4	<8.4	119	348
	6/12/2017	<8.3	<33.3	<8.3	<8.3	173	<8.3	16.7	2,620	18.7	<8.3	24.4	<8.3	<8.3	116	681
	9/29/2017	<2.5	<10.0	<2.5	<2.5	60	<2.5	6.9	901	12.9	<2.5	70.7	<2.5	<2.5	126	117
	11/7/2017	<10.0	<10.0	<2.5	<2.5	153	<2.5	13.7	2,350 J-	26.6	<2.5	108	<2.5	<2.5	211	181
	3/22/2018	<0.500	<2.50	<0.500	<0.500	192	<0.500	18.0	2,450	34.9	<0.500	80	0.8	0.200 J	278	236
	7/1/2018	<0.500	<2.50 J3	<0.500	<0.500	116	<0.500	13.8	1,880	32.8	<0.500	107	0.6	<0.500	246	118
	9/28/2018	<20.0	<100	<20.0	<20.0	141	<8.00	27.8	3,150	47.4	<10.0	252	<8.00	<10.0	528	134
	12/4/2018	<1.00	<5.00	<1.00	<1.00	148	<0.400	22.5	2,750	48.1	<0.500	146	1.1	<0.500	388	129
	3/26/2019	<40.0	<100	<20.0	<20.0	160	<8.00	22.3	3,210	42.2	<10.0	145	<8.00	<10.0	372	105
	6/7/2019	<20.0	<100	<20.0	<20.0	169	<8.00	26.5	3090	40.8	<10.0	115	<8.00	<10.0	315	145
	9/27/2019	<20.0	<100	<20.0	<20.0	156	<8.00	30.5	3240	53.9	<10.0	212	<8.00	<10.0	434	113
	12/4/2019	<20.0	<100	<20.0	<20.0	124	<8.00	17.5	2860	40.9	<10.0	162	<8.00	<10.0	398	11.8
MGMS1-2(60)	06/28/00	<10	<50	<5	<5	53.6	<5	<5	369	<5	<5	658	19.7	--	240	<5
	08/30/00	<20	<100	<10	<10	21.7	<10	13.1	267	<10	<10	2,590	108	--	586	<10
	11/29/00	<2	<10	<1	<1	1.58	<1	1.09	57.7	<1	<1	121	4.58	--	40.3	<1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-2(60) (continued)	02/27/01	<1	<5	<0.5	<0.5	0.838	<0.5	0.686	32.9	<0.5	<0.5	54.6	2.06	--	24.7	<0.5
	05/31/01	<1	<5	<0.50	<0.50	0.662	<0.50	0.581	39	<0.50	<0.50	69.4	<1	--	27.8	0.52
	09/24/01	<13	<13	<13	<13	<13	<13	<13	89	<13	<13	830	14	--	150	<13
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	20.4	<0.50	<0.50	12.8	<1	--	15.7	<0.50
	03/19/02	<1	<0.50	<0.50	<1	2.52	<0.50	0.99	68	<0.50	<0.50	62.9	1.2	--	34	3.48
	05/29/02	<1	<0.50	<0.50	<1	0.78	<0.50	<0.50	22.8	<0.50	<0.50	23.4	<0.50	--	14.2	0.6
	08/29/02	<10	<5	<5	<10	30.6	<5	5.1	661	<5	<5	138	<5	--	116	<5
	11/11/02	<1	<0.50	<0.50	<1	2.99	<0.50	0.83	86	<0.50	<0.50	38.2	1.16	--	38.9	<0.50
	01/23/03	<1	<0.50	<0.50	<1	1.53	<0.50	0.74	42.6	<0.50	<0.50	42.8	0.78	--	34.2	1.04
	05/28/03	<1	<0.50	<0.50	<1	2.87	<0.50	1.21	72	<0.50	<0.50	51.1	1.18	--	47.6	0.63
	11/11/03	<1	<1	<1	<1	1.84	<1	<1	48.8	<1	<1	45.9	<1	--	36	<1
	01/27/04	<1	<0.50	<0.50	<1	2.06	<0.50	1.06	72.3	0.69	<0.50	40.9	0.66	--	43.1	0.63
	05/03/04	<1	<1	<1	<1	4.07	<1	1.22	70.7	<1	<1	54.8	1.36	--	43.5	2.53
	08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/15/04	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.68	39	<0.50	<0.50	31	<0.50	--	28	0.67
	02/01/05	<1	<0.50	<0.50	<1	1.31	<0.50	<0.50	37.5	0.56	<0.50	33.2	<0.50	--	21.7	1.3
	05/16/05	<1	<0.50	<0.50	<1	0.95	<0.50	<0.50	40.6	<0.50	<0.50	21.7	<0.50	--	19.8	<0.50
	05/16/05 DUP	<1	<0.50	<0.50	<1	1.02	<0.50	<0.50	42.1	<0.50	<0.50	21.4	<0.50	--	20.5	<0.50
	08/18/05	<1	<0.500	<0.500	<1	7.28	<0.500	2.41	145	1.2	<0.500	76.5 B	1.46	--	65.6	5.16 B
	11/17/05	<1	<0.500	<0.500	<1	2.53	<0.500	0.99	87	0.59	<0.500	34.8	<0.500	--	26.4	0.93
	02/20/06	<1	<0.500	<0.500	<1	6.17	<0.500	1.93	136	1.1	<0.500	61.9	0.93	--	45.5	4.17
	06/06/06	<1	<1	<1	<1	1.02	<1	<1	33.7	<1	<1	23.4	<1	--	18.7	<1
	09/05/06	<1	<0.50	<0.50	<1	5.37	<0.50	1.75	115	0.84	<0.50	55.9	0.8	--	37.5	4.79
	12/06/06	<1	<0.50	<0.50	<1	3.39	<0.50	1.12	90.9	0.62	<0.50	39.5	<0.50	--	28.3	2.15
	02/07/07	<1	<0.50	<0.50	<1	4.37	<0.50	1.37	116	0.93	<0.50	55.9	0.58	--	40.7	3
	05/22/07	<1	<1	<1	<1	1.18	<1	<1	38.5	<1	<1	31.6	<1	--	25.2	<1
	09/11/07	<5	<2.50	<2.50	<5	26.6	<2.50	8.75	711	7.2	<2.50	81.4	2.95	--	216	11.9
	12/12/07	<1	<0.50	<0.50	<1	1.83	<0.50	0.79	64.9	0.65	<0.50	28.1	<0.50	--	24.9	0.67
	03/04/08	<1	<0.500	<0.500	<1	6.65	<0.500	2.22	166	2.92	<0.500	75.4	0.81	<0.500	60.5	2.79
	09/16/08	<5	<2.50	<2.50	<2.50	5.5	<2.50	<2.50	160	<2.50	<2.50	38.8	<2.50	<2.50	65.5	<2.50
	12/08/08	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	1.2	88	1.1	<0.50	40	0.51	<0.50	38	1.3
	12/08/08 DUP	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	1.2	84	1.1	<0.50	42	0.52	<0.50	38	1.3

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-2(60) (continued)	03/25/09	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	1.3	71	0.75	<0.50	40	0.65	<0.50	37	0.54
	06/15/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	0.8	47	0.9	<0.50	26	<0.50	<0.50	30	0.55
	09/15/09	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.82	44	0.58	<0.50	42	<0.50	<0.50	30	0.82
	12/14/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17	<0.50	<0.50	18	<0.50	<0.50	16	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	0.96	61	0.68	<0.50	40	0.51	<0.50	38	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	17	<0.50	<0.50	15	<0.50
	09/21/10	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	0.57	46	<0.5	<0.5	42	<0.5	<0.5	32	0.8
	12/07/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	16	<0.5	<0.5	19	<0.5	<0.5	15	<0.5
	03/08/11	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	19	<0.50	<0.50	27	<0.50	<0.50	16	<0.50
	06/06/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.3	<0.5	<0.5	16	<0.5	<0.5	11	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.73	42	0.5	<0.50	42	0.89	<0.50	30	0.74
	12/06/11	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	30	<0.50	<0.50	33	<0.50	<0.50	22	0.6
	03/08/12	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	32	<0.50	<0.50	36	<0.50	<0.50	21	<5
	06/19/12	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	<0.5	28	<0.5	<0.5	22	<0.5	<0.5	16	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.66	36	<0.50	<0.50	33	<0.50	<0.50	20	1.1
	12/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	19	<0.50	<0.50	11	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.56	38	<0.50	<0.50	35	<0.50	<0.50	20	0.66
	06/11/13	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	29	<0.50	<0.50	27	<0.50	<0.50	18	<0.50
	09/17/13	<0.50	<0.50	<0.50	<0.50	0.89	<0.50	<0.50	20	<0.50	<0.50	32	<0.50	<0.50	16	0.54
	12/10/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16	<0.50	<0.50	17	<0.50	<0.50	11	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.5	<0.50	<0.50	10	<0.50	<0.50	5.8	<0.50
	6/26/2014	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	33	<0.50	<0.50	21	<0.50	<0.50	20	<0.50
	9/23/2014	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	26	<0.50	<0.50	34	<0.50	<0.50	20	12
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	20	<0.50	<0.50	14	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	26.1	<0.50	<0.50	22.7	<0.50	<0.50	16.1	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.95	<0.50	<0.50	17.7	<0.50	<0.50	9.1	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.6	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18.8	<0.50	<0.50	13.8	<0.50	<0.50	12.4	<0.50
	3/9/2016	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	17.5	<0.50	<0.50	16.9	<0.50	<0.50	14	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11.8	<0.50	<0.50	18	<0.50	<0.50	11.1	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	0.89	<0.50	<0.50	17.7	<0.50	<0.50	22.5	<0.50	<0.50	17.6	<0.50
	12/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	7.6	<0.50	<0.50	4.7	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-2(60)	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	15.6	<0.5	<0.5	13.6	<0.5	<0.5	13.2	<0.5
(continued)	6/12/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.0	<0.50	<0.50	12.8	<0.50	<0.50	7.1	<0.50
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.00	<1.0	<0.50	18.3	<0.50	<0.50	18.3	<0.50	<0.50	13.4	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	1.60	<0.50	<0.50	24.9	<0.50	<0.50	14.0	<0.50	<0.50	14.7	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	1.30	<0.500	<0.500	13.4	<0.500	<0.500	23.3	<0.500	<0.500	13.9	<0.500
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.89	<0.500	<0.500	11.8	<0.500	<0.500	18.4	<0.500	<0.500	8.5	<0.500
	10/1/2018	<1.00	<5.00	<1.00	<1.00	6.66	<0.400	<0.400	23.9	<0.400	<0.500	29.4	<0.400	<0.500	16.6	20.00
	12/4/2018	<1.00	<5.00	<1.00	<1.00	0.67	<0.400	<0.400	9.6	<0.400	<0.500	14.4	<0.400	<0.500	8.2	<0.400
	3/26/2019	<1.00	<5.00	<1.00	<1.00	0.439	<0.400	<0.400	9.10	<0.400	<0.500	12.9	<0.400	<0.500	8.37	<0.400
	6/7/2019	<1.00	<5.00	<1.00	<1.00	0.651	<0.400	<0.400	11.4	<0.400	<0.500	15.5	<0.400	<0.500	9.57	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	4.58	<0.400	0.44	27.9	<0.400	<0.500	33.2	<0.400	<0.500	19	7.9
	12/4/2019	<1.00	<5.00	<1.00	<1.00	0.465	<0.400	<0.400	8.86	<0.400	<0.500	16.8	<0.400	<0.500	9.35	<0.400
MGMS1-1(110)	06/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.78	<0.50	<0.50	3.9	<1	--	3.35	<0.50
	08/30/00	<5	<25	<2.5	<2.5	3.7	<2.5	3.32	55	<2.5	<2.5	510	24	--	130	<2.5
	11/29/00	<5	<25	<2.5	<2.5	4.21	<2.5	4.59	51	<2.5	<2.5	583	23.2	--	166	<2.5
	02/27/01	<5	<25	<2.5	<2.5	5.21	<2.5	3.39	47.5	<2.5	<2.5	385	16.5	--	105	<2.5
	05/31/01	<10	<50	<5	<5	<5	<5	<5	55.8	<5	<5	639	13.8	--	141	<5
	09/24/01	<1.3	<1.3	<1.3	<1.3	6.1	<1.3	2.9	57	<1.3	<1.3	580	20	--	120	<1.3
	12/18/01	<5	<25	<2.5	<2.5	5.04	<2.5	2.68	54.8	<2.5	<2.5	527	20.2	--	131	<2.5
	03/19/02	<5	<2.5	<2.5	<5	5.25	<2.5	<2.5	54	<2.5	<2.5	454	10.8	--	98	<2.5
	05/29/02	<5	<2.5	<2.5	<5	4.9	<2.5	<2.5	62.3	<2.5	<2.5	299	9.7	--	65.1	<2.5
	08/29/02	<1	<0.50	<0.50	<1	5.43	<0.50	1.32	110	0.8	<0.50	60.2	3.62	--	47.8	<0.50
	11/11/02	<2	<1	<1	<2	4.74	<1	1.2	46.1	<1	<1	208	7.84	--	66.1	<1
	01/23/03	<2	<1	<1	<2	4.44	<1	1.24	65.3	<1	<1	210	6.54	--	74.1	<1
	05/28/03	<2	<1	<1	<2	3.96	<1	<1	69.2	<1	<1	109	2.48	--	57.5	<1
	11/11/03	<2	<2	<2	<2	4.14	<2	<2	44.8	<2	<2	256	3.6	--	60.2	<2
	01/27/04	<2	<1	<1	<2	4.22	<1	1.1	67.1	<1	<1	167	4.16	--	69.7	<1
	05/03/04	<1	<1	<1	<1	3.66	<1	<1	47.2	<1	<1	190	2.18	--	55.9	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	3.7	<2.5	<2.5	95	<2.5	<2.5	76	<2.5	--	64	<2.5
	06/20/05	<2	<1	<1	<2	9.22	<1	2.58	283	1.8	<1	23.6	1.62	--	70	1.24
	11/17/05	<1	<0.500	<0.500	<1	2.93	<0.500	<0.500	51.3	<0.500	<0.500	102	1.95	--	76.1	<0.500
	06/06/06	<1	<1	<1	<1	2.15	<1	<1	44	<1	<1	94.4	1.36	--	66.8	<1
	12/06/06	<1	<0.50	<0.50	<1	5.81	<0.50	0.6	142	<0.50	<0.50	53.8	0.88	--	74.6	0.57

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS1-1(110)	09/11/07	<2	<1	<1	<2	3.78	<1	1.2	189	<1	<1	31.6	<1	--	61.1	<1
(continued)	03/04/08	<1	<0.500	<0.500	<1	3.73	<0.500	0.91	242	2.37	<0.500	32.7	0.64	<0.500	44.4	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	0.87	160	0.9	<0.50	25	<0.50	<0.50	39	<0.50
	06/15/09	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	0.74	130	1	<0.50	24	<0.50	<0.50	39	<0.50
	09/15/09	<2.5	<2.5	<2.5	<2.5	20	<2.5	2.7	620	3.6	<2.5	24	<2.5	<2.5	75	<2.5
	03/17/10	<2.5	<2.5	<2.5	<2.5	20	<2.5	4.3	720	3.7	<2.5	20	<2.5	<2.5	79	<2.5
	09/21/10	<0.5	<0.5	<0.5	<0.5	2.5	<0.5	1.1	150	1	<0.5	28	<0.5	<0.5	53	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	0.57	83	0.52	<0.50	26	<0.50	<0.50	31	<0.50
	09/13/11	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	1.2	110	0.96	<0.50	30	<0.50	<0.50	59	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	<0.50	<0.50	22	<0.50	<0.50	21	<0.50
	09/12/12	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	0.53	60	<0.50	<0.50	22	<0.50	<0.50	25	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	0.95	<0.50	<0.50	65	<0.50	<0.50	23	<0.50	<0.50	24	<0.50
	09/17/13	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	0.56	68	<0.50	<0.50	26	<0.50	<0.50	32	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	63	<0.50	<0.50	23	<0.50	<0.50	27	0.65
	9/24/2014	Not sampled; 60-foot port accidentally sampled twice.														
	3/19/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.69	126	<0.50	<0.50	23.7	<0.50	<0.50	41.5	0.82
	9/21/2015	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	49	<0.50	<0.50	19.4	<0.50	<0.50	20.4	<0.50
	9/30/2016	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	56.7	<0.50	<0.50	18.4	<0.50	<0.50	28.7	<0.50
	3/31/2017	<0.50	<20	<0.50	<0.50	13.3	<0.50	1.1	328	0.7	<0.50	20.1	<0.50	<0.50	62	6.5
	9/29/2017	<2.0	<2.0	<0.50	<0.50	5.9	<1.0	0.5	173	<0.50	<0.50	9.0	<0.50	<0.50	33	0.6
	11/7/2017	<2.0	<2.0	<0.50	<0.50	10.5	<0.50	0.9	257	0.7	<0.50	11.5	<0.50	<0.50	42	0.9
	7/1/2018	<0.500	<2.50	<0.500	<0.500	3.3	<0.500	0.462 J	104	0.357 J	<0.500	18.5	0.132 J	<0.500	37	0.6
	10/1/2018	<1.00	<5.00	<1.00	<1.00	6.1	<0.400	0.7	153	0.5	<0.500	13.0	<0.400	<0.500	39	0.7
	6/7/2019	<1.00	<5.00	<1.00	<1.00	3.6	<0.400	<0.400	102	<0.400	<0.500	13.8	<0.400	<0.500	24	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	4.6	<0.400	<0.400	134	<0.400	<0.500	14.0	<0.400	<0.500	32	<0.400
MGMS2-4(40)	06/28/00	<50	<250	<25	<25	44.9	<25	<25	1,210	<25	<25	5,030	215	--	3,090	<25
	08/30/00	<10	<50	<5	<5	23.4	<5	31.3	644	7.28	<5	2,980	152	--	1,850	<5
	11/29/00	<100	<500	<50	<50	51.3	<50	94	1,420	<50	<50	8,740	424	--	3,980	<50
	02/27/01	<50	<250	<25	<25	35.6	<25	66.2	753	<25	<25	7,360	280	--	3,360	<25
	05/31/01	<50	<250	<25	<25	<25	<25	<25	604	<25	<25	3,610	94.4	--	2,050	<25
	09/24/01	<5	<5	<5	<5	28	<5	26	780	13	<5	2,600	170	--	1,700	<5
	12/18/01	<50	<250	<25	<25	175	<25	77	1,350	<25	<25	5,590	374	--	3,220	<25

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-4(40) (continued)	03/19/02	<50	<25	<25	<50	36	<25	36	868	<25	<25	6,240	180	--	3,040	<25
	05/29/02	<50	<25	<25	<50	76	<25	53	1,330	<25	<25	6,580	230	--	2,530	<25
	11/11/02	<20	<10	<10	<20	19.8	<10	13.6	639	<10	<10	3,080	89.4	--	1,820	<10
	01/23/03	<20	<10	<10	<20	13.4	<10	<10	353	<10	<10	2,290	52.6	--	1,480	<10
	05/28/03	<10	<5	<5	<10	5.4	<5	<5	110	<5	<5	1,190	19.1	--	474	<5
	11/11/03	<10	<10	<10	<10	<10	<10	<10	54.1	<10	<10	1,820	14	--	398	<10
	01/27/04	<20	<10	<10	<20	45.2	<10	10	397	<10	<10	1,740	55.8	--	688	<10
	05/03/04	<10	<10	<10	<10	<10	<10	<10	41.2	<10	<10	599	<10	--	200	<10
	08/17/04	<10	<5	<5	<10	9.7	<5	6.1	158	<5	<5	1,530	30.7	--	705	<5
	11/15/04	<25	<25	<25	<25	<25	<25	<25	310	<25	<25	2,900	<25	--	1,300	<25
	03/24/05	<20	<10	<10	<20	10.8	<10	<10	159	<10	<10	1,900	25.8	--	834	<10
	05/16/05	<20	<10	<10	<20	34.2	<10	28.2	489	<10	<10	2,540	52.2	--	1,150	<10
	11/16/05	<50	<25	<25	<50	43.5	<25	<25	396	<25	<25	4,240	82.5	--	1,750	<25
	06/06/06	<50	<50	<50	<50	62	<50	<50	917	<50	<50	4,820	55	--	1,770	<50
	12/05/06	<50	<25	<25	<50	<25	<25	<25	370	<25	<25	3,090	31.5	--	1,200	<25
	05/21/07	<20	<20	<20	<20	27.4	<20	<20	359	<20	<20	2,880	38.2	--	1,080	<20
	09/10/07	<50	<25	<25	<50	<25	<25	<25	402	<25	<25	2,010	52.5	--	1,600	<25
	12/12/07	<50	<25	<25	<50	26	<25	<25	330	<25	<25	2,080	35.5	--	914	<25
	03/04/08[7.]	<1	<0.500	<0.500	<1	20.4	<0.500	16.1	181	7.71	<0.500	1,810	53.7	0.51	950	4.68
	09/16/08	<50	<25	<25	<25	<25	<25	<25	208	<25	<25	2,330	32	<25	1,130	<25
	12/08/08	Not sampled. Air leak in sampling point prohibited the collection of the sample.														
	03/24/09	<2	<2	<2	<2	8.4	<2	3.6	100	2	<2	990	14	<2	430	<2
	09/15/09	<1.5	<1.5	<1.5	<1.5	3.1	<1.5	<1.5	52	<1.5	<1.5	440	4.1	<1.5	200	<1.5
	12/14/09	<1.5	<1.5	<1.5	<1.5	54	<1.5	16	360	6.9	<1.5	2,400	62	<1.5	1,000	2.6
	03/16/10	<7	<7	<7	<7	16	<7	<7	140	<7	<7	1,800	19	<7	810	<7
	06/14/10	<25	<25	<25	<25	72	<25	41	1,400	<25	<25	6,400	68	<25	1,500	43
	09/21/10	<2.5	<2.5	<2.5	<2.5	35	<2.5	17	480	9	<2.5	3,500	48	<2.5	1,500	5.4
	12/07/10	<15	<15	<15	<15	69	<15	26	700	<15	<15	4,100	83	<15	1,600	<15
	03/07/11	<15	<15	<15	<15	88	<15	30	930	<15	<15	3,700	91	<15	1,600	<15
	06/07/11	<15	<15	<15	<15	65	<15	30	1,600	17	<15	4,400	57	<15	1,400	48
	09/12/11	<15	<15	<15	<15	44	<15	28	7,400	20	<15	790	48	<15	380	58
	12/07/11	<15	<15	<15	<15	35	<15	<15	5,300	<15	<15	61	<15	<15	39	460

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-4(40)	03/08/12	<2	<2	<2	<2	38	<2	2.3	470	2.8	<2	9.9	5.2	<2	5.4	260
(continued)	06/19/12	<0.5	3.9	<0.5	<0.5	53	<0.5	<0.5	20	1.3	<0.5	7.2	<0.5	<0.5	2.5	63
	09/13/12	<1.5	1.8	<1.5	<1.5	39	<1.5	2.8	310	3.2	<1.5	89	5	<1.5	80	440
	12/11/12	<0.50	30	<0.50	<0.50	4.8	<0.50	<0.50	33	1.3	<0.50	10	<0.50	<0.50	3.4	4
	03/12/13	<0.50	8.2	<0.50	<0.50	28	<0.50	1.9	300	2	<0.50	5.6	2.5	<0.50	2.2	270
	06/11/13	<0.50	15	<0.50	<0.50	8.3	<0.50	<0.50	7.9	<0.50	<0.50	0.94	<0.50	<0.50	<0.50	4.8
	09/17/13	<0.50	9.4	<0.50	<0.50	28	<0.50	4.8	290	1.4	<0.50	16	1.6	<0.50	17	330
	12/16/13	<0.50	6.9	<0.50	<0.50	9.7	<0.50	<0.50	8.4	<0.50	<0.50	2.4	<0.50	<0.50	1.4	3.4
	3/24/2014	<0.50	2.4	<0.50	<0.50	45	<0.50	2.9	84	<0.50	<0.50	2.6	<0.50	<0.50	1.8	270
	6/26/2014	<0.50	6.1	<0.50	<0.50	31	<0.50	10	88	0.84	<0.50	21	<0.50	<0.50	22	90
	9/23/2014	<0.50	2.5	<0.50	<0.50	30	<0.50	30	590	2.4	<0.50	170	3.2	<0.50	110	800
	12/12/2014	<0.50	12	<0.50	<0.50	35	<0.50	<0.50	10	<0.50	<0.50	3.4	<0.50	<0.50	2.3	18
	3/20/2015	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	3.9	47	<0.50	<0.50	30.6	<0.50	<0.50	22.1	17.3
	6/19/2015	<0.50	<0.50	<0.50	<0.50	13.8	<0.50	1.3	53.8	<0.50	<0.50	18.4	<0.50	<0.50	12.8	48.3
	9/25/2015	<0.50	<0.50	<0.50	<0.50	12.3	<0.50	4.2	105	0.61	<0.50	67.4	0.92	<0.50	45.9	57.8
	12/8/2015	<0.50	3.8	<0.50	<0.50	13.5	<0.50	<0.50	7	<0.50	<0.50	4	<0.50	<0.50	2.8	3.3
	3/9/2016	<0.50	<2	<0.50	<0.50	20.6	<0.50	1.6	36	<0.50	<0.50	6.5	<0.50	<0.50	6.2	36
	6/17/2016	<0.50	<2	<0.50	<0.50	24.9	<0.50	26.4	744	2.8	<0.50	223	3.1	<0.50	146	227
	9/29/2016	<0.50	<2	<0.50	<0.50	12.1	<0.50	<0.50	115	<0.50	<0.50	33.3	<0.50	<0.50	24.8	142
	12/16/2016	<0.50	<2	<0.50	<0.50	10.3	<0.50	<0.50	5.2	<0.50	<0.50	2.6	<0.50	<0.50	1.9	2
	3/31/2017	<0.5	<2	<0.5	<0.5	57.6	<0.5	14.3	236	0.6	<0.5	4.3	<0.5	<0.5	14.4	235
	6/15/2017	<0.50	<2.0	<0.50	<0.50	38.6	<0.50	3.5	46.2	<0.50	<0.50	5.1	<0.50	<0.50	4.9	98.9
	9/29/2017	<2.0	<2.0	<0.50	<0.50	21.7	<1.0	6.8	195.0	0.74	<0.50	41.5	0.67	<0.50	31.3	428.0
	11/9/2017	<2.0	<2.0	<0.50	<0.50	21.3	<0.50	0.9	61.6	0.52	<0.50	13.2	<0.50	<0.50	9.2	170.0
	3/22/2018	<0.500	<2.50	<0.500	<0.500	25.9	<0.500	4.2	109.0	0.57	<0.500	46.0	0.259 J	<0.500	27.3	122.0
	7/1/2018	<0.500	<2.50	<0.500	<0.500	12.7	<0.500	5.9	151.0	0.97	<0.500	62.1	1.04	<0.500	48.9	38.2
	9/28/2018	<2.00	<10.00	<2.00	<2.00	8.7	<0.800	1.4	140.0	<0.800	<1.00	66.9	<0.800	<1.00	43.3	106.0
	12/10/2018	<1.00	<5.00	<1.00	<1.00	20.9	<0.400	0.6	24.9	<0.400	<0.500	18.7	<0.400	<0.500	12.0	123.0
	3/25/2019	<1.00	<5.00	<1.00	<1.00	26.6	<0.400	2.58	136	0.752	<0.500	62.0	0.581	<0.500	35.9	155
	6/4/2019	<1.00	<5.00	<1.00	<1.00	28.2	<0.400	0.960	37.8	<0.400	<0.500	14.6	<0.400	<0.500	10.4	145
	9/27/2019	<1.00	<5.00	<1.00	<1.00	11.2	<0.400	0.729	73.8	<0.400	<0.500	17	<0.400	<0.500	13.1	101
	12/4/2019	<1.00	<5.00	<1.00	<1.00	20.6	<0.400	0.778	40.5	<0.400	<0.500	32.3	<0.400	<0.500	17.9	65.4

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-3(60)	06/28/00	<5	<25	<2.5	<2.5	35.6	<2.5	8.3	433	<2.5	<2.5	110	22.3	--	198	<2.5
	08/30/00	<10	<50	<5	<5	36	<5	13	1,120	<5	<5	164	32	--	136	<5
	11/29/00	<5	<25	<2.5	<2.5	5.08	<2.5	3.88	279	<2.5	<2.5	26.8	<5	--	38	<2.5
	02/27/01	<2	<10	<1	<1	40.2	<1	2.65	46.6	<1	<1	20.7	12.4	--	27	173
	05/31/01	<1	<5	<0.50	<0.50	2.47	<0.50	2.3	39.1	<0.50	<0.50	113	3.44	--	75.6	5.06
	09/24/01	<2.5	<2.5	<2.5	<2.5	14	<2.5	11	180	3.6	<2.5	340	11	--	220	48
	12/18/01	<1	<5	<0.50	<0.50	0.607	<0.50	1.01	15	<0.50	<0.50	64.4	2.06	--	47.7	<0.50
	03/19/02	<1	<0.50	<0.50	<1	5.4	<0.50	2.96	62.9	0.81	<0.50	91.9	5.78	--	80.1	15.2
	05/29/02	<1	<0.50	<0.50	<1	2.55	<0.50	2.02	59.7	0.82	<0.50	119	4.8	--	67.6	1.06
	01/23/03	<1	<0.50	<0.50	<1	10.1	<0.50	2.7	114	1.12	<0.50	111	6.06	--	96	22.8
	05/28/03	<2	<1	<1	<2	15	<1	3.28	178	1.48	<1	131	9.3	--	126	15.6
	11/11/03	<2	<2	<2	<2	21.3	<2	4.56	208	<2	<2	223	9.06	--	139	20.6
	01/27/04	<1	<0.50	<0.50	<1	17.2	<0.50	2.83	117	1.57	<0.50	96.3	5.38	--	92.2	17.7
	05/03/04	<1	<1	<1	<1	4.79	<1	1.96	86.4	<1	<1	121	3.31	--	84	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	<2.5	13	4.4	220	2.8	<2.5	170	6.4	--	140	11
	02/01/05	<1	<0.50	<0.50	<1	2.49	<0.50	1.47	92	2.46	<0.50	97.7	2.41	--	73.9	0.6
	05/16/05	<1	<0.50	<0.50	<1	1.49	<0.50	1.51	45.2	0.59	<0.50	74.1	1.61	--	41.5	<0.50
	08/18/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	27.6 B	<0.500	<0.500	23.5 B	<0.500	--	13 B	<0.500
	11/16/05	<1	<0.500	<0.500	<1	7.5	<0.500	2.05	90.9	1.16	<0.500	107	3.1	--	78.3	2.68
	02/20/06	<1	<0.500	<0.500	<1	3.35	<0.500	1.6	65	0.82	<0.500	99.5	1.55	--	62.3	1.27
	06/06/06	<1	<1	<1	<1	<1	<1	<1	55	<1	<1	76.3	1.01	--	36.2	<1
	09/05/06	<1	<0.50	<0.50	<1	2.85	<0.50	1.13	75.1	0.73	<0.50	73	1.11	--	45.6	0.83
	12/05/06	<1	<0.50	<0.50	<1	2.58	<0.50	1.44	77	0.75	<0.50	98.7	1.27	--	61.2	0.79
	02/07/07	<1	<0.50	<0.50	<1	3.36	<0.50	1.3	96.5	0.79	<0.50	76.3	1.64	--	55	1.51
	05/21/07	<1	<1	<1	<1	2.45	<1	1.33	73.7	<1	<1	99.1	1.51	--	54.5	<1
	09/10/07	<10	<5	<5	<10	31.2	<5	8.2	559	<5	<5	221	10.8	--	192	26.7
	12/12/07	<1	<0.50	<0.50	<1	1.49	<0.50	0.88	78.6	0.56	<0.50	66.1	0.98	--	36.8	1.75
	03/04/08	<1	<0.500	<0.500	<1	4.46	<0.500	2.19	164	1.37	<0.500	89.7	2.32	<0.500	72.2	6.88
	09/16/08	<5	<2.50	<2.50	<5	10.4	<2.50	3.65	166	<2.50	<2.50	111	3.85	<2.50	96.4	7.15
	12/08/08	<0.80	<0.80	<0.80	<0.80	11	<0.80	3	160	1.7	<0.80	110	3.2	<0.80	80	10
	03/24/09	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	1.6	110	1	<0.50	84	2.2	<0.50	53	3.7
	09/15/09	<0.50	<0.50	<0.50	<0.50	6.4	<0.50	2.3	91	1.2	<0.50	110	2.4	<0.50	72	4.2
	12/14/09	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	1.1	61	0.75	<0.50	84	1.1	<0.50	54	0.96

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-3(60) (continued)	03/16/10	<0.50	<0.50	<0.50	<0.50	15	<0.50	3.6	140	1.6	<0.50	160	8.2	<0.50	110	12
	06/14/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.75	46	0.55	<0.50	73	0.86	<0.50	38	0.88
	09/21/10	<0.5	<0.5	<0.5	<0.5	11	<0.5	3	130	1.5	<0.5	150	5.8	<0.5	100	6.8
	12/07/10	<0.5	<0.5	<0.5	<0.5	4.1	<0.5	1.8	86	1.2	<0.5	120	1.7	<0.5	77	1.6
	03/07/11	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.86	73	0.62	<0.50	61	1.2	<0.50	34	1.4
	06/06/11	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5	22	<0.5	<0.5	64	0.54	<0.5	27	<0.5
	09/12/11	<0.50	<0.50	<0.50	<0.50	10	<0.50	3.2	110	1.4	<0.50	170	6	<0.50	100	2
	12/05/11	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	0.95	51	0.54	<0.50	84	1	<0.50	41	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	10	<0.50	2.9	300	1.9	<0.50	71	1.5	<0.50	45	43
	06/19/12	<0.5	<0.5	<0.5	<0.5	2	<0.5	1	79	0.87	<0.5	78	0.78	<0.5	45	5.3
	09/12/12	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.56	48	<0.50	<0.50	44	<0.50	<0.50	20	2.7
	12/11/12	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	2.5	59	1.5	<0.50	57	0.62	<0.50	36	16
	03/12/13	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	22	<0.50	<0.50	16	<0.50	<0.50	9	<0.50
	06/11/13	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	1.5	53	0.58	<0.50	29	0.55	<0.50	21	12
	09/17/13	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	0.98	73	0.66	<0.50	24	0.6	<0.50	13	29
	12/10/13	<0.50	<0.50	<0.50	<0.50	3	<0.50	1	88	0.88	<0.50	23	0.6	<0.50	18	13
	3/18/2014	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	28	<0.50	<0.50	33	<0.50	<0.50	13	1.7
	9/23/2014	Insufficient air pressure to inflate dedicated bladder; no sample collected.														
	12/12/2014	Insufficient air pressure to inflate dedicated bladder; no sample collected.														
	3/20/2015	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	29.4	<0.50	<0.50	41.4	<0.50	<0.50	24.3	5.2
	6/19/2015	<0.50	<0.50	<0.50	<0.50	2	<0.50	0.56	38.1	<0.50	<0.50	35.1	<0.50	<0.50	23.5	7.9
	9/25/2015	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.5	51.6	<0.50	<0.50	18.4	<0.50	<0.50	15.8	9.7
	12/8/2015	Well Damaged, Unable to Sample														
	6/17/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	19.4	<0.50	<0.50	17.2	<0.50	<0.50	11.8	3.4
	9/30/2016	<0.50	<2	<0.50	<0.50	2	<0.50	<0.50	40	<0.50	<0.50	9.6	<0.50	<0.50	11.5	9.6
	12/16/2016	<0.50	<2	<0.50	<0.50	1.7	<0.50	<0.50	35.3	<0.50	<0.50	40.7	<0.50	<0.50	24.8	1.4
	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	18.5	<0.5	<0.5	26	<0.5	<0.5	11.2	0.75
	6/15/2017	<2.0	<2.0	<0.50	<0.50	0.88	<1.0	<0.50	20.7	<0.50	<0.50	40.4	<0.50	<0.50	17.3	1.3
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.30	<1.0	<0.50	30.4	<0.50	<0.50	17.5	<0.50	<0.50	12.0	6.7
	11/9/2017	<2.0	<2.0	<0.50	<0.50	1.80	<0.50	<0.50	30.2	<0.50	<0.50	34.2	<0.50	<0.50	20.1	1.1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-3(60) (continued)	3/22/2018	<0.500	<2.50	<0.500	<0.500	0.82	<0.500	0.244 J	17.3	0.164 J	<0.500	20.6	0.205 J	<0.500	11.6	1.2
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.73	<0.500	<0.500	14.1	<0.500	<0.500	19.6	0.20	<0.500	10.1	1.6
	12/10/2018	<0.500	<2.50	<0.500	<0.500	2.26	<0.500	0.43	41.7	0.43	<0.500	36.1	<0.400	<0.500	20.7	4.4
	3/25/2019	<1.00	<5.00	<1.00	<1.00	1.86	<0.400	<0.400	36.8	0.415	<0.500	40.1	<0.400	<0.500	23.3	0.773
	6/4/2019	<1.00	<5.00	<1.00	<1.00	0.580	<0.400	<0.400	18.00	<0.400	<0.500	32.3	<0.400	<0.500	15.7	0.420
	9/27/2019	<1.00	<5.00	<1.00	<1.00	1.590	<0.400	<0.400	35.20	0.47	<0.500	25	<0.400	<0.500	13.8	3.080
	12/4/2019	<1.00	<5.00	<1.00	<1.00	2.030	<0.400	0.427	54.50	0.42	<0.500	28.9	<0.400	<0.500	19.4	2.850
MGMS2-2(110)	06/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	12.2	<0.50	<0.50	6.04	<1	--	17.1	<0.50
	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.41	<0.50	<0.50	16.4	<1	--	14.7	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	0.717	8.23	<0.50	<0.50	13	<1	--	19.3	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.756	7.31	<0.50	<0.50	15.2	<1	--	21.6	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.938	10.7	<0.50	<0.50	24.4	1.14	--	29.1	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	6.8	<0.50	<0.50	37	1.1	--	34	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.62	4.91	<0.50	<0.50	35.1	<1	--	27.5	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	0.61	9.97	<0.50	<0.50	35.6	1.23	--	24.6	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	1.21	31.9	<0.50	<0.50	114	2.39	--	51	0.61
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	1.01	57.1	<0.50	<0.50	47.8	2.79	--	44.1	2.98
	05/28/03	<1	<0.50	<0.50	<1	0.61	<0.50	0.73	63.9	<0.50	<0.50	54.6	1.98	--	43.1	1.13
	11/11/03	<1	<1	<1	<1	1.14	<1	<1	76.7	1.07	<1	32.4	2.19	--	30.8	2.03
	01/27/04	<1	<0.50	<0.50	<1	0.63	<0.50	<0.50	49	<0.50	<0.50	67.9	1.17	--	30	1
	05/03/04	<1	<1	<1	<1	<1	<1	<1	14	<1	<1	28	<1	--	13.6	<1
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	0.62	60	<0.50	<0.50	50	1.6	--	30	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	27.9	<0.50	<0.50	21.5	0.52	--	10.9	<0.50
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	15.1	<0.500	<0.500	18	<0.500	--	8.42	<0.500
	06/06/06	<1	<1	<1	<1	<1	<1	<1	30.9	<1	<1	13.9	<1	--	6.59	<1
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	36.2	<0.50	<0.50	17.9	<0.50	--	8.27	<0.50
	09/10/07	<5	<2.50	<2.50	<5	<2.50	<2.50	3.2	512	<2.50	<2.50	146	5.65	--	94.4	14.9
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	59.5	<0.500	<0.500	33.4	0.75	<0.500	16.7	2.82
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	0.71	77	<0.500	<0.500	44	1.18	<0.500	23.8	3.45
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	40	<0.50	<0.50	27	<0.50	<0.50	11	2.5
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	31	<0.50	<0.50	20	0.57	<0.50	8.9	2.3
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	16	<0.50		6.7	1.8
	03/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	28	<0.50	<0.50	21	<0.50	<0.50	8.1	1.6
	09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	33	<0.5	<0.5	34	0.6	<0.5	14	1.3

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-2(110) (continued)	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	24	<0.50	<0.50	26	<0.50	<0.50	8.6	1
	09/12/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	22	<0.50	<0.50	8.3	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	31	<0.50	<0.50	23	<0.50	<0.50	9.3	2.4
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	<0.50	<0.50	20	<0.50	<0.50	8.3	1.4
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	34	<0.50	<0.50	23	0.52	<0.50	10	2.7
	09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	30	<0.50	<0.50	18	<0.50	<0.50	8.7	2.2
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	21	<0.50	<0.50	13	<0.50	<0.50	6.2	2.5
	9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	25	<0.50	<0.50	12	<0.50	<0.50	7.3	4.9
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18.3	<0.50	<0.50	7.9	<0.50	<0.50	4.8	4.6
	9/25/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15.3	<0.50	<0.50	9.4	<0.50	<0.50	5.9	4.1
	3/9/2016	<0.50	<2	<0.50	<0.50	0.73	<0.50	<0.50	22.6	<0.50	<0.50	7.1	<0.50	<0.50	8	10
	9/29/2016	<0.50	<2	<0.50	<0.50	0.62	<0.50	<0.50	16.8	<0.50	<0.50	6.5	<0.50	<0.50	6.3	5.8
	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	19.5	<0.5	<0.5	6.4	<0.5	<0.5	6.6	6.4
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.8	<1.0	<0.50	63.5	<0.50	<0.50	2.2	<0.50	<0.50	5.3	25.0
	11/9/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	3.9	<0.50	<0.50	3.1	1.9
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.446 J	<0.500	<0.500	<0.500	6.7	<0.500	4.4	0.175 J	<0.500	3.4	3.87
	9/28/2018	<1.00	<5.00	<1.00	<1.00	0.4	<0.400	<0.400	11.3	<0.400	<0.500	5.0	<0.400	<0.500	4.3	4.63
	6/4/2019	<4.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2.37	<0.400	<0.500	3.44	<0.400	<0.500	2.04	0.770
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	5.49	<0.400	<0.500	4.29	<0.400	<0.500	2.73	2.320
MGMS2-1(132)	06/28/00	<1	<5	<0.50	<0.50	1.25	<0.50	1.77	27.6	<0.50	<0.50	27.5	2.06	--	54.3	<0.50
	08/30/00	<1	<5	<0.50	<0.50	0.903	<0.50	<0.50	23	<0.50	<0.50	77.8	2.47	--	52.9	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	0.569	12.4	<0.50	<0.50	25.3	<1	--	27.8	<0.50
	02/27/01	<1	<5	<0.50	<0.50	0.537	<0.50	0.605	11.4	<0.50	<0.50	25.2	<1	--	24.4	2.6
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	8.86	<0.50	<0.50	25.5	<1	--	24.4	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.76	7.6	<0.50	<0.50	29	1.1	--	30	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.773	6.81	<0.50	<0.50	26.8	1.36	--	23.8	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	0.53	8.62	<0.50	<0.50	33.5	0.77	--	24.2	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	1.29	35.4	0.52	<0.50	117	2.5	--	53.6	0.62
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	0.96	57.4	<0.50	<0.50	49.9	2.35	--	46.2	3.19
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	0.53	27.2	<0.50	<0.50	29.3	0.98	--	24	1.07
	11/11/03	<1	<1	<1	<1	<1	<1	<1	46.3	<1	<1	28.8	1.56	--	29.7	1.49

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS2-1(132) (continued)	01/27/04	<1	<0.50	<0.50	<1	0.63	<0.50	0.56	37.6	<0.50	<0.50	28	0.96	--	22.2	1.51
	05/04/04	<1	<1	<1	<1	<1	<1	<1	38.2	<1	<1	7.55	<1	--	5.22	<1
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	62	<0.50	<0.50	38	1.1	--	26	0.85
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	29.5	<0.50	<0.50	23.7	0.56	--	15.2	0.86
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	8.85	<0.500	<0.500	13	<0.500	--	6.06	<0.500
	06/06/06	<1	<1	<1	<1	<1	<1	<1	23.1	<1	<1	14.8	<1	--	6.71	<1
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	27.6	<0.50	<0.50	14.9	<0.50	--	7.89	<0.50
	09/10/07	<5	<2.50	<2.50	<5	4.55	<2.50	3	615	<2.50	<2.50	93.2	5.5	--	61	21.5
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	37.3 J	<0.500	<0.500	22.6 J	0.59	<0.500	12.9 J	2.4
	09/16/08	<1	<0.500	<0.500	<1	0.53	<0.500	1	101	0.56	<0.500	38.3	1.37	<0.500	26.1	6.11
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	24	0.57	<0.50	11	1.5
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	24	<0.50	<0.50	12	1.6
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	18	<0.50		8	1.5
	03/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	28	<0.50	<0.50	23	<0.50	<0.50	9.9	1.6
	09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	28	<0.5	<0.5	31	<0.5	<0.5	12	1.1
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	30	<0.50	<0.50	41	0.56	<0.50	13	0.97
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	24	<0.50	<0.50	9.4	1.8
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	22	<0.50	<0.50	9	2
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	24	<0.50	<0.50	19	<0.50	<0.50	8.3	1.9
	09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	35	<0.50	<0.50	15	<0.50	<0.50	8.1	2.7
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	12	<0.50	<0.50	5.4	2.6
	9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	9.8	<0.50	<0.50	6	5.5
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.5	<0.50	<0.50	9.4	<0.50	<0.50	4.4	0.75
	3/9/2016	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	36.8	<0.50	<0.50	7.9	0.69	<0.50	10.7	12.4
	9/29/2016	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	31.4	<0.50	<0.50	6.4	<0.50	<0.50	7.9	8.2
	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	15.6	<0.5	<0.5	5.2	<0.5	<0.5	4.7	4.8
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.2	<1.0	<0.50	64.9	<0.50	<0.50	2.4	0.6	<0.50	6.3	19.4
	11/9/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	14.3	<0.50	<0.50	3.6	<0.50	<0.50	4.5	5.0
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.5	<0.500	<0.500	13.8	<0.500	<0.500	4.5	0.191 J	<0.500	4.9	4.6
	9/28/2018	<1.00	<5.00	<1.00	<1.00	0.5	<0.400	<0.400	17.8	<0.400	<0.500	4.8	<0.400	<0.500	5.6	6.7
	6/4/2019	<4.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	5.43	<0.400	<0.500	2.76	<0.400	<0.500	2.13	2.07
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	7.96	<0.400	<0.500	3.66	<0.400	<0.500	3.07	3.29

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-4(40)	08/30/00	<10	<50	<5	<5	13.2	<5	5.01	858	14.1	<5	580	10.8	--	205	6.65
	11/29/00	<20	<100	<10	<10	<10	<10	<10	820	10.6	<10	2,810	<20	--	395	<10
	02/27/01	<50	<250	<25	<25	39.4	<25	29.2	4,570	<25	<25	2,970	<50	--	756	79.3
	05/31/01	<50	<250	<25	<25	<25	<25	<25	2,920	38.5	<25	3,960	<50	--	716	<25
	09/24/01	<2.5	<2.5	<2.5	<2.5	5.8	<2.5	<2.5	730	5.4	<2.5	1,400	9.2	--	230	3.5
	12/18/01	<50	<250	<25	<25	<25	<25	<25	2,550	<25	<25	3,310	<50	--	631	31
	03/19/02	<20	<10	<10	<20	34.6	<10	15.4	3,370	30.2	<10	3,560	23.8	--	707	57
	05/29/02	<50	<25	<25	<50	71.5	<25	26	5,180	38.5	<25	2,470	33.5	--	728	86
	11/11/02	<50	<25	<25	<50	<25	<25	<25	1,520	<25	<25	2,750	<25	--	309	<25
	01/23/03	<20	<10	<10	<20	137	<10	38.4	3,530	32.6	<10	2,380	118	--	1,400	83.6
	05/28/03	<50	<25	<25	<50	56	<25	28.5	1,720	<25	<25	3,560	<25	--	1,470	<25
	11/11/03	<10	<10	<10	<10	<10	<10	<10	672	<10	<10	58.3	<10	--	32.4	<10
	01/27/04	<20	<10	<10	<20	20	<10	<10	1,900	19.4	<10	1,350	10	--	246	20
	05/03/04	<20	<20	<20	<20	50	<20	<20	1,420	<20	<20	2,700	34.2	--	913	24.8
	08/17/04	<20	<10	<10	<20	71.6	<10	17	3,300	31	<10	1,360	29.2	--	569	45.2
	11/15/04	<25	<25	<25	<25	<25	<25	<25	1,400	<25	<25	1,600	<25	--	290	<25
	03/24/05	<20	<10	<10	<20	79.4	<10	30	3,440	34.2	<10	2,330	43.8	--	1,080	60.2
	03/24/05 DUP	<20	<10	<10	<20	83.2	<10	29.2	3,450	34	<10	2,150	44	--	1,040	58.6
	05/16/05	<10	<5	<5	<10	7	<5	<5	657	11.3	<5	1,130	8.1	--	224	<5
	11/16/05	<10	<5	<5	<10	5.8	<5	<5	794	8.4	<5	1,180	7.6	--	210	<5
	03/14/06	<50	<50	<50	<50	51	<50	<50	4,130	<50	<50	1,410	<50	--	484	<50
	06/06/06	<20	<20	<20	<20	20.4	<20	<20	2,290	32.2	<20	1,410	<20	--	401	23.6
	12/05/06	<20	<10	<10	<20	29.8	<10	<10	3,570	29	<10	1,020	<10	--	360	95.4
	05/22/07	<20	<20	<20	<20	20.8	<20	<20	2,640	20.2	<20	952	<20	--	349	22.6
	09/10/07	<50	<25	<25	<50	<25	<25	<25	2,340	<25	<25	499	<25	--	215	25.5
	12/12/07	<50	<25	<25	<50	<25	<25	<25	723	<25	<25	536	<25	--	133	<25
	03/04/08	<1	<0.500	<0.500	<1	32.4	3.08	22	2,280	25.4	3.86	1,580	27.5	<0.500	972	85.1
	09/16/08	<50	<25	<25	<50	64.5	<25	<25	2,700	<25	<25	714	<25	<25	462	47
	12/08/08	<9	<9	<9	<9	24	<9	<9	1,800	20	<9	350	<9	<9	160	90
	03/24/09	<7	<7	<7	<7	36	<7	7.9	1,600	12	<7	600	11	<7	280	33
	09/15/09	<5	<5	<5	<5	15	<5	<5	1,500	13	<5	550	<5	<5	180	8.2
	09/15/09 DUP	<5	<5	<5	<5	15	<5	<5	1,400	13	<5	540	<5	<5	170	9.8

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-4(40) (continued)	12/14/09	<2.5	<2.5	<2.5	<2.5	8.1	<2.5	<2.5	750	5.3	<2.5	180	<2.5	<2.5	74	19
	03/17/10	<2.5	<2.5	<2.5	<2.5	52	<2.5	14	1,800	18	2.9	810	16	<2.5	490	41
	03/17/10 DUP	<5	<5	<5	<5	51	<5	14	1,600	18	<5	780	16	<5	470	39
	06/14/10	<0.90	<0.90	<0.90	<0.90	2.4	<0.90	<0.90	230	2.3	<0.90	300	2.2	<0.90	88	1.5
	09/20/10	<7	<7	<7	<7	32	<7	8.6	1,800	16	<7	530	7.9	<7	230	31
	09/20/10 DUP	<6	<6	<6	<6	31	<6	7.4	1,700	15	<6	510	7.4	<6	220	29
	12/07/10	<2	<2	<2	<2	5.3	<2	<2	460	3.9	<2	330	2.2	<2	95	3.2
	03/07/11	<2	<2	<2	<2	20	<2	4.7	1,300	10	<2	330	4	<2	140	53
	03/07/11 DUP	<4	<4	<4	<4	19	<4	4.9	1,200	10	<4	320	<4	<4	140	46
	06/06/11	<3	<3	<3	<3	6.5	<3	4.1	780	7	<3	370	5.4	<3	150	8.5
	09/13/11	<5	<5	<5	<5	45	<5	13	1,800	19	<5	560	15	<5	380	29
	09/13/11 DUP	<7	<7	<7	<7	40	<7	12	1,700	16	<7	570	12	<7	330	23
	12/06/11	<5	<5	<5	<5	14	<5	<5	1,000	9.3	<5	140	<5	<5	64	44
	03/08/12	<5	<5	<5	<5	33	<5	13	1,400	14	<5	930	17	<5	450	28
	03/08/12 DUP	<6	<6	<6	<6	35	<6	14	1,400	14	<6	990	18	<6	480	30
	06/21/2012	<5	<5	<5	<5	22	<5	5.6	1,300	11	<5	220	<5	<5	140	44
	09/12/12	<5	<5	<5	<5	23	<5	6.2	1,400	13	<5	220	<5	<5	120	85
	09/12/12 DUP	<5	<5	<5	<5	23	<5	5.3	1,400	13	<5	230	<5	<5	120	86
	12/11/12	<2	<2	<2	<2	7.1	<2	<2	510	6.5	<2	180	<2	<2	72	6.5
	03/12/13	<2	<2	<2	<2	30	<2	8.4	1,400	12	<2	510	8.7	<2	260	35
	03/12/13 DUP	<2	<2	<2	<2	29	<2	8.8	1,300	12	<2	470	8.4	<2	250	35
	06/11/13	<2.5	<2.5	<2.5	<2.5	11	<2.5	<2.5	740	7.1	<2.5	110	<2.5	<2.5	58	34
	09/16/13	<2	<2	<2	<2	7.7	<2	<2	360	4.6	<2	100	<2	<2	48	24
	09/16/13 DUP	<2	<2	<2	<2	8.5	<2	<2	380	5.1	<2	100	<2	<2	49	25
	12/10/13	<0.90	<0.90	<0.90	<0.90	4.7	<0.90	<0.90	230	2.8	<0.90	60	<0.90	<0.90	29	2
	12/10/13 DUP	<0.90	<0.90	<0.90	<0.90	4.6	<0.90	<0.90	230	2.7	<0.90	61	<0.90	<0.90	29	1.9
	3/18/2014	<0.90	<0.90	<0.90	<0.90	2.7	<0.90	0.98	280	1.8	0.91	84	<0.90	<0.90	38	<0.90
	3/18/2014 DUP	<0.90	<0.90	<0.90	<0.90	2.6	<0.90	<0.90	280	1.9	0.93	86	<0.90	<0.90	39	<0.90
	6/26/2014	<0.90	<0.90	<0.90	<0.90	12	<0.90	3.5	690	5.7	<0.90	180	1.3	<0.90	100	20
	6/26/14 DUP	<0.90	<0.90	<0.90	<0.90	11	<0.90	2.8	490	5	<0.90	160	1.1	<0.90	930	14
	9/23/2014	<0.90	<0.90	<0.90	<0.90	10	<0.90	1.7	410	5.8	<0.90	72	<0.90	<0.90	55	74
	9/23/2014 DUP	<0.20	<0.20	<0.20	<0.20	11	<0.20	<0.20	430	5.5	<0.20	70	<0.20	<0.20	53	75

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-4(40) (continued)	12/12/2014	<2	<2	<2	<2	7.9	<2	<2	490	4.2	<2	36	<2	<2	28	20
	3/18/2015	<1.6	<1.6	<1.6	<1.6	20	<1.6	3.2	896	7.3	<1.6	249	<1.6	<1.6	159	21.7
	3/18/2015 DUP	<0.50	<0.50	<0.50	<0.50	17	<0.50	2.4	713	5.5	<0.50	194	<0.50	<0.50	124	16.8
	6/19/2015	<0.84	<0.84	<0.84	<0.84	7.2	<0.84	<0.84	339	3.2	<0.84	34.4	<0.84	<0.84	32.8	73.3
	9/22/2015	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	164	<0.50	<0.50	2.5	<0.50	<0.50	8.6	61.9
	9/22/2015 DUP	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	151	1.2	<0.50	2.3	<0.50	<0.50	7.8	51.9
	12/7/2015	<0.50	<0.50	<0.50	<0.50	9.1	<0.50	2	370	3.1	<0.50	109	<0.50	<0.50	94.8	4
	3/9/2016	<2.5	<10	<2.5	<2.5	11.6	<2.5	<2.5	610	4	<2.5	86.7	<2.5	<2.5	89.7	22.9
	3/8/2016 DUP	<2.5	<10	<2.5	<2.5	12.4	<2.5	<2.5	643	5.4	<2.5	97.4	<2.5	<2.5	102	28
	6/17/2016	<1.2	<5	<1.2	<1.2	24.5	<1.2	6	955	9.1	<1.2	232	<1.2	<1.2	209	85.9
	9/30/2016	<0.50	<2	<0.50	<0.50	4.1	<0.50	0.54	226	1.8	<0.50	1.7	<0.50	<0.50	1.3	45.8
	9/30/2016 DUP	<0.50	<2	<0.50	<0.50	4.5	<0.50	0.6	219	2	<0.50	1.5	<0.50	<0.50	1.4	52.1
	12/16/2016	<0.50	<2	<0.50	<0.50	1	<0.50	<0.50	1.3	0.97	<0.50	0.63	<0.50	<0.50	<0.50	0.88
	3/28/2017	<0.5	<2	<0.5	<0.5	22.5	0.68	2.8	979	5.5	<0.5	1.4	<0.5	<0.5	0.6	257
	3/28/2017 DUP	<2.5	<10	<2.5	<2.5	20.7	<2.5	3.3	1,050	6	<2.5	<2.5	<2.5	<2.5	<2.5	323
	6/12/2017	<0.50	<2.0	<0.50	<0.50	3.3	<0.50	<0.50	1.7	<0.50	<0.50	0.97	<0.50	<0.50	<0.50	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	1.1	<1.0	<0.50	0.7	<0.50	<0.50	0.79	<0.50	<0.50	<0.50	<0.50
	9/26/2017 DUP	<2.0	<2.0	<0.50	<0.50	1.1	<1.0	<0.50	0.8	<0.50	<0.50	0.86	<0.50	<0.50	<0.50	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	4.2	<0.50	<0.50	7.6	<0.50	<0.50	0.85	<0.50	<0.50	<0.50	12.80
	11/10/2017 DUP	<2.0	<2.0	<0.50	<0.50	4.3	<0.50	<0.50	8.0	<0.50	<0.50	0.71	<0.50	<0.50	<0.50	15.80
	3/22/2018	<0.500	<2.50	<0.500	<0.500	8.6	<0.500	<0.500	9.8	0.179 J	0.63	1.45	<0.500	<0.500	0.53	39.80
	7/1/2018	<0.500	<2.50	<0.500	<0.500	1.4	<0.500	<0.500	7.6	<0.500	0.279 J	0.498 J	<0.500	<0.500	0.169 J	8.98
	7/1/2018 DUP	<0.500	<2.50	<0.500	<0.500	2.0	<0.500	<0.500	9.4	<0.500	0.318 J	0.63	<0.500	<0.500	0.163 J	17.30
	9/28/2018	<1.00	<5.00	<1.00	<1.00	6.7	<0.400	<0.400	116.0	<0.400	<0.500	0.97	<0.400	<0.500	<0.400	129.0
	9/28/2018 DUP	<1.00	<5.00	<1.00	<1.00	9.1	<0.400	0.56	143.0	<0.400	<0.500	0.69	<0.400	<0.500	<0.400	129.0
	12/10/2018	<1.00	<5.00	<1.00	<1.00	1.5	<0.400	<0.400	1.8	<0.400	<0.500	0.60	<0.400	<0.500	<0.400	5.44
	3/26/2019	<2.00	<5.00	<1.00	<1.00	8.36	<0.400	0.709	117	<0.400	<0.500	0.680	<0.400	<0.500	<0.400	151
	6/3/2019	<2	<5	<0.5	<0.5	7.22	<0.400	0.440	74.7	<0.400	0.520	0.530	<0.400	<0.500	<0.400	157
	6/3/2019 DUP	<2	<5	<0.5	<0.5	7.40	<0.400	0.420	75.6	<0.400	0.610	0.560	<0.400	<0.500	<0.400	144
	9/27/2019	<1.00	<5.00	<1.00	<1.00	5.09	<0.400	<0.400	80.5	<0.400	<0.500	0.497	<0.400	<0.500	<0.400	106
	9/27/2019 DUP	<1.00	<5.00	<1.00	<1.00	5.09	<0.400	0.413	80.4	<0.400	<0.500	0.578	<0.400	<0.500	<0.400	104
	12/4/2019	<1.00	<5.00	<1.00	<1.00	1.63	<0.400	<0.400	2.57	<0.400	<0.500	1.350	<0.400	<0.500	0.45	4.5
	12/4/2019 DUP	<1.00	<5.00	<1.00	<1.00	1.67	<0.400	<0.400	2.66	<0.400	<0.500	1.130	<0.400	<0.500	<0.400	5.79

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-3(60)	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	7.03	<1	--	3.31	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.11	<0.50	<0.50	2.8	<1	--	1.28	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	21.5	<0.50	<0.50	14.9	<1	--	7.32	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	10.1	<0.50	<0.50	9.84	<1	--	4.76	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.1	<0.50	<0.50	9.7	<0.50	--	3.7	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.26	<0.50	<0.50	17	<1	--	3.84	<0.50
	03/19/02	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	17.6	<0.50	<0.50	32.3	0.5	--	14	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	40.5	<0.50	<0.50	20.8	<0.50	--	7.92	<0.50
	01/23/03	<1	<0.50	<0.50	<1	0.5	<0.50	<0.50	33.9	<0.50	<0.50	20.3	<0.50	--	12.7	<0.50
	05/28/03	<1	<0.50	<0.50	<1	0.58	<0.50	<0.50	88.3	0.53	<0.50	16.9	<0.50	--	11.9	0.7
	11/11/03	<2	<2	<2	<2	<2	<2	<2	298	<2	<2	36.1	<2	--	23	<2
	01/27/04	<2	<1	<1	<2	1.2	<1	<1	274	1.24	<1	25.2	<1	--	23.4	1.28
	05/03/04	<2	<2	<2	<2	<2	<2	<2	274	<2	<2	46.6	<2	--	27	<2
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	43	<0.50	<0.50	8.8	<0.50	--	3.4	<0.50
	02/01/05	<2	<1	<1	<2	<1	<1	<1	179	1.72	<1	15.6	<1	--	7.9	<1
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	33.8	<0.50	<0.50	5.7	<0.50	--	2.39	<0.50
	08/18/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	47.9	<0.500	<0.500	4.39	<0.500	--	1.96	0.66
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	8.39	<0.500	<0.500	2.59	<0.500	--	0.83	<0.500
	02/21/06	<5	<2.50	<2.50	<5	2.65	<2.50	<2.50	558	<2.50	<2.50	25	<2.50	--	14.4	21.6
	03/14/06	<1	<1	<1	<1	2.92	<1	1.37	97.1	<1	<1	50.6	<1	--	39.2	<1
	06/06/06	<1	<1	<1	<1	<1	<1	<1	7.97	<1	<1	2.84	<1	--	1.04	<1
	09/05/06	<1	<0.50	<0.50	<1	2.75	<0.50	1.17	108	0.78	<0.50	47.3	0.93	--	34.2	0.65
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	19.8	<0.50	<0.50	10.5	<0.50	--	5.57	<0.50
	02/07/07	<1	<0.50	<0.50	<1	1.08	<0.50	<0.50	44.3	<0.50	<0.50	21.5	<0.50	--	15.4	<0.50
	05/22/07	<1	<1	<1	<1	<1	<1	<1	32.5	<1	<1	45.2	<1	--	18.2	<1
	09/10/07	<2	<1	<1	<2	2.98	<1	<1	148	<1	<1	28.8	<1	--	31.6	1.67
	12/12/07	<2	<1	<1	<2	<1	<1	<1	11.5	<1	<1	4.22	<1	--	1.9	1.18
	03/04/08	<1	<0.500	<0.500	<1	1.58	<0.500	0.68	72.1	0.6	<0.500	27.2	0.5	<0.500	22.7	2.33
	12/08/08	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	44	<0.50	<0.50	12	<0.50	<0.50	9.2	1.3
	03/24/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	42	<0.50	<0.50	21	<0.50	<0.50	14	0.91
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	8.5	<0.50	<0.50	4.3	0.84
	12/14/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	2	<0.50	<0.50	0.85	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-3(60) (continued)	03/17/10	<0.50	<0.50	<0.50	<0.50	0.69	<0.50	<0.50	25	<0.50	<0.50	17	<0.50	<0.50	10	0.57
	06/14/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	<0.50	2.4	<0.50	<0.50	1.1	0.69
	09/20/10	<0.5	<0.5	<0.5	<0.5	0.81	<0.5	<0.5	28	<0.5	<0.5	18	<0.5	<0.5	11	0.52
	12/07/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	9	<0.5	<0.5	3.4	<0.5	<0.5	1.5	0.94
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17	<0.50	<0.50	10	<0.50	<0.50	4.6	0.67
	06/06/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	2	<0.5	<0.5	0.73	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	34	<0.50	<0.50	17	<0.50	<0.50	12	<0.50
	12/05/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	14	<0.50	<0.50	7.3	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	21	<0.50	<0.50	15	<0.50	<0.50	9	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	3	<0.5	<0.5	1.2	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	39	<0.50	<0.50	18	<0.50	<0.50	12	<0.50
	12/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	2.3	<0.50	<0.50	0.9	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	22	<0.50	<0.50	16	<0.50	<0.50	9	<0.50
	06/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16	<0.50	<0.50	11	<0.50	<0.50	5.4	<0.50
	09/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	6.8	<0.50	<0.50	3.3	<0.50
	12/10/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	3.6	<0.50	<0.50	1.5	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	2.5	<0.50	<0.50	0.89	<0.50
	6/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	3.4	<0.50	<0.50	1.4	<0.50
	9/23/2014	<0.50	<0.50	<0.50	<0.50	0.71	<0.50	<0.50	2	<0.50	<0.50	8.8	<0.50	<0.50	4.7	<0.50
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	2.2	<0.50	<0.50	0.72	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12.2	<0.50	<0.50	6	<0.50	<0.50	3.7	<0.50
	6/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6	<0.50	<0.50	3.5	<0.50	<0.50	1.6	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	3.9	<0.50	<0.50	2	0.6
	12/7/2015	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	13.9	<0.50	<0.50	4.2	<0.50	<0.50	2.5	16.7
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	2.8	<0.50	<0.50	0.78	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	17.4	<0.50	<0.50	5.8	<0.50	<0.50	5	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	3.7	<0.50	<0.50	1.9	<0.50
	12/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	1.7	<0.50	<0.50	0.68	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.62	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
	6/12/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.3	<0.50	<0.50	0.64	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	1.20	<1.0	<0.50	34.2	<0.50	<0.50	8.6	<0.50	<0.50	7.80	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	1.70	<0.50	<0.50	37.6	<0.50	<0.50	0.8	<0.50	<0.50	1.50	13.90

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-3(60) (continued)	3/22/2018	<0.500	<2.50	<0.500	<0.500	0.76	<0.500	<0.500	15.6	<0.500	<0.500	2.2	<0.500	<0.500	1.76	5.89
	7/2/2018	<0.500	<2.50 J3	<0.500	<0.500	0.67	<0.500	<0.500	12.7	<0.500	<0.500	2.7	<0.500	<0.500	1.92	3.36
	9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	9.3	<0.400	<0.500	3.3	<0.400	<0.500	2.31	<0.400
	12/10/2018	<1.00	<5.00	<1.00	<1.00	1.21	<0.400	<0.400	17.7	<0.400	<0.500	0.9	<0.400	<0.500	1.16	0.86
	3/26/2019	<2.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.23	<0.400	<0.500	1.04	<0.400	<0.500	0.420	<0.400
	6/3/2019	<4.00	<5.00	<1.00	<1.00	0.420	<0.400	<0.400	8.52	<0.400	<0.500	0.790	<0.400	<0.500	0.730	<0.400
	9/27/2019	<1.00	<5.00	<1.00	<1.00	1.130	<0.4	<0.4	21.8	<0.400	<0.500	1.030	<0.400	<0.500	1.230	3.980
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.62	<0.400	<0.500	1.170	<0.400	<0.500	0.634	<0.400
MGMS3-2(101)	08/30/00	<10	<50	<5	<5	7.28	<5	<5	120	<5	<5	154	12.1	--	98.2	<5
	11/29/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	11.4	<2.5	<2.5	11.5	<5	--	13	<2.5
	02/27/01	<2	<10	<1	<1	<1	<1	<1	2.4	<1	<1	3.36	<2	--	1.98	<1
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.24	<0.50	<0.50	3.07	<1	--	1.85	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	<0.50	5.3	<0.50	--	2.4	<0.50
	12/18/01	<1	<5	<0.50	<0.50	0.864	<0.50	0.913	10.3	<0.50	<0.50	50.9	2.98	--	23.9	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.02	<0.50	<0.50	6.88	<0.50	--	2.54	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	8.19	<0.50	<0.50	11.5	<0.50	--	3.9	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	21.2	<0.50	<0.50	17.2	<0.50	--	8.38	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	28.6	<0.50	<0.50	18.4	<0.50	--	8.76	<0.50
	11/11/03	<1	<1	<1	<1	<1	<1	<1	53.7	<1	<1	18.3	<1	--	9.3	<1
	01/27/04	<1	<0.50	<0.50	<1	0.53	<0.50	<0.50	114	0.8	<0.50	24	<0.50	--	15.1	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	22.1	<1	<1	6.74	<1	--	4.21	<1
	11/15/04	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	47	<0.50	<0.50	6.3	<0.50	--	2.9	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	66.5	<0.50	<0.50	3.59	<0.50	--	1.48	0.77
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	25.3	<0.500	<0.500	4.93	<0.500	--	1.66	0.66
	03/14/06	<1	<1	<1	<1	<1	<1	<1	23.1	<1	<1	2.91	<1	--	1.14	1.06
	06/06/06	<1	<1	<1	<1	<1	<1	<1	15.9	<1	<1	3.56	<1	--	1.88	1.06
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	32.6	<0.50	<0.50	2.84	<0.50	--	1.17	2.85
	09/10/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	40.4	<0.50	<0.50	6.32	<0.50	--	3.7	13.2
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	18.1	<0.500	<0.500	3.4	<0.500	<0.500	1.47	5.64
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	20.4	<0.500	<0.500	6.34	<0.500	<0.500	3.5	4.24
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	3	<0.50	<0.50	1.5	2.3
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	2.4	<0.50	<0.50	1.2	2.2
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	3.8	<0.50	<0.50	2.1	3.2

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-2(101) (continued)	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	3.1	<0.50	<0.50	1.8	1.2
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.5	<0.5	<0.5	3	<0.5	<0.5	1.4	1.2
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	3.7	<0.50	<0.50	2.2	0.86
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	5.9	<0.50	<0.50	4.5	<0.50
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	2.7	<0.50	<0.50	1.3	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.9	<0.50	<0.50	5.6	<0.50	<0.50	4.4	0.59
	09/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	3.6	<0.50	<0.50	2.1	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.8	<0.50	<0.50	9.1	<0.50	<0.50	6.5	<0.50
	9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	3	<0.50	<0.50	1.5	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	4.4	<0.50	<0.50	2.8	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	3.8	<0.50	<0.50	2.6	1.2
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.3	<0.50	<0.50	7.5	<0.50	<0.50	6.1	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	4.4	<0.50	<0.50	3	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	7	<0.5	<0.5	7	<0.5	<0.5	6	<0.5
	9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	5	<0.50	<0.50	0.96	<0.50	<0.50	1	0.9
	11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	2.50	<0.50	<0.50	2	<0.50
	7/1/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	2	<0.500	<0.500	1.82	<0.500	<0.500	1	0.359 J
	9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2	<0.400	<0.500	1.98	<0.400	<0.500	1	<0.400
	06/03/19	<4.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.930	<0.400	<0.500	1.89	<0.400	<0.500	1.11	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.852	<0.400	<0.500	1.84	<0.400	<0.500	0.958	<0.400
MGMS3-1(132)	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	5.58	<1	--	0.746	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	2.04	<0.50	<0.50	0.754	<1	--	<0.50	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.08	<0.50	<0.50	2.62	<1	--	0.722	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	6.67	<0.50	<0.50	3.13	<1	--	1.44	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	6.1	<0.50	--	1.9	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.11	<0.50	<0.50	8.75	<1	--	2.24	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.88	<0.50	<0.50	9.63	<0.50	--	3.02	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	11.8	<0.50	<0.50	14.6	<0.50	--	4.28	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	16.8	<0.50	<0.50	11.4	<0.50	--	6.04	<0.50
	05/28/03	<1	<0.50	<0.50	<1	0.59	<0.50	<0.50	93.3	0.76	<0.50	16.3	<0.50	--	10.1	0.83
	11/11/03	<1	<1	<1	<1	<1	<1	<1	72.4	<1	<1	12.2	<1	--	8	<1

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-1(132) (continued)	01/27/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	34.9	0.61	<0.50	12.7	<0.50	--	9.47	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	11.9	<1	<1	<1	<1	--	14.2	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	200	<2.5	<2.5	6.2	<2.5	--	3.4	<2.5
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	42.6	0.79	<0.50	4.42	<0.50	--	2.23	<0.50
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	19.9	<0.500	<0.500	2.41	<0.500	--	0.8	<0.500
	03/14/06	<1	<1	<1	<1	<1	<1	<1	20.3	<1	<1	2.13	<1	--	<1	<1
	06/06/06	<1	<1	<1	<1	<1	<1	<1	18.6	<1	<1	1.57	<1	--	<1	1.36
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	24.1	<0.50	<0.50	3.05	<0.50	--	1.08	4.68
	09/10/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	36.5	<0.50	<0.50	4.69	<0.50	--	3.17	16.8
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	21.8	<0.500	<0.500	3.37	<0.500	<0.500	1.64	6.83
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	26	<0.500	<0.500	4.86	<0.500	<0.500	3.52	4.96
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	1.8	<0.50	<0.50	0.79	2.4
	03/24/09 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	1.6	<0.50	<0.50	0.78	2.3
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	4.3	<0.50	<0.50	1.9	1.6
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	2.1	<0.50	<0.50	1.2	2
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.2	<0.50	<0.50	2.6	<0.50	<0.50	1.9	0.92
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6.5	<0.5	<0.5	2.9	<0.5	<0.5	2.3	1.3
	03/07/11	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	18	<0.50	<0.50	4	<0.50	<0.50	3.8	4.3
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	<0.50	<0.50	3.8	<0.50	<0.50	3.4	0.55
	03/08/12	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	9.3	<0.50	<0.50	7	<0.50	<0.50	6.9	0.67
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6	<0.50	<0.50	4.9	<0.50	<0.50	4	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.4	<0.50	<0.50	8.1	<0.50	<0.50	7.2	0.98
	09/16/13	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	9.8	<0.50	<0.50	7.9	<0.50	<0.50	8.1	0.84
	3/18/2014	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	0.51	11	<0.50	<0.50	13	<0.50	<0.50	11	0.76
	9/23/2014	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	8.9	<0.50	<0.50	9	<0.50	<0.50	7.9	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	9.3	<0.50	<0.50	6.3	<0.50	<0.50	6	0.56
	9/22/2015	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	13.3	<0.50	<0.50	8.1	<0.50	<0.50	8.2	1.2
	3/9/2016	<0.50	<2	<0.50	<0.50	1	<0.50	0.56	14.4	<0.50	<0.50	13.5	0.56	<0.50	12.7	0.8
	9/30/2016	<0.50	<2	<0.50	<0.50	0.84	<0.50	0.54	12.9	<0.50	<0.50	13.8	<0.50	<0.50	11.9	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MGMS3-1(132) (continued)	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	7.9	<0.5	<0.5	13.8	<0.5	<0.5	9.6	<0.5
	9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	3.4	<0.50	<0.50	3.0	<0.50	<0.50	2.8	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	5.1	<0.50	<0.50	3.8	<0.50
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.247 J	<0.500	<0.500	4.0	<0.500	<0.500	5.6	<0.500	<0.500	4.1	0.359 J
	9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.5	<0.400	<0.500	3.8	<0.400	<0.500	3.2	<0.400
	6/5/2019	<4.00	<5.00	<1.00	<1.00	0.412	<0.400	<0.400	5.97	<0.400	<0.500	9.45	<0.400	<0.500	6.79	<0.400
	12/4/2019	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	5.34	<0.400	<0.500	8.69	<0.400	<0.500	6.21	<0.400
CMT1-1	11/11/03	<1	<1	2.87	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	08/19/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/04	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	--	<5	<5
	03/23/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500
	05/26/06	Well Abandoned														
CMT1-2	11/11/03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	--	1.03	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	08/19/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	--	0.88	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.37	<0.50	--	0.99	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	--	0.69	<0.50
	11/17/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.6	<0.500	--	<0.500	<0.500
	05/26/06	Well Abandoned														
CMT1-3	11/11/03	<2	<2	3.56	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2	<2
	01/26/04	<1	<0.50	1.1	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/03/04	<1	<1	2.97	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	08/19/04	<1	<0.50	2.16	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/04	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	--	<25	<25
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	--	<0.50	<0.50
	11/17/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500
	05/26/06	Well Abandoned														

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
EX	03/23/09	<5	<5	<5	<5	<5	<5	<5	50	<5	<5	1,400	43	<5	420	<5
	06/18/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	24	1.1	<0.50	11	<0.50
	09/18/09	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	3.3	120	0.76	<0.50	2,100	38	<0.50	380	1.1
	12/18/09	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	5.6	<2.5	<2.5	700	3.7	<2.5	56	<2.5
	03/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	150	3.2	<0.50	33	<0.50
	06/17/10	<0.50	<0.50	<0.50	<0.50	0.97	<0.50	<0.50	92	<0.50	<0.50	150	2.3	<0.50	39	2.2
	09/23/10	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	1.6	90	0.53	<0.5	2,400	20	<0.5	220	1.8
	12/21/10	<0.5	<0.5	<0.5	<0.5	0.83	<0.5	0.59	30	<0.50	<0.5	900	6.7	<0.5	99	0.71
	03/31/11	<4	<4	<4	<4	8.2	<4	8.1	240	<4	<4	6,800	110	<4	910	5.1
	06/07/11	<4	<4	<4	<4	<4	<4	<4	140	<4	<4	1,400	15	<4	170	<4
	09/19/11	<5	<5	<5	<5	7.9	<5	11	290	<5	<5	4,100	73	<5	460	14
	12/07/11	<5	<5	<5	<5	16	<5	19	12,000	9.3	<5	<50	17	<5	<50	140
	03/09/12	<4	<4	<4	<4	5	<4	<4	1,400	8.6	<4	33	<4	<4	10	290
	06/22/12	<0.5	5.5	<0.5	<0.5	3.4	<0.5	0.68	170	1.3	<0.5	3	0.59	<0.5	1.1	120
	09/14/12	<1.5	2.7	<1.5	<1.5	1.5	<1.5	<1.5	320	<1.5	<1.5	3	<1.5	<1.5	<1.5	42
	12/14/12	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	12
	03/15/13	<0.50	2.8	<0.50	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	1.2	<0.50	<0.50	<0.50	4.4
	06/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	0.79	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	1.9	<0.50	<0.50	1.9	<0.50	0.54	71	0.68	<0.50	4.1	<0.50	<0.50	2.6	30
	12/16/13	<0.50	1.4	<0.50	<0.50	3.8	<0.50	<0.50	34	<0.50	<0.50	2	<0.50	<0.50	1.4	28
	3/24/2014	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	30	<0.50	<0.50	20	<0.50	<0.50	7.5	11
	6/23/2014	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	1.1	160	0.97	<0.50	29	<0.50	<0.50	15	38
	9/30/2014	Insufficient water for sampling .														
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	22	<0.50	<0.50	2.7	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	2.1	688	1.9	<0.50	168	2.5	<0.50	55.8	2.8
	6/18/2015	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	2.6	420	1.6	<0.50	186	0.88	<0.50	42	3.2
	9/22/2015	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	3.7	543	2.6	<0.50	302	0.65	<0.50	61.9	24.4
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	427	<0.50	<0.50	94	<0.50	<0.50	21.3	2.1
	3/8/2016	<1.2	<5	<1.2	<1.2	4	<1.2	2.9	1,160	3.6	<1.2	274	5	<1.2	71.1	13.3
	6/17/2016	<5	<20	<5	<5	<5	<5	<5	1,040	<5	<5	592	<5	<5	90.8	<5
	9/28/2016	<1.7	<6.7	<1.7	<1.7	4.6	<1.7	3.5	2,230	3.8	<1.7	39.4	2.5	<1.7	549	128
	12/12/2016	<0.50	3.7	<0.50	<0.50	<0.50	<0.50	<0.50	8.1	<0.50	<0.50	4.3	<0.50	<0.50	0.96	51.9

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
EX (continued)	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	5.2	<0.5	<0.5	6.1	<0.5	<0.5	1.9	<0.5
	6/14/2017	<2.0	10.2	<0.50	<0.50	10.7	<1.0	<0.50	11.7	0.56	<0.50	9.5	<0.50	<0.50	3.0	1.3
	9/26/2017	<2.0	3.4	<0.50	<0.50	8.8	<1.0	<0.50	6.9	<0.50	<0.50	0.8	<0.50	<0.50	0.6	10.1
	3/21/2018	<0.500	1.45 J	<0.500	<0.500	1.3	<0.500	<0.500	22.6	<0.500	<0.500	1.5	<0.500	<0.500	2.7	10.8
	6/28/2018	<0.500	42.9	<0.500	<0.500	4.6	<0.500	1.11	722.0	8.72	<0.500	1.9	<0.500	<0.500	0.8	424.0
	9/24/2018	<1.00	<5.00	<1.00	<1.00	1.4	<0.400	<0.400	3.4	0.75	<0.500	3.1	<0.400	<0.500	2.4	7.6
	12/4/2018	<1.00	<5.00	<1.00	<1.00	0.9	<0.400	<0.400	8.2	<0.400	<0.500	6.4	<0.400	<0.500	3.6	1.9
MP-1	03/23/09	<4	<4	<4	<4	6	<4	<4	89	<4	<4	1,200	10	<4	180	<4
	06/18/09	<4	<4	<4	<4	4.3	<4	<4	43	<4	<4	1,500	12	<4	180	<4
	09/18/09	<4	<4	<4	<4	14	<4	<4	240	8.9	<4	1,100	8.2	<4	310	7.3
	12/18/09	<4	<4	<4	<4	<4	<4	<4	58	<4	<4	1,000	7.1	<4	180	<4
	03/16/10	<3	<3	<3	<3	22	<3	4.7	410	13	<3	1,500	8.6	<3	400	10
	06/17/10	<3	<3	<3	<3	3.2	<3	<3	120	<3	<3	800	5.4	<3	140	<3
	09/23/10	<3	<3	<3	<3	<3	<3	<3	41	<3	<3	730	4	<3	120	<3
	12/10/10	<3	<3	<3	<3	<3	<3	<3	27	<3	<3	1,000	4.5	<3	150	<3
	03/14/11	<3	<3	<3	<3	7.1	<3	<3	150	<3	<3	1,200	6.4	<3	180	5.9
	06/07/11	<2.5	<2.5	<2.5	<2.5	4.9	<2.5	<2.5	75	<2.5	<2.5	640	3.3	<2.5	130	<2.5
	09/19/11	<1.5	<1.5	<1.5	<1.5	2.4	<1.5	<1.5	41	<1.5	<1.5	300	1.9	<1.5	72	1.6
	12/07/11	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	<2.5	49	3.1	<2.5	640	3.1	<2.5	120	<2.5
	03/09/12	<1.5	<1.5	<1.5	<1.5	9.4	<1.5	2.8	440	6.3	<1.5	490	3.5	<1.5	140	21
	06/22/12	<2.5	<2.5	<2.5	<2.5	5.6	<2.5	2.8	530	2.9	<2.5	690	12	<2.5	120	48
	09/14/12	<1.5	<1.5	<1.5	<1.5	4	<1.5	<1.5	170	2.2	<1.5	340	2	<1.5	83	4.5
	12/14/12	<0.90	<0.90	<0.90	<0.90	2	<0.90	<0.90	170	1.7	<0.90	230	1	<0.90	48	1.8
	03/15/13	<0.90	<0.90	<0.90	<0.90	5.1	<0.90	0.94	140	2.5	<0.90	230	1	<0.90	69	1.8
	06/14/13	<0.90	<0.90	<0.90	<0.90	4.5	<0.90	1.4	190	1.6	<0.90	330	1.4	<0.90	70	1.8
	09/20/13	<0.90	<0.90	<0.90	<0.90	2.9	<0.90	<0.90	77	1.5	<0.90	260	0.95	<0.90	66	<0.90
	12/16/13	<0.90	<0.90	<0.90	<0.90	1.7	<0.90	1.1	67	0.92	<0.90	290	1.2	<0.90	70	<0.90
	3/24/2014	<1.5	<1.5	<1.5	<1.5	2.2	<1.5	<1.5	240	<1.5	<1.5	360	1.8	<1.5	54	<1.5
	6/23/2014	<1.5	<1.5	<1.5	<1.5	4.9	<1.5	2.3	290	1.7	<1.5	1,200	9.5	<1.5	130	5
	9/30/2014	<2	<2	<2	<2	2.8	<2	<2	110	<2	<2	360	<2	<2	63	16
	12/15/2014	<1.5	<1.5	<1.5	<1.5	1.7	<1.5	<1.5	58	<1.5	<1.5	320	<1.5	<1.5	59	<1.5

Please refer to notes at end of table.

Cascadia Associates, LLC

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo-form	Chloro-ethane	Chloro-form	Dibromo-chloro-methane	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,2-Dichloro-propane	Tetra-chloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	Trichloro-ethene	Vinyl Chloride
MP-1	3/20/2015	<1	<1	<1	<1	3.6	<1	1.5	188	1.5	<1	565	1	<1	95.6	24.8
(continued)	6/18/2015	<0.84	<0.84	<0.84	<0.84	2.9	<0.84	1.5	91	0.87	<0.84	376	<0.84	<0.84	80.8	<0.84
	9/22/2015	<1.2	<1.2	<1.2	<1.2	1.8	<1.2	1.4	38.3	<1.2	<1.2	343	<1.2	<1.2	68.3	<1.2
	12/8/2015	<1.2	<1.2	<1.2	<1.2	1.8	<1.2	1.5	50.9	<1.2	<1.2	308	<1.2	<1.2	62.6	<1.2
	3/8/2016	<0.84	<3.3	<0.84	<0.84	7.5	<0.84	2.1	148	1.2	<0.84	433	<0.84	<0.84	100	<0.84
	6/17/2016	<0.50	<2	<0.50	<0.50	5	<0.50	1.5	125	0.97	<0.50	206	<0.50	<0.50	67.3	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	1.3	<0.50	3.1	40.5	<0.50	<0.50	99.4	<0.50	<0.50	35.5	3.3
	12/13/2016	<0.50	<2	<0.50	<0.50	0.64	<0.50	0.92	209	0.55	<0.50	2.9	<0.50	<0.50	1	4.3
	3/30/2017	<0.5	71.4	<0.5	<0.5	7.5	<0.5	<0.5	177	6	<0.5	<0.5	<0.5	<0.5	0.79	186
	6/14/2017	<2.0	4.0	<0.50	<0.50	2.3	<1.0	<0.50	143	1.9	<0.50	16.2	<0.50	<0.50	8.5	29.4
	9/26/2017	<2.0	<2.0	<0.50	<0.50	3.4	<1.0	4.50	83	0.8	<0.50	307.0	<0.50	<0.50	65.9	2.3
	11/9/2017	<2.0	<2.0	<0.50	<0.50	3.3	<0.50	4.30	105	0.9	<0.50	198.0	<0.50	<0.50	74.0	2.6
	3/21/2018	<0.500	<2.50	<0.500	<0.500	3.2	<0.500	4.04	151	1.0	<0.500	245.0	<0.500	<0.500	64.5	1.6
	6/28/2018	<0.500	<2.50	<0.500	<0.500	10.2	<0.500	9.34	353	1.7	<0.500	747.0	0.56	<0.500	140.0	5.3
	9/26/2018	<20.0	<100	<20.0	<20.0	<8.00	<8.00	<8.00	60	<8.00	<10.0	322.0	<8.00	<10.0	57.0	<8.00
	12/4/2018	<1.00	<5.00	<1.00	<1.00	<0.400	2.79	6.59	130	0.8	<0.500	355.0	<0.400	<0.500	76.7	1.2
	3/20/2019	<2.00	<5.00	<1.00	<1.00	1.43	<0.400	3.08	69.0	<0.400	<0.500	146	<0.400	<0.500	36.6	1.55
	6/7/2019	<10	<100	<10	<10	<8.00	<8.00	<8.00	205	<8.00	<10.0	769	<8.00	<10.0	111	<8.00
	9/26/2019	<2.00	<5.00	<2.00	<2.00	1.36	<0.800	1.14	37.1	<0.800	<1.00	176	<0.800	<1.00	26.8	<0.800
	12/3/2019	<2.00	<10.0	<2.00	<2.00	1.57	<0.800	1.8	40.6	<0.800	<1.00	306	<0.800	<1.00	57.8	<0.800
MP-3	6/28/2018	<0.500	<2.50	<0.500	<0.500	5.24	<0.500	1.78	203	1.31	<0.500	398	1.82	<0.500	65.1	8.96
	9/27/2018	<1.00	<5.00	<1.00	<1.00	4.06	<0.400	3.52	187	1.60	<0.500	721	0.950	<0.500	148	0.730

Notes:

1. HVOCs = Halogenated volatile organic compounds analysis by U.S. Environmental Protection Agency (EPA) Method 8260B; results reported in micrograms per liter (µg/L).
2. TPH = Total petroleum hydrocarbons in the diesel and heavy oil range analysis by Washington Department of Ecology (WDOE) Method TPH-418.1 Results reported in milligrams per liter (mg/L).
3. -- = Not sampled or not analyzed.
4. < = Not detected at or above the specified laboratory method reporting limit (MRL).
5. B = Estimated concentration based on data quality review - similar detection in associated field blank/equipment blanks (less than 5x difference).
6. J = Estimated concentration based on data quality review.
7. n-Propylbenzene, 1,1,1,2-Tetrachloro-ethane, and 1,1,2-Trichloroethane were detected during the first semi-annual 2008 monitoring event. Refer to Table 3 of the *First Semi-Annual 2008 Groundwater Monitoring Report* for detection concentrations.
8. ND = Not detected and no reporting limit specified.
10. E = Chloroform was detected in the equipment blank during the March 2010 and September 2010 sampling events. Chloroform was flagged with an "E" in samples where the concentration was five times or less than the maximum detection in the equipment blank.

Cascadia Associates, LLC

APPENDIX C

LABORATORY ANALYTICAL REPORTS AND

DATA QUALITY REVIEW (ON CD)

1.0 INTRODUCTION

This appendix documents the results of a quality assurance/quality control (QA/QC) review of the analytical data for groundwater samples collected during the September and December 2019 groundwater sampling events, and air samples collected during the July, September, and November 2019 soil vapor extraction (SVE) effluent sampling events. The samples were collected at the NuStar Terminals Services, Inc. (NuStar) Vancouver Facility (Facility) in Vancouver, Washington, and submitted to TestAmerica Laboratories in West Sacramento, California, and Apex Labs in Tigard, Oregon. A list of the laboratory reports is presented below. A copy of each analytical laboratory report is included in this appendix.

Report	Report Date	Sampling Event
A9I0801	October 11, 2019	Third Quarter Groundwater Monitoring
A9I0852	October 16, 2019	Third Quarter Groundwater Monitoring
A9I0898	October 17, 2019	Third Quarter Groundwater Monitoring
J52078	July 15, 2019	Soil Vapor Monitoring
J54161	October 3, 2019	Soil Vapor Monitoring
J56029	January 6, 2020	Soil Vapor Monitoring
A9L0082	January 6, 2020	Fourth Quarter Groundwater Monitoring
A9L0122	December 30, 2019	Fourth Quarter Groundwater Monitoring
A9L0164	December 30, 2019	Fourth Quarter Groundwater Monitoring

2.0 DATA VALIDATION

The QA review outlines the applicable quality control criteria utilized during the data review process, as well as any deviations from those criteria. Examination and validation of the laboratory summary reports include:

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

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

3.0 ANALYTICAL METHODS

Chemical analyses for water samples consisted of volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method 8260C. Select groundwater samples were also analyzed for total organic carbon (TOC) by EPA Method 5310, ethene by EPA Method RSK-175M, ammonia as nitrogen by EPA Method 4500-NH3 G and nitrate as nitrogen and nitrite as nitrogen by EPA Method 300.0. SVE effluent vapor samples were analyzed for VOCs using EPA Method TO-15.

4.0 QUALITY ASSURANCE OBJECTIVES 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 monitoring groundwater quality trends and SVE monitoring data 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 were compared to action levels for each parameter in the media of concern. Precision, accuracy, representativeness, completeness, and comparability parameters used to indicate data quality are defined below.

Sample Receipt. Samples were received by the laboratory in good condition and on ice. VOA containers for VOC analysis arrived without headspace with the exception of 1 of 5 bottles from MW-13, 1 of 5 bottles from MW-26, and 2 of 3 bottles from MW-5 in report A9I0852.

Reporting Limits. Detection limits are set by the laboratory and are based on instrumentation abilities, sample matrix, and suggested detection limits by the EPA or the Washington State Department of Ecology (Ecology). In some cases, the detection limits may be raised due to high concentrations of analytes in the samples or matrix interferences. Detection limits were generally consistent with industry standards and below promulgated regulatory standards when possible (if not raised, as previously discussed). Reporting limits were reviewed and are generally acceptable for this project. Reporting limits for individual samples are varied based on the magnitude of the chemical impact. It is not expected that any of the raised detection limits compromise the usability of the data.

Holding Times. Samples were analyzed within the recommended method holding time.

Calibration and Analysis. Calibration verification was outside of acceptable limits for select VOCs in each sample batch. As the corresponding sample results are all below method reporting limits, and are not considered COCs for this project, no data were flagged. All other calibrations were within the control limits for analytes presented in Table 3. The nitrate result for sample MW-8 (Report A9L0082) was inadvertently omitted from the initial report. Upon later examination of the data, it was determined that the sample result was outside the acceptable calibration range. At that time, the sample was outside the hold time and not reanalyzed. The result is flagged with an "E" qualifier to indicate that the presented result is considered an estimate.

Method Blanks. A method, or laboratory, blank is a sample prepared in the laboratory along with the actual samples and analyzed for the same parameters at the same time. It is used to assess if detected contaminants may have been the result of contamination of the samples in the laboratory. No analytes were detected in the laboratory method blanks for the water analyses

Laboratory Control Samples and Laboratory Control Sample Duplicate. Laboratory Control Samples (LCS) and Laboratory Control Sample Duplicates (LCSD) were analyzed to assess the accuracy of the analytical equipment and methods. LCS are prepared from an analyte-free matrix that is then spiked with known levels of the constituents of interest (COI; i.e., a standard). The concentrations are measured, and the results compared to the known spiked levels. This

comparison is expressed as percent recovery. The LCS and LCSD recovery for each quality control batch were within acceptable recovery limits, with the following exceptions:

- Report A9I0801. The LCS recovery of bromomethane, chloroethane, 2,2-dichloropropane, and trichlorofluoromethane were above acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of bromoform, carbon tetrachloride, dibromochloromethane, and 1,2-dibromo-3-chloropropane were below acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of vinyl chloride for (9091420-BS1) and (9091430-BS1) was slightly above acceptable range and the reported results may be biased.

- Report A9I0852. The LCS recovery of bromomethane, chloroethane, 2,2-dichloropropane, and trichlorofluoromethane were above acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of bromoform, carbon tetrachloride, dibromochloromethane, and 1,2-dibromo-3-chloropropane were below acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of vinyl chloride for (9091420-BS1) and (9091430-BS1) was slightly above acceptable range and the reported results for samples MW-5, MW-7, MW-12, and MW-19 may be biased.

- Report A9I0898. The LCS recovery of bromomethane, bromochloromethane, chloroethane, 2,2-dichloropropane, 1,1,2,2,-tetrachloroethane, 1,2,3-trichlorobenzene, carbon tetrachloride, and trichlorofluoromethane were above acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of bromoform, carbon tetrachloride, dibromochloromethane, and dibromochloromethane were below acceptable limits. No associated sample data were detected; therefore, no sample data were flagged. The LCS recovery of vinyl chloride for (9100476-BS1) and (9091430-BS1) was slightly above acceptable range and the reported results for samples MW-1, MGMS1-40, MGMS1-60, MGMS2-40, MGMS2-60, MGMS3-40, and MGMS3-60 may be biased.

- Report A9L0082. The LCS recovery of bromochloromethane, bromoform, bromomethane, and dibromochloromethane were outside acceptable limits. No associated sample data were detected; therefore, no sample data were flagged.

- Report A9L0122. The LCS recovery of bromochloromethane, bromoform, bromomethane, and dibromochloromethane were outside acceptable limits. No associated sample data were detected; therefore, no sample data were flagged.

- Report A9L0164. The LCS recovery of bromochloromethane, bromoform, and dibromochloromethane were above acceptable limits. No associated sample data were detected; therefore, no sample data were flagged.

- Report J54161. The LCS recovery of hexachlorobutadiene (analytical batch 320-327435) were outside acceptable limits. No associated sample data were detected; therefore, no sample data were flagged.

The LCS is then compared to the LCSD of the same batch and expressed as a relative percent difference (RPD) value. The percent recovery and RPD values are then compared to control limits to assess data quality. The RPD between the LCS and LCSD were within an acceptable range.

Matrix Spike Analyses. A matrix spike QC sample is used to assess the performance of the analytical method by determining potential matrix interferences. Matrix spike (MS) and matrix spike duplicate (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 MSD is then compared to the MS of the same batch and expressed as an RPD value. The percent recovery and RPD values are then compared to control limits to assess data quality.

The recovery from the following MS and MSD samples were outside of control limits:

- Report A9I0898. The MS and MSD recoveries (using sample MW-1) was outside acceptable limits for bromochloromethane and cis-1,2,-dichlorothene due to high concentration of analyte in the sample. The MS recovery percentage (using sample MW-1) was slightly outside acceptable limits for bromomethane, chloroethane, 2,2-dichloropropane, trichlorofluoromethane, and vinyl chloride. The MS and MSD recoveries (using sample MGMS2-40) was outside acceptable limits for cis-1,2,-dichlorothene and vinyl chloride due to high concentration of analyte in the sample. The MS recovery percentage (using sample MGMS2-40) was slightly outside acceptable limits for bromomethane, 2,2-dichloropropane, 1,1,2,2,-tetrachloroethane, and trichlorofluoromethane.

- Report A9L0082. The MS recovery (using sample MW-26 for the spike) of bromochloromethane and dibromochloromethane were above acceptable limits. The MS recovery (using sample MW-9) of ammonia was outside acceptable recovery limits. The associated MSD recovery of ammonia was within an acceptable range.

- Report A9L0122. The MS recovery (using sample S-1 for the spike) of bromochloromethane and dibromochloromethane were above acceptable limits. The MS recovery (using sample MW-5) of ammonia was outside acceptable recovery limits. The associated MSD recovery of ammonia was within an acceptable range.

The RPD between the corresponding MS and MSD samples was within an acceptable range, with the exception of 1,1,2,2-tetrachloroethane in matrix spike samples (from lab report A9I0898), indicating that the precision of the analysis process was acceptable.

No MS or MSD samples were analyzed as part of the air sample QC batch.

Surrogate Recovery. Surrogates are organic compounds that are similar in chemical composition to the COI and spiked into environmental and batch quality control samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis. Surrogate recoveries were within acceptable control limits.

Laboratory Duplicate. A laboratory duplicate is a second analysis of an environmental sample received by the laboratory, which serves as an internal check on laboratory quality as well as potential variability of the sample matrix. The laboratory duplicate concentration is compared to the primary sample concentration to assess the precision of the analytical method. This comparison can be expressed by the RPD between the original and duplicate samples. The laboratory duplicate sample RPD values were within recommended control limits.

Field Duplicate. A field duplicate is a second field sample collected from a selected monitoring point. Field duplicate samples serve as a check on laboratory quality as well as potential variability of the sample matrix. The field duplicate is analyzed and compared with the primary sample to assess the precision of the analytical method. This comparison can be expressed by the RPD between the primary and duplicate samples. The field duplicate sample RPD values were within recommended limits.

Trip Blank. A trip blank is a sample of analyte-free water that is transported from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures. Trip blanks assess contamination introduced during shipping and field-handling activities. Trip blank samples did not contain analytes above the laboratory reporting limit.

Conclusion. In conclusion, the overall QA objectives have been met, and the data are of adequate quality for use in this project with appropriate lab qualifiers.

Apex Laboratories, LLC

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

Friday, October 11, 2019

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

RE: A9I0801 - Shore Terminal-Vancouver - Nustar Van 3Q19

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 A9I0801, which was received by the laboratory on 9/25/2019 at 3:55:00PM.

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	0.1 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

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

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-21i-105	A9I0801-01	Water	09/25/19 10:40	09/25/19 15:55
MW-22i	A9I0801-02	Water	09/25/19 11:30	09/25/19 15:55
MW-10	A9I0801-03	Water	09/25/19 12:20	09/25/19 15:55
MW-14	A9I0801-04	Water	09/25/19 13:10	09/25/19 15:55
S-1	A9I0801-05	Water	09/25/19 14:00	09/25/19 15:55
S-2	A9I0801-06	Water	09/25/19 14:40	09/25/19 15:55
MW-21i-40	A9I0801-07	Water	09/25/19 10:09	09/25/19 15:55
MW-18i	A9I0801-08	Water	09/25/19 13:25	09/25/19 15:55
MW-16	A9I0801-09	Water	09/25/19 12:14	09/25/19 15:55
MW-20i	A9I0801-10	Water	09/25/19 11:20	09/25/19 15:55
MW-25i	A9I0801-11	Water	09/25/19 14:14	09/25/19 15:55
Trip Blank#2137	A9I0801-12	Water	09/25/19 00:00	09/25/19 15:55

Apex Laboratories

Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL CASE NARRATIVE

Work Order: A9I0801

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology.

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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A9I0801-01)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
cis-1,2-Dichloroethene	**4.08**	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Tetrachloroethene (PCE)	**4.93**	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A9I0801-01)				**Matrix: Water**		**Batch: 9091420**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/19 22:45	EPA 8260C	
Trichloroethene (TCE)	**2.62**	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/19 22:45	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/19 22:45	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/19 22:45	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:* *80-120 %*	*1*	*09/28/19 22:45*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*	*80-120 %*	*1*	*09/28/19 22:45*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*09/28/19 22:45*	*EPA 8260C*	
MW-22i (A9I0801-02)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1-Dichloroethane	**0.577**	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
cis-1,2-Dichloroethene	**15.5**	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-22i (A9I0801-02)				**Matrix: Water**		**Batch: 9091420**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Tetrachloroethene (PCE)	**3.12**	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/19 23:39	EPA 8260C	
Trichloroethene (TCE)	**6.88**	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/19 23:39	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/19 23:39	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/19 23:39	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/28/19 23:39*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*09/28/19 23:39*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*		*80-120 %*	*1*	*09/28/19 23:39*	*EPA 8260C*	
MW-10 (A9I0801-03)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 (A9I0801-03)				**Matrix: Water**		**Batch: 9091420**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Tetrachloroethene (PCE)	**2.03**	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 00:06	EPA 8260C	
Trichloroethene (TCE)	**1.35**	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 00:06	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:06	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 00:06	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/29/19 00:06*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*09/29/19 00:06*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*1*	*09/29/19 00:06*	*EPA 8260C*	
MW-14 (A9I0801-04)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A9I0801-04)				**Matrix: Water**		**Batch: 9091420**		
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1-Dichloroethane	**12.5**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1-Dichloroethene	**4.58**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
trans-1,2-Dichloroethene	**3.60**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Tetrachloroethene (PCE)	**91.8**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1,1-Trichloroethane	**1.47**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 00:33	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 00:33	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 00:33	EPA 8260C	
Vinyl chloride	**0.482**	---	0.400	ug/L	1	09/29/19 00:33	EPA 8260C	**Q-54b**
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*104 %*	*Limits:*	*80-120 %*	*09/29/19 00:33*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*09/29/19 00:33*	*EPA 8260C*	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A9I0801-04)				**Matrix: Water**		**Batch: 9091420**		
Surrogate: 4-Bromofluorobenzene (Surr)			*Recovery: 95 %*	*Limits: 80-120 %*	*1*	*09/29/19 00:33*	*EPA 8260C*	
MW-14 (A9I0801-04RE1)				**Matrix: Water**		**Batch: 9091430**		
cis-1,2-Dichloroethene	**264**	---	4.00	ug/L	10	09/30/19 17:54	EPA 8260C	
Trichloroethene (TCE)	**327**	---	4.00	ug/L	10	09/30/19 17:54	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)			*Recovery: 95 %*	*Limits: 80-120 %*	*1*	*09/30/19 17:54*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*	*80-120 %*	*1*	*09/30/19 17:54*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*09/30/19 17:54*	*EPA 8260C*	
S-1 (A9I0801-05RE1)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 17:00	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
cis-1,2-Dichloroethene	**1.86**	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-1 (A9I0801-05RE1)				**Matrix: Water**		**Batch: 9091430**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Tetrachloroethene (PCE)	**1.10**	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 17:00	EPA 8260C	
Trichloroethene (TCE)	**2.71**	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 17:00	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:00	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 17:00	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 17:00*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*1*	*09/30/19 17:00*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*09/30/19 17:00*	*EPA 8260C*	
S-2 (A9I0801-06RE1)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 17:27	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A9I0801-06RE1)				**Matrix: Water**		**Batch: 9091430**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1-Dichloroethane	**8.88**	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
cis-1,2-Dichloroethene	**49.6**	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
trans-1,2-Dichloroethene	**0.638**	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1,1-Trichloroethane	**0.942**	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 17:27	EPA 8260C	
Trichloroethene (TCE)	**2.85**	---	0.400	ug/L	1	09/30/19 17:27	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 17:27	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 17:27	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 17:27*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*09/30/19 17:27*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*92 %*		*80-120 %*	*1*	*09/30/19 17:27*	*EPA 8260C*	
S-2 (A9I0801-06RE2)				**Matrix: Water**		**Batch: 9100474**		
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 19:19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits:*	*80-120 %*	*1*	*10/01/19 19:19*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*1*	*10/01/19 19:19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*1*	*10/01/19 19:19*	*EPA 8260C*	
MW-21i-40 (A9I0801-07)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A9I0801-07)				**Matrix: Water**		**Batch: 9091420**		
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1-Dichloroethane	**2.48**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1-Dichloroethene	**0.768**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
cis-1,2-Dichloroethene	**55.5**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
trans-1,2-Dichloroethene	**0.657**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	
Tetrachloroethene (PCE)	**22.5**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 01:54	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A9I0801-07)				**Matrix: Water**		**Batch: 9091420**		
Trichloroethene (TCE)	**14.9**	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 01:54	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 01:54	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 01:54	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/29/19 01:54*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*09/29/19 01:54*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*1*	*09/29/19 01:54*	*EPA 8260C*	
MW-18i (A9I0801-08)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
cis-1,2-Dichloroethene	**0.630**	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-18i (A9I0801-08)				**Matrix: Water**		**Batch: 9091420**		
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Tetrachloroethene (PCE)	**0.920**	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 02:21	EPA 8260C	
Trichloroethene (TCE)	**0.647**	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 02:21	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:21	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 02:21	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/29/19 02:21*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*09/29/19 02:21*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*		*80-120 %*	*1*	*09/29/19 02:21*	*EPA 8260C*	
MW-16 (A9I0801-09)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A9I0801-09)				**Matrix: Water**		**Batch: 9091420**		
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
cis-1,2-Dichloroethene	**14.4**	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Tetrachloroethene (PCE)	**136**	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1,1-Trichloroethane	**0.658**	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 02:48	EPA 8260C	
Trichloroethene (TCE)	**23.9**	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 02:48	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 02:48	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 02:48	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*1*	*09/29/19 02:48*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*1*	*09/29/19 02:48*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*		*80-120 %*	*1*	*09/29/19 02:48*	*EPA 8260C*	
MW-20i (A9I0801-10)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A9I0801-10)				**Matrix: Water**		**Batch: 9091420**		
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1-Dichloroethane	**0.461**	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
cis-1,2-Dichloroethene	**9.43**	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
Tetrachloroethene (PCE)	**2.34**	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 03:15	EPA 8260C	
Trichloroethene (TCE)	**1.44**	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 03:15	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:15	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 03:15	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 93 %*		*Limits: 80-120 %*	*1*	*09/29/19 03:15*	*EPA 8260C*	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A9I0801-10)				**Matrix: Water**		**Batch: 9091420**		
Surrogate: Toluene-d8 (Surr)		*Recovery: 105 %*	*Limits: 80-120 %*		*1*	*09/29/19 03:15*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*09/29/19 03:15*	*EPA 8260C*	
MW-25i (A9I0801-11)				**Matrix: Water**		**Batch: 9091420**		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	

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Apex Laboratories, LLC

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-25i (A9I0801-11)				**Matrix: Water**		**Batch: 9091420**		
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/19 03:41	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/19 03:41	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/19 03:41	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/19 03:41	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:*	*80-120 %*	*09/29/19 03:41*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*09/29/19 03:41*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*09/29/19 03:41*	*EPA 8260C*	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A9I0801-01)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	**28.3**	---	0.200	mg/L	10	09/26/19 16:36	SM 4500-NH3 G	
MW-22i (A9I0801-02)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	**0.339**	---	0.0200	mg/L	1	09/26/19 16:38	SM 4500-NH3 G	
MW-10 (A9I0801-03)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	**37.3**	---	0.400	mg/L	20	09/26/19 16:39	SM 4500-NH3 G	
MW-14 (A9I0801-04)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	**29.6**	---	0.400	mg/L	20	09/26/19 16:41	SM 4500-NH3 G	
S-1 (A9I0801-05)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 16:42	SM 4500-NH3 G	
S-2 (A9I0801-06)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	**0.691**	---	0.0200	mg/L	1	09/26/19 16:44	SM 4500-NH3 G	
MW-21i-40 (A9I0801-07)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 16:45	SM 4500-NH3 G	
MW-18i (A9I0801-08)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 16:47	SM 4500-NH3 G	
MW-16 (A9I0801-09RE1)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 17:13	SM 4500-NH3 G	
MW-20i (A9I0801-10)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 16:57	SM 4500-NH3 G	
MW-25i (A9I0801-11)				**Matrix: Water**		**Batch: 9091333**		
Ammonia as N	ND	---	0.0200	mg/L	1	09/26/19 16:59	SM 4500-NH3 G	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A9I0801-01)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**4.46**	---	0.500	mg/L	2	09/26/19 15:12	EPA 300.0	
Nitrite-Nitrogen	**1.81**	---	0.500	mg/L	2	09/26/19 15:12	EPA 300.0	
MW-22i (A9I0801-02)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 15:34	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 15:34	EPA 300.0	
MW-10 (A9I0801-03)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**429**	---	12.5	mg/L	50	09/26/19 15:55	EPA 300.0	
MW-10 (A9I0801-03RE1)				**Matrix: Water**				
Batch: 9091308								
Nitrite-Nitrogen	ND	---	0.500	mg/L	2	09/26/19 16:17	EPA 300.0	R-04
MW-14 (A9I0801-04RE1)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**145**	---	12.5	mg/L	50	09/26/19 21:19	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 17:00	EPA 300.0	
S-1 (A9I0801-05)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**3.72**	---	0.250	mg/L	1	09/26/19 18:05	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 18:05	EPA 300.0	
S-2 (A9I0801-06)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**1.77**	---	0.250	mg/L	1	09/26/19 19:10	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 19:10	EPA 300.0	
MW-21i-40 (A9I0801-07)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**3.49**	---	0.250	mg/L	1	09/26/19 19:31	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 19:31	EPA 300.0	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-18i (A9I0801-08)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**0.831**	---	0.250	mg/L	1	09/26/19 19:53	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 19:53	EPA 300.0	
MW-16 (A9I0801-09)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**7.15**	---	0.250	mg/L	1	09/26/19 20:14	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 20:14	EPA 300.0	
MW-20i (A9I0801-10)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**0.617**	---	0.250	mg/L	1	09/26/19 20:36	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 20:36	EPA 300.0	
MW-25i (A9I0801-11)				**Matrix: Water**				
Batch: 9091308								
Nitrate-Nitrogen	**0.710**	---	0.250	mg/L	1	09/26/19 20:57	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/19 20:57	EPA 300.0	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A9I0801-04)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**5.06**	---	1.00	mg/L	1	10/01/19 09:30	SM 5310 C	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091420 - EPA 5030B							**Water**					
Blank (9091420-BLK1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 20:30								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091420 - EPA 5030B									Water			
Blank (9091420-BLK1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 20:30								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 93 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*104 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*96 %*		*80-120 %*			*"*					
LCS (9091420-BS1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 19:36								
EPA 8260C												
Bromobenzene	18.9	---	0.500	ug/L	1	20.0	---	95	80 - 120%	---	---	
Bromochloromethane	22.9	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Bromodichloromethane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Bromoform	21.9	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
Bromomethane	25.7	---	5.00	ug/L	1	20.0	---	**128**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	23.5	---	1.00	ug/L	1	20.0	---	118	80 - 120%	---	---	
Chlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloroethane	25.9	---	5.00	ug/L	1	20.0	---	**130**	**80 - 120%**	---	---	Q-56
Chloroform	20.0	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloromethane	21.4	---	5.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
2-Chlorotoluene	18.4	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
4-Chlorotoluene	18.8	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Dibromochloromethane	20.1	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	18.7	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Dibromomethane	20.3	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	18.3	---	0.500	ug/L	1	20.0	---	92	80 - 120%	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091420 - EPA 5030B							**Water**					
LCS (9091420-BS1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 19:36								
1,3-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,4-Dichlorobenzene	18.3	---	0.500	ug/L	1	20.0	---	92	80 - 120%	---	---	
Dichlorodifluoromethane	22.1	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1-Dichloroethane	21.2	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.8	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloroethene	22.2	---	0.400	ug/L	1	20.0	---	111	80 - 120%	---	---	
cis-1,2-Dichloroethene	21.1	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
trans-1,2-Dichloroethene	21.2	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
1,2-Dichloropropane	20.8	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,3-Dichloropropane	20.7	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
2,2-Dichloropropane	26.6	---	1.00	ug/L	1	20.0	---	**133**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,3-Dichloropropene	21.3	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
Hexachlorobutadiene	18.3	---	5.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
Methylene chloride	20.0	---	5.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.2	---	0.500	ug/L	1	20.0	---	111	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.0	---	0.400	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,1,1-Trichloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,1,2-Trichloroethane	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichloroethene (TCE)	19.0	---	0.400	ug/L	1	20.0	---	95	80 - 120%	---	---	
Trichlorofluoromethane	28.3	---	2.00	ug/L	1	20.0	---	**142**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Vinyl chloride	26.3	---	0.400	ug/L	1	20.0	---	**131**	**80 - 120%**	---	---	Q-56
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 96 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*96 %*		*80-120 %*			*"*					
Duplicate (9091420-DUP1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 23:12								

QC Source Sample: MW-21i-105 (A9I0801-01)

EPA 8260C

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091420 - EPA 5030B							**Water**					
Duplicate (9091420-DUP1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 23:12								
QC Source Sample: MW-21i-105 (A9I0801-01)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
cis-1,2-Dichloroethene	**3.85**	---	0.400	ug/L	1	---	4.08	---	---	6	30%	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091420 - EPA 5030B							**Water**					
Duplicate (9091420-DUP1)		Prepared: 09/28/19 17:55		Analyzed: 09/28/19 23:12								
QC Source Sample: MW-21i-105 (A9I0801-01)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**4.88**	---	0.400	ug/L	1	---	4.93	---	---	1	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**2.57**	---	0.400	ug/L	1	---	2.62	---	---	2	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 94 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*104 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*92 %*		*80-120 %*			*"*					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Bromochloromethane	22.3	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Bromodichloromethane	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Bromoform	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Bromomethane	27.1	---	5.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	23.9	---	1.00	ug/L	1	20.0	---	119	80 - 120%	---	---	
Chlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Chloroethane	26.7	---	5.00	ug/L	1	20.0	---	**133**	**80 - 120%**	---	---	Q-56
Chloroform	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloromethane	21.2	---	5.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
2-Chlorotoluene	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
4-Chlorotoluene	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
Dibromochloromethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Dibromomethane	20.1	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	

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Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
1,3-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,4-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Dichlorodifluoromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,1-Dichloroethane	21.1	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.8	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloroethene	22.4	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
cis-1,2-Dichloroethene	21.2	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
trans-1,2-Dichloroethene	21.4	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2-Dichloropropane	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,3-Dichloropropane	21.1	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
2,2-Dichloropropane	27.0	---	1.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
cis-1,3-Dichloropropene	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.6	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Hexachlorobutadiene	18.6	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
Methylene chloride	20.0	---	3.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.8	---	0.500	ug/L	1	20.0	---	114	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.7	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.1	---	2.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
1,1,1-Trichloroethane	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Trichloroethene (TCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
Trichlorofluoromethane	28.9	---	2.00	ug/L	1	20.0	---	**145**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Vinyl chloride	26.2	---	0.400	ug/L	1	20.0	---	**131**	**80 - 120%**	---	---	Q-56
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					

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5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							Water					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	10.0	ug/L	1	---	---	---	---	---	---	

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5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*100 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
EPA 8260C												
Bromobenzene	18.7	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	
Bromochloromethane	19.7	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Bromodichloromethane	18.2	---	1.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
Bromoform	12.2	---	1.00	ug/L	1	20.0	---	**61**	**80 - 120%**	---	---	Q-55
Bromomethane	24.7	---	5.00	ug/L	1	20.0	---	**124**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	15.2	---	1.00	ug/L	1	20.0	---	**76**	**80 - 120%**	---	---	Q-55
Chlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Chloroform	20.1	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloromethane	19.9	---	5.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
2-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
4-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Dibromochloromethane	14.3	---	1.00	ug/L	1	20.0	---	**71**	**80 - 120%**	---	---	Q-55
1,2-Dibromo-3-chloropropane	15.5	---	5.00	ug/L	1	20.0	---	**78**	**80 - 120%**	---	---	Q-55
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Dibromomethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
1,3-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Dichlorodifluoromethane	19.5	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1-Dichloroethane	20.3	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
cis-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
trans-1,2-Dichloroethene	19.7	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloropropane	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
2,2-Dichloropropane	20.9	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloropropene	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,3-Dichloropropene	17.7	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
trans-1,3-Dichloropropene	17.3	---	1.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
Hexachlorobutadiene	22.4	---	5.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Methylene chloride	19.2	---	10.0	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	16.3	---	0.400	ug/L	1	20.0	---	81	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,2,3-Trichlorobenzene	24.1	---	2.00	ug/L	1	20.0	---	**121**	**80 - 120%**	---	---	Q-56
1,2,4-Trichlorobenzene	21.7	---	2.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,1,1-Trichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,2-Trichloroethane	19.7	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
Trichlorofluoromethane	22.3	---	2.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Vinyl chloride	21.0	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091333 - Method Prep: Aq							**Water**					
Blank (9091333-BLK1)		Prepared: 09/26/19 12:22		Analyzed: 09/26/19 16:11								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9091333-BS1)		Prepared: 09/26/19 12:22		Analyzed: 09/26/19 16:12								
SM 4500-NH3 G												
Ammonia as N	2.04	---	0.0200	mg/L	1	2.00	---	102	90 - 110%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091308 - Method Prep: Aq							Water					
Blank (9091308-BLK1)		Prepared: 09/26/19 07:51		Analyzed: 09/26/19 10:32								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9091308-BS1)		Prepared: 09/26/19 07:51		Analyzed: 09/26/19 10:53								
EPA 300.0												
Nitrate-Nitrogen	2.01	---	0.250	mg/L	1	2.00	---	100	90 - 110%	---	---	
Nitrite-Nitrogen	2.07	---	0.250	mg/L	1	2.00	---	104	90 - 110%	---	---	
Duplicate (9091308-DUP2)		Prepared: 09/26/19 07:51		Analyzed: 09/26/19 18:26								
QC Source Sample: S-1 (A9I0801-05)												
EPA 300.0												
Nitrate-Nitrogen	**3.73**	---	0.250	mg/L	1	---	3.72	---	---	0.1	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Matrix Spike (9091308-MS2)		Prepared: 09/26/19 07:51		Analyzed: 09/26/19 18:48								
QC Source Sample: S-1 (A9I0801-05)												
EPA 300.0												
Nitrate-Nitrogen	6.31	---	0.312	mg/L	1	2.50	3.72	103	80 - 120%	---	---	
Nitrite-Nitrogen	2.58	---	0.312	mg/L	1	2.50	ND	103	80 - 120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091432 - Method Prep: Aq							**Water**					
Blank (9091432-BLK1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 06:30								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9091432-BS1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 07:00								
SM 5310 C												
Total Organic Carbon	9.73	---	1.00	mg/L	1	10.0	---	97	85 - 115%	---	---	

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SAMPLE PREPARATION INFORMATION

Halogenated 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: 9091420							
A9I0801-01	Water	EPA 8260C	09/25/19 10:40	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-02	Water	EPA 8260C	09/25/19 11:30	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-03	Water	EPA 8260C	09/25/19 12:20	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-04	Water	EPA 8260C	09/25/19 13:10	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-07	Water	EPA 8260C	09/25/19 10:09	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-08	Water	EPA 8260C	09/25/19 13:25	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-09	Water	EPA 8260C	09/25/19 12:14	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-10	Water	EPA 8260C	09/25/19 11:20	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
A9I0801-11	Water	EPA 8260C	09/25/19 14:14	09/28/19 20:37	5mL/5mL	5mL/5mL	1.00
Batch: 9091430							
A9I0801-04RE1	Water	EPA 8260C	09/25/19 13:10	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0801-05RE1	Water	EPA 8260C	09/25/19 14:00	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0801-06RE1	Water	EPA 8260C	09/25/19 14:40	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
Batch: 9100474							
A9I0801-06RE2	Water	EPA 8260C	09/25/19 14:40	10/01/19 16:00	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091333							
A9I0801-01	Water	SM 4500-NH3 G	09/25/19 10:40	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-02	Water	SM 4500-NH3 G	09/25/19 11:30	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-03	Water	SM 4500-NH3 G	09/25/19 12:20	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-04	Water	SM 4500-NH3 G	09/25/19 13:10	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-05	Water	SM 4500-NH3 G	09/25/19 14:00	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-06	Water	SM 4500-NH3 G	09/25/19 14:40	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-07	Water	SM 4500-NH3 G	09/25/19 10:09	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-08	Water	SM 4500-NH3 G	09/25/19 13:25	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-09RE1	Water	SM 4500-NH3 G	09/25/19 12:14	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-10	Water	SM 4500-NH3 G	09/25/19 11:20	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00
A9I0801-11	Water	SM 4500-NH3 G	09/25/19 14:14	09/26/19 12:22	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

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5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091308							
A9I0801-01	Water	EPA 300.0	09/25/19 10:40	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-02	Water	EPA 300.0	09/25/19 11:30	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-03	Water	EPA 300.0	09/25/19 12:20	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-03RE1	Water	EPA 300.0	09/25/19 12:20	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-04RE1	Water	EPA 300.0	09/25/19 13:10	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-05	Water	EPA 300.0	09/25/19 14:00	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-06	Water	EPA 300.0	09/25/19 14:40	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-07	Water	EPA 300.0	09/25/19 10:09	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-08	Water	EPA 300.0	09/25/19 13:25	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-09	Water	EPA 300.0	09/25/19 12:14	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-10	Water	EPA 300.0	09/25/19 11:20	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00
A9I0801-11	Water	EPA 300.0	09/25/19 14:14	09/26/19 07:51	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091432							
A9I0801-04	Water	SM 5310 C	09/25/19 13:10	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00

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5820 SW Kelly Ave Unit B	Project Number:	**Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

QUALIFIER DEFINITIONS

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

Apex Laboratories

Q-54b	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +11%. The results are reported as Estimated Values.
Q-55	Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
R-04	Reporting levels elevated due to preparation and/or analytical dilution necessary 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.

Apex Laboratories

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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:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

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

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

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

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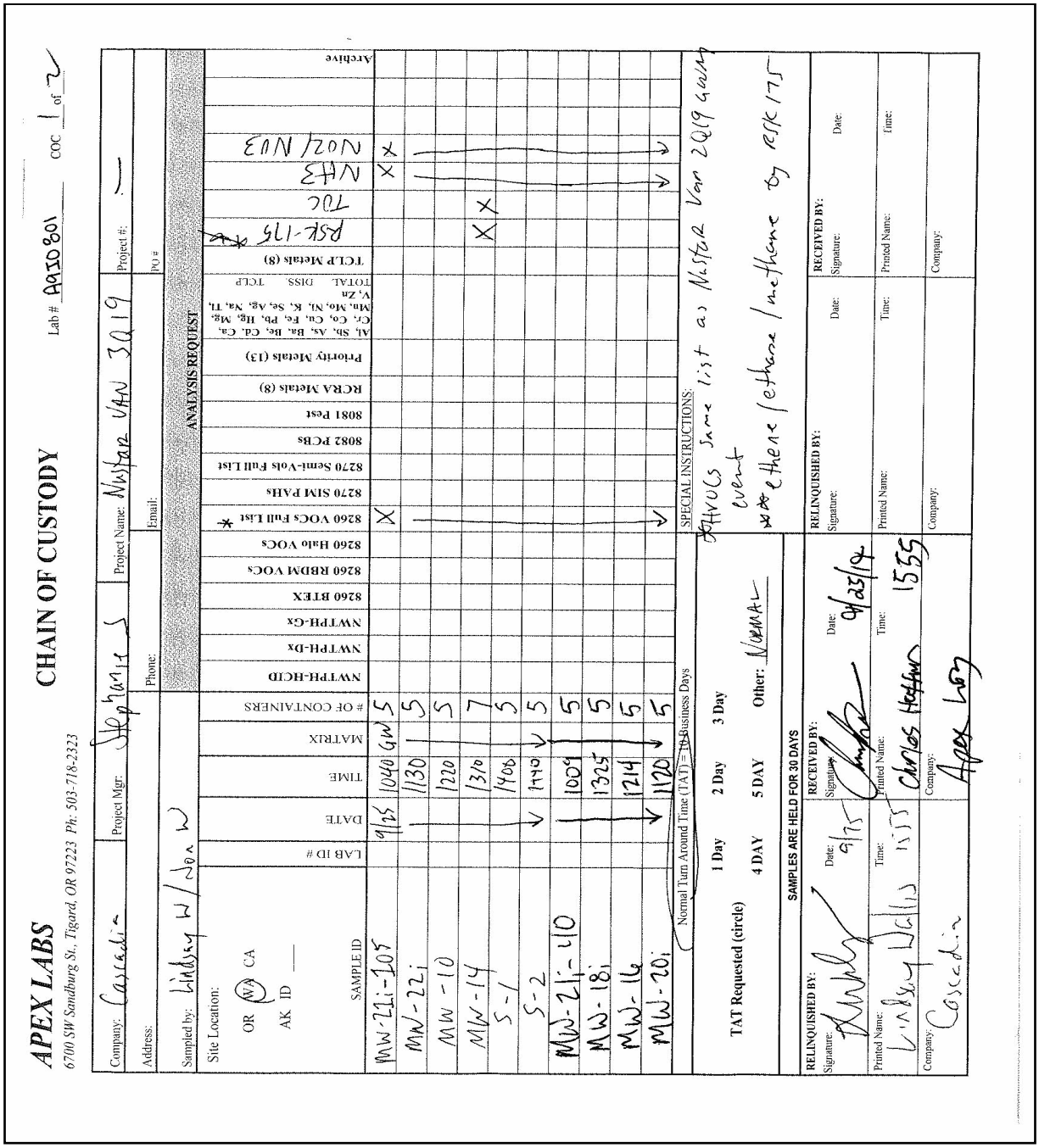
Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**



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

CHAIN OF CUSTODY

Lab # A9I0801 COC 1 of 2

Company: Cascadia | Project Mgr: Stephanie S | Project Name: Nustar VAN 3Q19 | Project #: 1

Address: | Phone: | Email: | PO #

Sampled by: Lindsay W / Dan W

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	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)	RSK-175	TOC	NH3	NO2/NO3	Archive
MW-22i-105		9/25	1040	GW	5							X												
MW-22i			1130		5																			
MW-10			1220		5																			
MW-14			1310		7															X	X			
S-1			1405		5																			
S-2		↓	1440	↓	5																			
MW-21i-110			1009		5																			
MW-18i			1325		5																			
MW-16			1214		5																			
MW-20i		↓	1120	↓	5							↓										↓	↓	

Normal Turn Around Time (TAT) = 10 Business Days

SPECIAL INSTRUCTIONS:
Analysis same list as Nustar Van 2Q19 event
** ethene / ethane / methane by RSK 175

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

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Printed Name: Lindsay Wells	Printed Name: Charles Hoffman	Printed Name:	Printed Name:
Company: Cascadia	Company: Apex Labs	Company:	Company:
Date: 9/25 Time: 1555	Date: 9/25/19 Time: 1555	Date: Time:	Date: Time:

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

APEX LABS

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

CHAIN OF CUSTODY

Lab # A9I0801 COC 2 of 2

Company: Cascadia | Project Mgr: Stephanie S | Project Name: NuStar VAN 3Q19 | Project #: —

Address: 5820 SW Kelly Ave Unit B | Phone: 503-906-6577 | Email: sbsalisbury@cascadia associates.com

Sampled by: LW/JW

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	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)	F02	~~RK 175 X~~	NH3	NO2/NO3			Archive
MW-25i		9/25	1414	GW	5							X											X	X			

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

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

SPECIAL INSTRUCTIONS: *HVOCs same list as NuStar Van 2Q19 GWM event

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 9/25	Signature: [signature] Date: 9/25/19	Signature: Date:	Signature: Date:
Printed Name: Lindsay Wallis Time: 1555	Printed Name: Charles Haskins Time: 1555	Printed Name: Time:	Printed Name: Time:
Company: Cascadia	Company: Apex	Company:	Company:

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar Van 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0801 - 10 11 19 1300**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9I0801

Project/Project #: Nustar Van 3Q19

Delivery Info:

Date/time received: 9/25/19 @ 1355 By: CF H

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

Cooler Inspection Date/time inspected: 9/25/19 @ 1726 By: CF H

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)	0.1						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	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: 9-25-19 @ 18:40 By: TMG

All samples intact? Yes X No Comments:

Bottle labels/COCs agree? Yes X TMG 9-25-19 No X Comments: Trip blank 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 3/3 S-2, MW-16 have sed

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

Comments:

Additional information: TB # 2137

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

TMG

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

AirTECHNOLOGY
Laboratories, Inc.

October 10, 2019

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg Street
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9I0801
Lab Number: K092701-01

Enclosed are results for sample(s) received 9/27/19 by Air Technology Laboratories. Sample was received intact and chilled to 3° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER K092701-01

Apex Laboratories

A9I0801

9/26/19

SENDING LABORATORY:

Apex Laboratories
6700 S.W. Sandburg Street
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 336-0745
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-14 **Water** **Sampled: 09/25/19 13:10** (A9I0801-04)

	Analysis	Due	Expires	Comments
01	**RSK 175 Preserved (Meth, Eth, Eth) (Sub)**	10/08/19 17:00	10/09/19 13:10	

Containers Supplied:
(D) 40 mL VOA - HCL
(E) 40 mL VOA - HCL

4°C 3°C

Tama Yang (signature)	9-26-19	UPS (Shipper)	
Released By	Date	Received By	Date
UPS (Shipper)	9/27/19 1209	Kathy Chareon	9/27/19 1209
Released By	Date	Received By	Date

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A9I0801
Date Received: 09/27/19
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	K092701-01							
Client Sample I.D.:	MW-14 (A9I0801-04)							
Date/Time Sampled:	9/25/19 13:10							
Date/Time Analyzed:	10/8/19 17:06							
QC Batch No.:	191008GC8A1							
Analyst Initials:	CM							
Dilution Factor:	1.0							
ANALYTE	Result ug/L	RL ug/L						
Ethene	ND	1.0						
Ethane	ND	1.0						
Methane	20	1.0						

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 10/10/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191008GC8A1
Matrix: Water
Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK		LCS		LCSD					
Date/Time Analyzed:	10/8/19 14:41		10/8/19 16:12		10/8/19 16:26					
Analyst Initials:	CM		CM		CM					
Dilution Factor:	1.0		1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec.	High %Rec.	Max. RPD
Ethene	ND	1.0	951	92.3	945	91.7	0.6	70	130	30
Ethane	ND	1.0	1,060	95.6	1,060	95.6	0.0	70	130	30
Methane	ND	1.0	620	105	566	96.1	9.0	70	130	30

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 10/10/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Apex Laboratories, LLC

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

Wednesday, October 16, 2019

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

RE: A9I0852 - Shore Terminal-Vancouver - Nustar VAN 3Q19 GWM

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 A9I0852, which was received by the laboratory on 9/26/2019 at 4:00:00PM.

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	1.8 degC	Cooler #2	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

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-17	A9I0852-01	Water	09/26/19 08:10	09/26/19 16:00
MW-9	A9I0852-02	Water	09/26/19 08:45	09/26/19 16:00
MP-1	A9I0852-03	Water	09/26/19 09:30	09/26/19 16:00
MW-19	A9I0852-04	Water	09/26/19 10:10	09/26/19 16:00
MW-19 DUP	A9I0852-05	Water	09/26/19 10:10	09/26/19 16:00
MW-7	A9I0852-06	Water	09/26/19 11:00	09/26/19 16:00
MW-7 DUP	A9I0852-07	Water	09/26/19 11:00	09/26/19 16:00
MW-13	A9I0852-08	Water	09/26/19 11:50	09/26/19 16:00
MW-12	A9I0852-09	Water	09/26/19 12:40	09/26/19 16:00
MW-12 DUP	A9I0852-10	Water	09/26/19 12:40	09/26/19 16:00
MW-32s	A9I0852-11	Water	09/26/19 14:20	09/26/19 16:00
MW-26	A9I0852-12	Water	09/26/19 08:22	09/26/19 16:00
MW-23i	A9I0852-13	Water	09/26/19 09:20	09/26/19 16:00
MW-5	A9I0852-14	Water	09/26/19 10:15	09/26/19 16:00
MW-8	A9I0852-15	Water	09/26/19 11:01	09/26/19 16:00
MW-19i	A9I0852-16	Water	09/26/19 12:11	09/26/19 16:00
EW-1	A9I0852-17	Water	09/26/19 14:56	09/26/19 16:00

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL CASE NARRATIVE

Work Order: A9I0852

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9I0852-01)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 18:48	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
cis-1,2-Dichloroethene	**3.87**	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Tetrachloroethene (PCE)	**2.41**	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9I0852-01)				**Matrix: Water**		**Batch: 9091430**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 18:48	EPA 8260C	
Trichloroethene (TCE)	**4.62**	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 18:48	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 18:48	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 18:48	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 93 %*		*Limits: 80-120 %*	*1*	*09/30/19 18:48*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*	*80-120 %*	*1*	*09/30/19 18:48*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/30/19 18:48*	*EPA 8260C*	
MW-9 (A9I0852-02)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 19:15	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
cis-1,2-Dichloroethene	**3.34**	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A9I0852-02)				**Matrix: Water**		**Batch: 9091430**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Tetrachloroethene (PCE)	**81.3**	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1,1-Trichloroethane	**2.34**	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 19:15	EPA 8260C	
Trichloroethene (TCE)	**25.4**	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 19:15	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 19:15	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 19:15	EPA 8260C	Q-54
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits: 80-120 %*	*1*	*09/30/19 19:15*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*	*80-120 %*	*1*	*09/30/19 19:15*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*	*80-120 %*	*1*	*09/30/19 19:15*	*EPA 8260C*	
MP-1 (A9I0852-03RE1)				**Matrix: Water**		**Batch: 9100474**		
Bromobenzene	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Bromochloromethane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	10/01/19 21:34	EPA 8260C	
Carbon tetrachloride	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	10/01/19 21:34	EPA 8260C	
Chloroform	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	10/01/19 21:34	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9I0852-03RE1)				**Matrix: Water**		**Batch: 9100474**		
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1-Dichloroethane	**1.36**	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1-Dichloroethene	**1.14**	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
cis-1,2-Dichloroethene	**37.1**	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	10/01/19 21:34	EPA 8260C	
Methylene chloride	ND	---	20.0	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Tetrachloroethene (PCE)	**176**	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Trichloroethene (TCE)	**26.8**	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	10/01/19 21:34	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	10/01/19 21:34	EPA 8260C	
Vinyl chloride	ND	---	0.800	ug/L	2	10/01/19 21:34	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*101 %*	*Limits:*	*80-120 %*	*1*	*10/01/19 21:34*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*1*	*10/01/19 21:34*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*		*80-120 %*	*1*	*10/01/19 21:34*	*EPA 8260C*	
MW-19 (A9I0852-04)				**Matrix: Water**		**Batch: 9091431**		
Bromobenzene	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Bromochloromethane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Bromodichloromethane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Bromoform	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Bromomethane	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Carbon tetrachloride	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A9I0852-04)				**Matrix: Water**		**Batch: 9091431**		
Chlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Chloroethane	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Chloroform	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Chloromethane	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
2-Chlorotoluene	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
4-Chlorotoluene	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Dibromochloromethane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Dibromomethane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1-Dichloroethane	**33.3**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1-Dichloroethene	**35.1**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
cis-1,2-Dichloroethene	**958**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
trans-1,2-Dichloroethene	**9.59**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Methylene chloride	ND	---	50.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1,1-Trichloroethane	**26.9**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Trichloroethene (TCE)	**1430**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	09/30/19 20:06	EPA 8260C	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:06	EPA 8260C	
Vinyl chloride	**35.4**	---	4.00	ug/L	10	09/30/19 20:06	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 122 %*		*Limits: 80-120 %*	*1*	*09/30/19 20:06*	*EPA 8260C*	*S-02*

Apex Laboratories

Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A9I0852-04)				**Matrix: Water**		**Batch: 9091431**		
Surrogate: Toluene-d8 (Surr)		*Recovery:*	*102 %*	*Limits: 80-120 %*	*1*	*09/30/19 20:06*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*09/30/19 20:06*	*EPA 8260C*	
MW-19 (A9I0852-04RE1)				**Matrix: Water**		**Batch: 9100475**		
Tetrachloroethene (PCE)	**4340**	---	40.0	ug/L	100	10/01/19 17:14	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*116 %*	*Limits: 80-120 %*	*1*	*10/01/19 17:14*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*10/01/19 17:14*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*10/01/19 17:14*	*EPA 8260C*	
MW-19 DUP (A9I0852-05)				**Matrix: Water**		**Batch: 9091431**		
Bromobenzene	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Bromochloromethane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Bromodichloromethane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Bromoform	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Bromomethane	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Carbon tetrachloride	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Chlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Chloroethane	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Chloroform	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Chloromethane	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
2-Chlorotoluene	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
4-Chlorotoluene	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Dibromochloromethane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Dibromomethane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1-Dichloroethane	**41.9**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1-Dichloroethene	**40.2**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
cis-1,2-Dichloroethene	**1160**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
trans-1,2-Dichloroethene	**12.1**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 DUP (A9I0852-05)				**Matrix: Water**		**Batch: 9091431**		
1,1-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Methylene chloride	ND	---	50.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1,1-Trichloroethane	**30.6**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Trichloroethene (TCE)	**1620**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	09/30/19 20:33	EPA 8260C	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	09/30/19 20:33	EPA 8260C	
Vinyl chloride	**39.1**	---	4.00	ug/L	10	09/30/19 20:33	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*121 %*	*Limits: 80-120 %*	*1*	*09/30/19 20:33*	*EPA 8260C*	*S-02*
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*09/30/19 20:33*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*09/30/19 20:33*	*EPA 8260C*	
MW-19 DUP (A9I0852-05RE1)				**Matrix: Water**		**Batch: 9100475**		
Tetrachloroethene (PCE)	**4010**	---	40.0	ug/L	100	10/01/19 17:41	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits: 80-120 %*	*1*	*10/01/19 17:41*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*10/01/19 17:41*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*10/01/19 17:41*	*EPA 8260C*	
MW-7 (A9I0852-06)				**Matrix: Water**		**Batch: 9100475**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 (A9I0852-06)				**Matrix: Water**		**Batch: 9100475**		
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1-Dichloroethane	**2.98**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1-Dichloroethene	**0.650**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
cis-1,2-Dichloroethene	**20.1**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Tetrachloroethene (PCE)	**41.7**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 15:00	EPA 8260C	
Trichloroethene (TCE)	**17.9**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 15:00	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:00	EPA 8260C	
Vinyl chloride	**0.420**	---	0.400	ug/L	1	10/01/19 15:00	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*10/01/19 15:00*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*10/01/19 15:00*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*10/01/19 15:00*	*EPA 8260C*	
MW-7 DUP (A9I0852-07)				**Matrix: Water**		**Batch: 9100475**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

MW-7 DUP (A9I0852-07) — **Matrix: Water** — **Batch: 9100475**

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1-Dichloroethane	**2.95**	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1-Dichloroethene	**0.672**	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
cis-1,2-Dichloroethene	**21.0**	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	
Tetrachloroethene (PCE)	**39.6**	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 15:27	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 DUP (A9I0852-07)				**Matrix: Water**		**Batch: 9100475**		
Trichloroethene (TCE)	**17.8**	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 15:27	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:27	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 15:27	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits: 80-120 %*	*1*	*10/01/19 15:27*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*10/01/19 15:27*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*10/01/19 15:27*	*EPA 8260C*	
MW-13 (A9I0852-08)				**Matrix: Water**		**Batch: 9091431**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Chloroethane	ND	---	11.0	ug/L	1	09/30/19 16:31	EPA 8260C	R-02
Chloroform	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 16:31	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1-Dichloroethane	**1.07**	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
cis-1,2-Dichloroethene	**1.94**	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
trans-1,2-Dichloroethene	**0.439**	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-13 (A9I0852-08)				**Matrix: Water**		**Batch: 9091431**		
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 16:31	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 16:31	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 16:31	EPA 8260C	
Vinyl chloride	**2.01**	---	0.400	ug/L	1	09/30/19 16:31	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*110 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 16:31*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*09/30/19 16:31*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*		*80-120 %*	*1*	*09/30/19 16:31*	*EPA 8260C*	
MW-12 (A9I0852-09)				**Matrix: Water**		**Batch: 9100475**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Chloroethane	**18.1**	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9I0852-09)				**Matrix: Water**		**Batch: 9100475**		
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1-Dichloroethane	**6.26**	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
cis-1,2-Dichloroethene	**5.31**	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
trans-1,2-Dichloroethene	**0.565**	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 16:20	EPA 8260C	
Trichloroethene (TCE)	**0.442**	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 16:20	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:20	EPA 8260C	
Vinyl chloride	**6.82**	---	0.400	ug/L	1	10/01/19 16:20	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*10/01/19 16:20*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*		*80-120 %*	*1*	*10/01/19 16:20*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*		*80-120 %*	*1*	*10/01/19 16:20*	*EPA 8260C*	
MW-12 DUP (A9I0852-10)				**Matrix: Water**		**Batch: 9100475**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 DUP (A9I0852-10)				**Matrix: Water**		**Batch: 9100475**		
Chloroethane	**16.0**	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1-Dichloroethane	**6.12**	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
cis-1,2-Dichloroethene	**5.06**	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
trans-1,2-Dichloroethene	**0.550**	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 16:47	EPA 8260C	
Trichloroethene (TCE)	**0.459**	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 16:47	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:47	EPA 8260C	
Vinyl chloride	**6.45**	---	0.400	ug/L	1	10/01/19 16:47	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 111 %*		*Limits: 80-120 %*	*1*	*10/01/19 16:47*	*EPA 8260C*	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 DUP (A9I0852-10)				**Matrix: Water**		**Batch: 9100475**		
Surrogate: Toluene-d8 (Surr)		*Recovery: 103 %*	*Limits: 80-120 %*		*1*	*10/01/19 16:47*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*10/01/19 16:47*	*EPA 8260C*	
MW-32s (A9I0852-11)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 20:36	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32s (A9I0852-11)				**Matrix: Water**		**Batch: 9091430**		
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 20:36	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 20:36	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 20:36	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 20:36	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:* *80-120 %*	*1*	*09/30/19 20:36*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*	*80-120 %*	*1*	*09/30/19 20:36*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*96 %*	*80-120 %*	*1*	*09/30/19 20:36*	*EPA 8260C*	
MW-26 (A9I0852-12)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Bromochloromethane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Bromodichloromethane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Bromoform	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Bromomethane	ND	---	25.0	ug/L	5	09/30/19 21:03	EPA 8260C	
Carbon tetrachloride	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Chlorobenzene	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Chloroethane	ND	---	25.0	ug/L	5	09/30/19 21:03	EPA 8260C	
Chloroform	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Chloromethane	ND	---	25.0	ug/L	5	09/30/19 21:03	EPA 8260C	
2-Chlorotoluene	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
4-Chlorotoluene	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Dibromochloromethane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	25.0	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Dibromomethane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2-Dichlorobenzene	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
1,3-Dichlorobenzene	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
1,4-Dichlorobenzene	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Dichlorodifluoromethane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1-Dichloroethane	**5.14**	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1-Dichloroethene	ND	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
cis-1,2-Dichloroethene	**104**	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A9I0852-12)				**Matrix: Water**		**Batch: 9091430**		
trans-1,2-Dichloroethene	**2.60**	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2-Dichloropropane	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
1,3-Dichloropropane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
2,2-Dichloropropane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1-Dichloropropene	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Hexachlorobutadiene	ND	---	25.0	ug/L	5	09/30/19 21:03	EPA 8260C	
Methylene chloride	ND	---	15.0	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Tetrachloroethene (PCE)	**133**	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	10.0	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	10.0	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1,1-Trichloroethane	ND	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
1,1,2-Trichloroethane	ND	---	2.50	ug/L	5	09/30/19 21:03	EPA 8260C	
Trichloroethene (TCE)	**272**	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Trichlorofluoromethane	ND	---	10.0	ug/L	5	09/30/19 21:03	EPA 8260C	
1,2,3-Trichloropropane	ND	---	5.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Vinyl chloride	ND	---	2.00	ug/L	5	09/30/19 21:03	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*96 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 21:03*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*09/30/19 21:03*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*92 %*		*80-120 %*	*1*	*09/30/19 21:03*	*EPA 8260C*	
MW-23i (A9I0852-13)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 21:30	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A9I0852-13)				**Matrix: Water**		**Batch: 9091430**		
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Tetrachloroethene (PCE)	**0.589**	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 21:30	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 21:30	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:30	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 21:30	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*96 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 21:30*	*EPA 8260C*
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*1*	*09/30/19 21:30*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*93 %*		*80-120 %*	*1*	*09/30/19 21:30*	*EPA 8260C*
MW-5 (A9I0852-14)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A9I0852-14)				**Matrix: Water**		**Batch: 9091430**		
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 21:57	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
cis-1,2-Dichloroethene	**10.7**	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Tetrachloroethene (PCE)	**0.972**	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 21:57	EPA 8260C	
Trichloroethene (TCE)	**1.35**	---	0.400	ug/L	1	09/30/19 21:57	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 21:57	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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A9I0852-14)				**Matrix: Water**		**Batch: 9091430**		
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 21:57	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits: 80-120 %*	*1*	*09/30/19 21:57*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*09/30/19 21:57*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*	*80-120 %*	*1*	*09/30/19 21:57*	*EPA 8260C*	
MW-5 (A9I0852-14RE1)				**Matrix: Water**		**Batch: 9100474**		
Chloroethane	**42.7**	---	5.00	ug/L	1	10/01/19 20:13	EPA 8260C	
Vinyl chloride	**1.10**	---	0.400	ug/L	1	10/01/19 20:13	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*99 %*	*Limits: 80-120 %*	*1*	*10/01/19 20:13*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*10/01/19 20:13*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*	*80-120 %*	*1*	*10/01/19 20:13*	*EPA 8260C*	
MW-8 (A9I0852-15)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 22:24	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A9I0852-15)				**Matrix: Water**		**Batch: 9091430**		
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Tetrachloroethene (PCE)	**4.20**	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 22:24	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 22:24	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:24	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 22:24	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*92 %*	*Limits:*	*80-120 %*	*09/30/19 22:24*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*09/30/19 22:24*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*		*80-120 %*	*09/30/19 22:24*	*EPA 8260C*	
MW-19i (A9I0852-16)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 22:51	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 22:51	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19i (A9I0852-16)				**Matrix: Water**		**Batch: 9091430**		
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
cis-1,2-Dichloroethene	**0.433**	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 22:51	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 22:51	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 22:51	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 22:51	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:*	*80-120 %*	*1*	*09/30/19 22:51*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*1*	*09/30/19 22:51*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*1*	*09/30/19 22:51*	*EPA 8260C*	
EW-1 (A9I0852-17)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A9I0852-17)				**Matrix: Water**		**Batch: 9091430**		
Bromoform	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Chloroform	**1.54**	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 23:18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
cis-1,2-Dichloroethene	**2.39**	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Tetrachloroethene (PCE)	**24.4**	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1,1-Trichloroethane	**0.482**	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 23:18	EPA 8260C	
Trichloroethene (TCE)	**7.40**	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 23:18	EPA 8260C	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A9I0852-17)				**Matrix: Water**		**Batch: 9091430**		
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/30/19 23:18	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)			*Recovery: 95 %*	*Limits: 80-120 %*	*1*	*09/30/19 23:18*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*	*80-120 %*	*1*	*09/30/19 23:18*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*09/30/19 23:18*	*EPA 8260C*	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9I0852-01)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**2.12**	---	0.0200	mg/L	1	09/27/19 14:44	SM 4500-NH3 G	
MW-9 (A9I0852-02)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**0.680**	---	0.0200	mg/L	1	09/27/19 14:46	SM 4500-NH3 G	
MP-1 (A9I0852-03)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**2.15**	---	0.0200	mg/L	1	09/27/19 14:50	SM 4500-NH3 G	
MW-19 (A9I0852-04RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**113**	---	1.00	mg/L	50	09/27/19 15:34	SM 4500-NH3 G	
MW-19 DUP (A9I0852-05RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**119**	---	1.00	mg/L	50	09/27/19 15:36	SM 4500-NH3 G	
MW-7 (A9I0852-06RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**19.8**	---	1.00	mg/L	50	09/27/19 15:37	SM 4500-NH3 G	
MW-7 DUP (A9I0852-07RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**20.3**	---	1.00	mg/L	50	09/27/19 15:39	SM 4500-NH3 G	
MW-13 (A9I0852-08RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**76.2**	---	1.00	mg/L	50	09/27/19 15:48	SM 4500-NH3 G	
MW-12 (A9I0852-09RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**107**	---	1.00	mg/L	50	09/27/19 15:49	SM 4500-NH3 G	
MW-12 DUP (A9I0852-10RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**122**	---	1.00	mg/L	50	09/27/19 15:51	SM 4500-NH3 G	
MW-32s (A9I0852-11)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**0.0630**	---	0.0200	mg/L	1	09/27/19 15:10	SM 4500-NH3 G	
MW-26 (A9I0852-12)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**13.9**	---	0.0200	mg/L	1	09/27/19 15:12	SM 4500-NH3 G	
MW-26 (A9I0852-12RE1)				**Matrix: Water**		**Batch: 9091378**		

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A9I0852-12RE1)				**Matrix: Water**		**Batch: 9091378**		
Ammonia as N	**32.4**	---	1.00	mg/L	50	09/27/19 15:54	SM 4500-NH3 G	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9I0852-01RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**1.10**	---	0.250	mg/L	1	09/27/19 14:46	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 14:46	EPA 300.0	
MW-9 (A9I0852-02)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**138**	---	5.00	mg/L	20	09/27/19 15:07	EPA 300.0	
MW-9 (A9I0852-02RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 15:29	EPA 300.0	
MP-1 (A9I0852-03)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**97.7**	---	2.50	mg/L	10	09/27/19 15:50	EPA 300.0	
MP-1 (A9I0852-03RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrite-Nitrogen	**0.384**	---	0.250	mg/L	1	09/27/19 17:38	EPA 300.0	
MW-19 (A9I0852-04RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**232**	---	12.5	mg/L	50	09/28/19 13:14	EPA 300.0	**H-01**
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 19:04	EPA 300.0	
MW-19 DUP (A9I0852-05RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**233**	---	12.5	mg/L	50	09/28/19 13:35	EPA 300.0	**H-01**
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 19:48	EPA 300.0	
MW-7 (A9I0852-06)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**11.5**	---	1.25	mg/L	5	09/27/19 20:09	EPA 300.0	
MW-7 (A9I0852-06RE1)				**Matrix: Water**				
Batch: 9091368								

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 (A9I0852-06RE1)				**Matrix: Water**				
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 20:31	EPA 300.0	
MW-7 DUP (A9I0852-07)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**11.5**	---	1.25	mg/L	5	09/27/19 20:52	EPA 300.0	
MW-7 DUP (A9I0852-07RE1)				**Matrix: Water**				
Batch: 9091368								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 21:57	EPA 300.0	
MW-13 (A9I0852-08)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 22:18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 22:18	EPA 300.0	
MW-12 (A9I0852-09)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**0.371**	---	0.250	mg/L	1	09/27/19 22:40	EPA 300.0	**M-04**
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 22:40	EPA 300.0	
MW-12 DUP (A9I0852-10)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**0.383**	---	0.250	mg/L	1	09/27/19 23:02	EPA 300.0	**M-04**
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 23:02	EPA 300.0	
MW-32s (A9I0852-11)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 23:23	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/19 23:23	EPA 300.0	
MW-26 (A9I0852-12)				**Matrix: Water**				
Batch: 9091368								
Nitrate-Nitrogen	**383**	---	25.0	mg/L	100	09/27/19 23:45	EPA 300.0	
MW-26 (A9I0852-12RE1)				**Matrix: Water**				
Batch: 9091368								

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A9I0852-12RE1)				**Matrix: Water**				
Nitrite-Nitrogen	ND	---	0.500	mg/L	2	09/28/19 01:33	EPA 300.0	R-04

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9I0852-03)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**1.94**	---	1.00	mg/L	1	10/01/19 11:00	SM 5310 C	
MW-19 (A9I0852-04)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**5.38**	---	1.00	mg/L	1	10/01/19 12:41	SM 5310 C	
MW-13 (A9I0852-08)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**34.3**	---	5.00	mg/L	5	10/01/19 13:13	SM 5310 C	
MW-12 (A9I0852-09RE1)				**Matrix: Water**				
Batch: 9100799								
Total Organic Carbon	**46.1**	---	5.00	mg/L	5	10/08/19 16:05	SM 5310 C	
MW-26 (A9I0852-12)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**4.38**	---	1.00	mg/L	1	10/01/19 14:14	SM 5310 C	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B									Water			
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*92 %*		*80-120 %*			*"*					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Bromochloromethane	22.3	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Bromodichloromethane	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Bromoform	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Bromomethane	27.1	---	5.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	23.9	---	1.00	ug/L	1	20.0	---	119	80 - 120%	---	---	
Chlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Chloroethane	26.7	---	5.00	ug/L	1	20.0	---	**133**	**80 - 120%**	---	---	Q-56
Chloroform	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloromethane	21.2	---	5.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
2-Chlorotoluene	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
4-Chlorotoluene	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
Dibromochloromethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Dibromomethane	20.1	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
1,3-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,4-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Dichlorodifluoromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,1-Dichloroethane	21.1	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.8	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloroethene	22.4	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
cis-1,2-Dichloroethene	21.2	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
trans-1,2-Dichloroethene	21.4	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2-Dichloropropane	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,3-Dichloropropane	21.1	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
2,2-Dichloropropane	27.0	---	1.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
cis-1,3-Dichloropropene	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.6	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Hexachlorobutadiene	18.6	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
Methylene chloride	20.0	---	3.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.8	---	0.500	ug/L	1	20.0	---	114	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.7	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.1	---	2.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
1,1,1-Trichloroethane	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Trichloroethene (TCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
Trichlorofluoromethane	28.9	---	2.00	ug/L	1	20.0	---	**145**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Vinyl chloride	26.2	---	0.400	ug/L	1	20.0	---	**131**	**80 - 120%**	---	---	Q-56
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
Duplicate (9091430-DUP1)		Prepared: 09/30/19 14:46		Analyzed: 09/30/19 20:09								

QC Source Sample: MP-1 (A9I0852-03)

EPA 8260C

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Duplicate (9091430-DUP1)		Prepared: 09/30/19 14:46	Analyzed: 09/30/19 20:09									
QC Source Sample: MP-1 (A9I0852-03)												
Bromobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromoform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromomethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Chloroethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Chloroform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chloromethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dibromomethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
cis-1,2-Dichloroethene	**37.4**	---	4.00	ug/L	10	---	34.1	---	---	9	30%	
trans-1,2-Dichloroethene	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Methylene chloride	ND	---	30.0	ug/L	10	---	ND	---	---	---	30%	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Duplicate (9091430-DUP1)		Prepared: 09/30/19 14:46		Analyzed: 09/30/19 20:09								
QC Source Sample: MP-1 (A9I0852-03)												
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**165**	---	4.00	ug/L	10	---	168	---	---	2	30%	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**26.2**	---	4.00	ug/L	10	---	26.7	---	---	2	30%	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091431 - EPA 5030B							**Water**					
Blank (9091431-BLK1)		Prepared: 09/30/19 09:30		Analyzed: 09/30/19 12:03								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091431 - EPA 5030B									Water			
Blank (9091431-BLK1)		Prepared: 09/30/19 09:30		Analyzed: 09/30/19 12:03								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*104 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*			*"*				
LCS (9091431-BS1)		Prepared: 09/30/19 09:30		Analyzed: 09/30/19 11:09								
EPA 8260C												
Bromobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
Bromochloromethane	21.3	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Bromodichloromethane	20.0	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Bromoform	21.3	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Bromomethane	22.4	---	5.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Carbon tetrachloride	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Chloroethane	17.1	---	5.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
Chloroform	20.1	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloromethane	17.2	---	5.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
2-Chlorotoluene	19.8	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
4-Chlorotoluene	20.7	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Dibromochloromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	19.0	---	5.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Dibromomethane	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,2-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091431 - EPA 5030B							**Water**					
LCS (9091431-BS1)		Prepared: 09/30/19 09:30		Analyzed: 09/30/19 11:09								
1,3-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,4-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Dichlorodifluoromethane	16.0	---	1.00	ug/L	1	20.0	---	80	80 - 120%	---	---	
1,1-Dichloroethane	19.7	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	18.7	---	0.400	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,1-Dichloroethene	20.3	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,2-Dichloroethene	18.7	---	0.400	ug/L	1	20.0	---	93	80 - 120%	---	---	
trans-1,2-Dichloroethene	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,2-Dichloropropane	19.3	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
2,2-Dichloropropane	21.3	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
1,1-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
cis-1,3-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.0	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Hexachlorobutadiene	18.1	---	5.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
Methylene chloride	19.7	---	5.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	21.7	---	0.400	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.0	---	0.500	ug/L	1	20.0	---	110	80 - 120%	---	---	
Tetrachloroethene (PCE)	20.8	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,2,3-Trichlorobenzene	20.9	---	2.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,1,1-Trichloroethane	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,2-Trichloroethane	20.8	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Trichloroethene (TCE)	19.6	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichlorofluoromethane	21.7	---	2.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,2,3-Trichloropropane	20.6	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
Vinyl chloride	19.1	---	0.400	ug/L	1	20.0	---	95	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 105 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*92 %*		*80-120 %*			*"*					
Duplicate (9091431-DUP2)		Prepared: 09/30/19 11:53		Analyzed: 09/30/19 21:00								

QC Source Sample: MW-19 DUP (A9I0852-05)

EPA 8260C

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091431 - EPA 5030B							**Water**					
Duplicate (9091431-DUP2)		Prepared: 09/30/19 11:53	Analyzed: 09/30/19 21:00									
QC Source Sample: MW-19 DUP (A9I0852-05)												
Bromobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromoform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromomethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Chloroethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Chloroform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chloromethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dibromomethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethane	**37.1**	---	4.00	ug/L	10	---	41.9	---	---	12	30%	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethene	**33.2**	---	4.00	ug/L	10	---	40.2	---	---	19	30%	
cis-1,2-Dichloroethene	**1060**	---	4.00	ug/L	10	---	1160	---	---	9	30%	
trans-1,2-Dichloroethene	**10.5**	---	4.00	ug/L	10	---	12.1	---	---	14	30%	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Methylene chloride	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091431 - EPA 5030B							**Water**					
Duplicate (9091431-DUP2)		Prepared: 09/30/19 11:53		Analyzed: 09/30/19 21:00								
QC Source Sample: MW-19 DUP (A9I0852-05)												
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**3860**	---	4.00	ug/L	10	---	4530	---	---	16	30%	E
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	**25.5**	---	4.00	ug/L	10	---	30.6	---	---	18	30%	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**1400**	---	4.00	ug/L	10	---	1620	---	---	14	30%	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Vinyl chloride	**32.2**	---	4.00	ug/L	10	---	39.1	---	---	19	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 122 %*		*Limits: 80-120 %*			*Dilution: 1x*					S-02
Toluene-d8 (Surr)			*101 %*		*80-120 %*		*"*					
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*		*"*					

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	10.0	ug/L	1	---	---	---	---	---	---	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*100 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
EPA 8260C												
Bromobenzene	18.7	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	
Bromochloromethane	19.7	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Bromodichloromethane	18.2	---	1.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
Bromoform	12.2	---	1.00	ug/L	1	20.0	---	**61**	**80 - 120%**	---	---	Q-55
Bromomethane	24.7	---	5.00	ug/L	1	20.0	---	**124**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	15.2	---	1.00	ug/L	1	20.0	---	**76**	**80 - 120%**	---	---	Q-55
Chlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Chloroform	20.1	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloromethane	19.9	---	5.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
2-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
4-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Dibromochloromethane	14.3	---	1.00	ug/L	1	20.0	---	**71**	**80 - 120%**	---	---	Q-55
1,2-Dibromo-3-chloropropane	15.5	---	5.00	ug/L	1	20.0	---	**78**	**80 - 120%**	---	---	Q-55
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Dibromomethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
1,3-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Dichlorodifluoromethane	19.5	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1-Dichloroethane	20.3	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
cis-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
trans-1,2-Dichloroethene	19.7	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloropropane	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
2,2-Dichloropropane	20.9	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloropropene	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,3-Dichloropropene	17.7	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
trans-1,3-Dichloropropene	17.3	---	1.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
Hexachlorobutadiene	22.4	---	5.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Methylene chloride	19.2	---	10.0	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	16.3	---	0.400	ug/L	1	20.0	---	81	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,2,3-Trichlorobenzene	24.1	---	2.00	ug/L	1	20.0	---	**121**	**80 - 120%**	---	---	Q-56
1,2,4-Trichlorobenzene	21.7	---	2.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,1,1-Trichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,2-Trichloroethane	19.7	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
Trichlorofluoromethane	22.3	---	2.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Vinyl chloride	21.0	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	

Surr: 1,4-Difluorobenzene (Surr)	*Recovery: 99 %*	*Limits: 80-120 %*	*Dilution: 1x*	
Toluene-d8 (Surr)	*98 %*	*80-120 %*	*"*	
4-Bromofluorobenzene (Surr)	*94 %*	*80-120 %*	*"*	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100475 - EPA 5030B							**Water**					
Blank (9100475-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:16								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100475 - EPA 5030B							**Water**					
Blank (9100475-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:16								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 112 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*100 %*		*80-120 %*			*"*					
LCS (9100475-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 11:22								
EPA 8260C												
Bromobenzene	21.1	---	0.500	ug/L	1	20.0	---	106	80 - 120%	---	---	
Bromochloromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Bromodichloromethane	20.3	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Bromoform	20.7	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
Bromomethane	22.1	---	5.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Carbon tetrachloride	19.3	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
Chlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Chloroethane	17.3	---	5.00	ug/L	1	20.0	---	87	80 - 120%	---	---	
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
Chloromethane	17.1	---	5.00	ug/L	1	20.0	---	85	80 - 120%	---	---	
2-Chlorotoluene	20.4	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
4-Chlorotoluene	21.5	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Dibromochloromethane	20.4	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	19.0	---	5.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.7	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
Dibromomethane	21.5	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100475 - EPA 5030B							**Water**					
LCS (9100475-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 11:22								
1,3-Dichlorobenzene	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,4-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Dichlorodifluoromethane	15.4	---	1.00	ug/L	1	20.0	---	**77**	**80 - 120%**	---	---	Q-55
1,1-Dichloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	19.1	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1-Dichloroethene	20.3	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,2-Dichloroethene	18.8	---	0.400	ug/L	1	20.0	---	94	80 - 120%	---	---	
trans-1,2-Dichloroethene	19.5	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,2-Dichloropropane	20.1	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,3-Dichloropropane	20.0	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
2,2-Dichloropropane	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,1-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
cis-1,3-Dichloropropene	19.8	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.1	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Hexachlorobutadiene	17.6	---	5.00	ug/L	1	20.0	---	88	80 - 120%	---	---	
Methylene chloride	19.5	---	5.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.7	---	0.500	ug/L	1	20.0	---	114	80 - 120%	---	---	
Tetrachloroethene (PCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2,3-Trichlorobenzene	20.0	---	2.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2,4-Trichlorobenzene	17.8	---	2.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
1,1,1-Trichloroethane	19.3	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1,2-Trichloroethane	20.9	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
Trichlorofluoromethane	21.8	---	2.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,2,3-Trichloropropane	21.1	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Vinyl chloride	18.6	---	0.400	ug/L	1	20.0	---	93	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 104 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*90 %*		*80-120 %*			*"*					
Duplicate (9100475-DUP1)		Prepared: 10/01/19 12:08		Analyzed: 10/01/19 15:54								

QC Source Sample: MW-7 DUP (A9I0852-07)

EPA 8260C

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100475 - EPA 5030B							**Water**					
Duplicate (9100475-DUP1)		Prepared: 10/01/19 12:08		Analyzed: 10/01/19 15:54								
QC Source Sample: MW-7 DUP (A9I0852-07)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	**3.09**	---	0.400	ug/L	1	---	2.95	---	---	5	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	**0.584**	---	0.400	ug/L	1	---	0.672	---	---	14	30%	
cis-1,2-Dichloroethene	**20.8**	---	0.400	ug/L	1	---	21.0	---	---	1	30%	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	0.334	---	---	***	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100475 - EPA 5030B							**Water**					
Duplicate (9100475-DUP1)		Prepared: 10/01/19 12:08		Analyzed: 10/01/19 15:54								
QC Source Sample: MW-7 DUP (A9I0852-07)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**40.9**	---	0.400	ug/L	1	---	39.6	---	---	3	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**17.4**	---	0.400	ug/L	1	---	17.8	---	---	2	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	0.400	ug/L	1	---	0.371	---	---	***	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 116 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*102 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*99 %*		*80-120 %*			*"*					

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091378 - Method Prep: Aq							**Water**					
Blank (9091378-BLK1)		Prepared: 09/27/19 09:56		Analyzed: 09/27/19 14:20								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9091378-BS1)		Prepared: 09/27/19 09:56		Analyzed: 09/27/19 14:23								
SM 4500-NH3 G												
Ammonia as N	1.86	---	0.0200	mg/L	1	2.00	---	93	90 - 110%	---	---	
Matrix Spike (9091378-MS1)		Prepared: 09/27/19 09:56		Analyzed: 09/27/19 14:47								
QC Source Sample: MW-9 (A9I0852-02)												
SM 4500-NH3 G												
Ammonia as N	2.96	---	0.0250	mg/L	1	2.50	0.680	91	90 - 110%	---	---	
Matrix Spike Dup (9091378-MSD1)		Prepared: 09/27/19 09:56		Analyzed: 09/27/19 14:49								
QC Source Sample: MW-9 (A9I0852-02)												
SM 4500-NH3 G												
Ammonia as N	3.07	---	0.0250	mg/L	1	2.50	0.680	96	90 - 110%	3	10%	

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091368 - Method Prep: Aq							**Water**					
Blank (9091368-BLK1)		Prepared: 09/27/19 08:10		Analyzed: 09/27/19 13:41								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9091368-BS1)		Prepared: 09/27/19 08:10		Analyzed: 09/27/19 14:03								
EPA 300.0												
Nitrate-Nitrogen	2.01	---	0.250	mg/L	1	2.00	---	100	90 - 110%	---	---	
Nitrite-Nitrogen	2.08	---	0.250	mg/L	1	2.00	---	104	90 - 110%	---	---	
Duplicate (9091368-DUP1)		Prepared: 09/27/19 08:10		Analyzed: 09/27/19 16:12								
QC Source Sample: MP-1 (A9I0852-03)												
EPA 300.0												
Nitrate-Nitrogen	**97.1**	---	2.50	mg/L	10	---	97.7	---	---	0.7	10%	
Duplicate (9091368-DUP2)		Prepared: 09/27/19 08:10		Analyzed: 09/28/19 00:06								
QC Source Sample: MW-26 (A9I0852-12)												
EPA 300.0												
Nitrate-Nitrogen	**383**	---	25.0	mg/L	100	---	383	---	---	0.1	10%	
Duplicate (9091368-DUP3)		Prepared: 09/27/19 08:10		Analyzed: 09/27/19 18:00								
QC Source Sample: MP-1 (A9I0852-03RE1)												
EPA 300.0												
Nitrite-Nitrogen	**0.380**	---	0.250	mg/L	1	---	0.384	---	---	1	15%	Q-16
Duplicate (9091368-DUP4)		Prepared: 09/27/19 08:10		Analyzed: 09/28/19 01:54								
QC Source Sample: MW-26 (A9I0852-12RE1)												
EPA 300.0												
Nitrite-Nitrogen	ND	---	0.500	mg/L	2	---	ND	---	---	---	15%	Q-16, R-04
Matrix Spike (9091368-MS1)		Prepared: 09/27/19 08:10		Analyzed: 09/27/19 16:34								
QC Source Sample: MP-1 (A9I0852-03)												
EPA 300.0												
Nitrate-Nitrogen	118	---	2.50	mg/L	10	20.0	97.7	101	80 - 120%	---	---	E

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091368 - Method Prep: Aq							**Water**					
Matrix Spike (9091368-MS2)		Prepared: 09/27/19 08:10			Analyzed: 09/28/19 00:28							
QC Source Sample: MW-26 (A9I0852-12)												
EPA 300.0												
Nitrate-Nitrogen	590	---	25.0	mg/L	100	200	383	103	80 - 120%	---	---	
Matrix Spike (9091368-MS3)		Prepared: 09/27/19 08:10			Analyzed: 09/27/19 18:21							
QC Source Sample: MP-1 (A9I0852-03RE1)												
EPA 300.0												
Nitrite-Nitrogen	3.00	---	0.312	mg/L	1	2.50	0.384	105	80 - 120%	---	---	Q-16
Matrix Spike (9091368-MS4)		Prepared: 09/27/19 08:10			Analyzed: 09/28/19 02:16							
QC Source Sample: MW-26 (A9I0852-12RE1)												
EPA 300.0												
Nitrite-Nitrogen	4.16	---	0.500	mg/L	2	4.00	ND	104	80 - 120%	---	---	Q-16

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091432 - Method Prep: Aq							**Water**					
Blank (9091432-BLK1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 06:30								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9091432-BS1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 07:00								
SM 5310 C												
Total Organic Carbon	9.73	---	1.00	mg/L	1	10.0	---	97	85 - 115%	---	---	

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9100799 - Method Prep: Aq									Water			
Blank (9100799-BLK1)		Prepared: 10/08/19 11:13		Analyzed: 10/08/19 15:07								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9100799-BS1)		Prepared: 10/08/19 11:13		Analyzed: 10/08/19 15:36								
SM 5310 C												
Total Organic Carbon	10.1	---	1.00	mg/L	1	10.0	---	101	85 - 115%	---	---	
LCS (9100799-BS2)		Prepared: 10/08/19 11:13		Analyzed: 10/08/19 14:37								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		**85 - 115%**	---	---	TOC_I

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SAMPLE PREPARATION INFORMATION

Halogenated 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: 9091430							
A9I0852-01	Water	EPA 8260C	09/26/19 08:10	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-02	Water	EPA 8260C	09/26/19 08:45	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-11	Water	EPA 8260C	09/26/19 14:20	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-12	Water	EPA 8260C	09/26/19 08:22	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-13	Water	EPA 8260C	09/26/19 09:20	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-14	Water	EPA 8260C	09/26/19 10:15	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-15	Water	EPA 8260C	09/26/19 11:01	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-16	Water	EPA 8260C	09/26/19 12:11	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0852-17	Water	EPA 8260C	09/26/19 14:56	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
Batch: 9091431							
A9I0852-04	Water	EPA 8260C	09/26/19 10:10	09/30/19 11:53	5mL/5mL	5mL/5mL	1.00
A9I0852-05	Water	EPA 8260C	09/26/19 10:10	09/30/19 11:53	5mL/5mL	5mL/5mL	1.00
A9I0852-08	Water	EPA 8260C	09/26/19 11:50	09/30/19 11:53	5mL/5mL	5mL/5mL	1.00
Batch: 9100474							
A9I0852-03RE1	Water	EPA 8260C	09/26/19 09:30	10/01/19 13:23	5mL/5mL	5mL/5mL	1.00
A9I0852-14RE1	Water	EPA 8260C	09/26/19 10:15	10/01/19 13:23	5mL/5mL	5mL/5mL	1.00
Batch: 9100475							
A9I0852-04RE1	Water	EPA 8260C	09/26/19 10:10	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00
A9I0852-05RE1	Water	EPA 8260C	09/26/19 10:10	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00
A9I0852-06	Water	EPA 8260C	09/26/19 11:00	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00
A9I0852-07	Water	EPA 8260C	09/26/19 11:00	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00
A9I0852-09	Water	EPA 8260C	09/26/19 12:40	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00
A9I0852-10	Water	EPA 8260C	09/26/19 12:40	10/01/19 12:08	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091378							
A9I0852-01	Water	SM 4500-NH3 G	09/26/19 08:10	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-02	Water	SM 4500-NH3 G	09/26/19 08:45	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-03	Water	SM 4500-NH3 G	09/26/19 09:30	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-04RE1	Water	SM 4500-NH3 G	09/26/19 10:10	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-05RE1	Water	SM 4500-NH3 G	09/26/19 10:10	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-06RE1	Water	SM 4500-NH3 G	09/26/19 11:00	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00

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Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

SAMPLE PREPARATION INFORMATION

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9I0852-07RE1	Water	SM 4500-NH3 G	09/26/19 11:00	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-08RE1	Water	SM 4500-NH3 G	09/26/19 11:50	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-09RE1	Water	SM 4500-NH3 G	09/26/19 12:40	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-10RE1	Water	SM 4500-NH3 G	09/26/19 12:40	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-11	Water	SM 4500-NH3 G	09/26/19 14:20	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-12	Water	SM 4500-NH3 G	09/26/19 08:22	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00
A9I0852-12RE1	Water	SM 4500-NH3 G	09/26/19 08:22	09/27/19 09:56	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091368							
A9I0852-01RE1	Water	EPA 300.0	09/26/19 08:10	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-02	Water	EPA 300.0	09/26/19 08:45	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-02RE1	Water	EPA 300.0	09/26/19 08:45	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-03	Water	EPA 300.0	09/26/19 09:30	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-03RE1	Water	EPA 300.0	09/26/19 09:30	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-04RE1	Water	EPA 300.0	09/26/19 10:10	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-05RE1	Water	EPA 300.0	09/26/19 10:10	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-06	Water	EPA 300.0	09/26/19 11:00	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-06RE1	Water	EPA 300.0	09/26/19 11:00	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-07	Water	EPA 300.0	09/26/19 11:00	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-07RE1	Water	EPA 300.0	09/26/19 11:00	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-08	Water	EPA 300.0	09/26/19 11:50	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-09	Water	EPA 300.0	09/26/19 12:40	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-10	Water	EPA 300.0	09/26/19 12:40	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-11	Water	EPA 300.0	09/26/19 14:20	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-12	Water	EPA 300.0	09/26/19 08:22	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00
A9I0852-12RE1	Water	EPA 300.0	09/26/19 08:22	09/27/19 08:10	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091432							
A9I0852-03	Water	SM 5310 C	09/26/19 09:30	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19 GWM**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

SAMPLE PREPARATION INFORMATION

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9I0852-04	Water	SM 5310 C	09/26/19 10:10	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00
A9I0852-08	Water	SM 5310 C	09/26/19 11:50	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00
A9I0852-12	Water	SM 5310 C	09/26/19 08:22	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00
Batch: 9100799							
A9I0852-09RE1	Water	SM 5310 C	09/26/19 12:40	10/08/19 11:13	40mL/40mL	40mL/40mL	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.
H-01	This sample was analyzed outside the recommended holding time.
M-04	Due to matrix interference, this analyte cannot be accurately quantified. The reported result may contain a high bias.
Q-16	Reanalysis of an original Batch QC sample.
Q-54	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by + 31%. The results are reported as Estimated Values.
Q-55	Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
R-02	The Reporting Limit for this analyte has been raised to account for interference from coeluting organic compounds present in the sample.
R-04	Reporting levels elevated due to preparation and/or analytical dilution necessary for analysis.
S-02	Surrogate recovery cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.
TOC_I	Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

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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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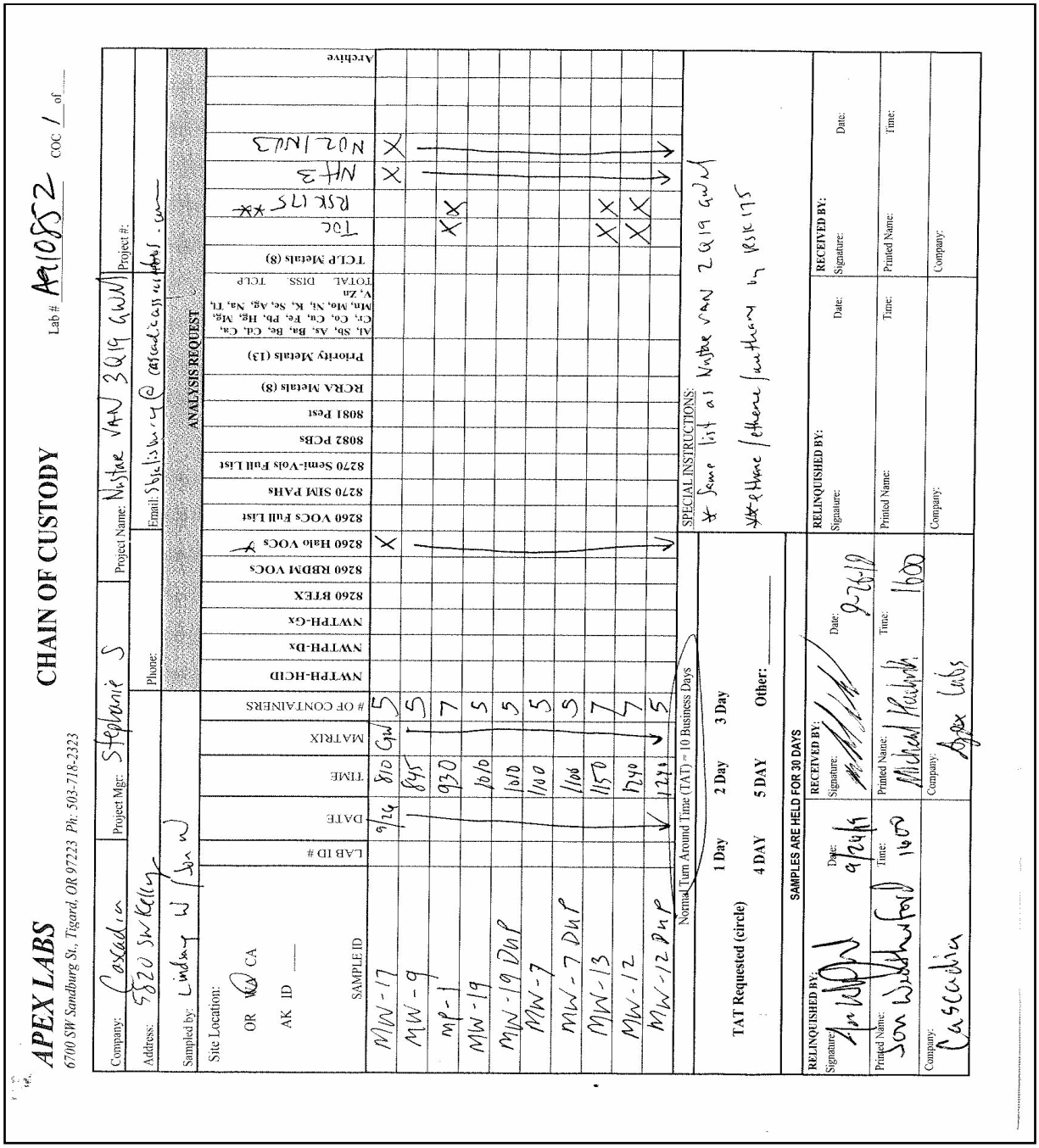

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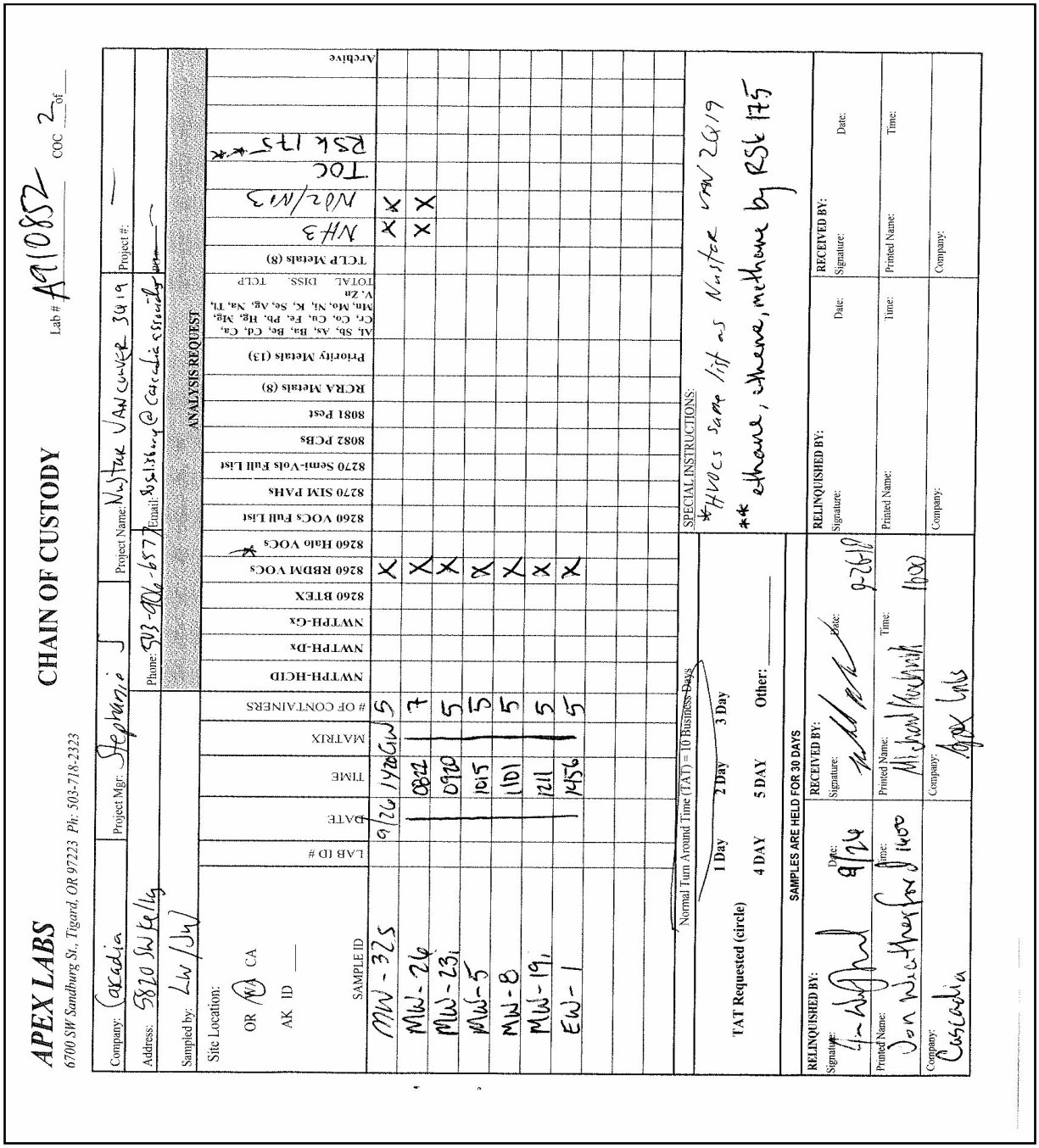

APEX LABS
6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY

Lab # A9I0852 COC 2 of

Company: Cascadia | Project Mgr: Stephanie J | Project Name: Nustar VAN winter 3Q19 | Project #:

Address: 5820 SW Kelly Ave | Phone: 503-894-6577 | Email: ssalisbury@cascadiaconsulting.com

Sampled by: LW/JW

Site Location: OR WA CA AK ID

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDMI 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)	NH3	NO2/NO3	TOC	Rsk 175**	Archive
MW-32S		9/26	1720	GW	5					X										X	X			
MW-24			0820		7					X										X	X			
MW-23i			0920		5					X														
MW-5			1015		5					X														
MW-8			1101		5					X														
MW-19i			1211		5					X														
EW-1			1456		5					X														

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:
*HVOCs same list as Nustar VAN 2Q19
** ethene, ethane, methane by RSK 175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 9/26	Date: 9/27/19	Date:	Date:
Time: 1700	Time: 1000	Time:	Time:
Printed Name: Jon Wickstrom	Printed Name:	Printed Name:	Printed Name:
Company: Cascadia	Company: Apex Labs	Company:	Company:

Apex Laboratories

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0852 - 10 16 19 1520**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9 10852

Project/Project #: NuStar Van. 3Q19 GWM

Delivery Info:

Date/time received: 9-26-19 @ 1600 By: MK

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

Cooler Inspection Date/time inspected: 9-26-19 @ 1725 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)	1.8	0.9					
Received on ice? (Y/N)	Y	Y					
Temp. blanks? (Y/N)	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: 9/26/19 @ 1840 By: AM

All samples intact? Yes X No Comments:

Bottle labels/COCs agree? Yes No X Comments: Trip Blank provided, not listed on COC. MW-19 lists 5 containers, 7 containers provided

COC/container discrepancies form initiated? Yes No X NA

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

Do VOA vials have visible headspace? Yes X No NA

Comments: MW-131 1/5 HS, 5/5 VIS red, MW-26 1/5 HS, MW-5 2/3 HS

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

Comments:

Additional information: TB#2137

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

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Lisa Domenighini, Client Services Manager

AirTECHNOLOGY
Laboratories, Inc.

October 15, 2019

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg Street
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9I0852
Lab Number: K100106-01/05

Enclosed are results for sample(s) received 10/01/19 by Air Technology Laboratories. Sample was received intact and chilled to 3° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A9I0852

K100106-01|05

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Apex Laboratories	Air Technology Laboratories, Inc
6700 S.W. Sandburg Street	18501 E. Gale Ave Suite 130
Tigard, OR 97223	City of Industry, CA 91748
Phone: (503) 718-2323	Phone :(626) 964-4032
Fax: (503) 336-0745	Fax: (626) 964-5832
Project Manager: Lisa Domenighini	

01 **Sample Name: MP-1** **Water** **Sampled: 09/26/19 09:30** (A9I0852-03)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/19 17:00	10/10/19 09:30	

Containers Supplied:
(F) 40 mL VOA - HCL
(G) 40 mL VOA - HCL

5 conts. listed, 7 conts. provided

02 **Sample Name: MW-19** **Water** **Sampled: 09/26/19 10:10** (A9I0852-04)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/19 17:00	10/10/19 10:10	

Containers Supplied:
(F) 40 mL VOA - HCL
(G) 40 mL VOA - HCL

03 **Sample Name: MW-13** **Water** **Sampled: 09/26/19 11:50** (A9I0852-08)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/19 17:00	10/10/19 11:50	2/2 voas have visible sediment

Containers Supplied:
(F) 40 mL VOA - HCL
(G) 40 mL VOA - HCL

04 **Sample Name: MW-12** **Water** **Sampled: 09/26/19 12:40** (A9I0852-09)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/19 17:00	10/10/19 12:40	

Containers Supplied:
(F) 40 mL VOA - HCL
(G) 40 mL VOA - HCL

Standard TAT - ship Monday

3°C

[signature]	9/30/19	UPS (Shipper)	
Released By	Date	Received By	Date
UPS (Shipper)	10/1/19 1218	[signature]	10/1/19 1218
Released By	Date	Received By	Date

SUBCONTRACT ORDER

Apex Laboratories

A9I0852

Sample Name: MW-26 **Water** **Sampled: 09/26/19 08:22** (A9I0852-12)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/19 17:00	10/10/19 08:22	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Standard TAT - Ship Monday

3°C

Released By	Date	Received By	Date
UPS (Shipper)	9/30/19	UPS (Shipper)	
UPS (Shipper)	10/1/19 1218	Kathy Charron	10/1/19 1218
Released By	Date	Received By	Date

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A9I0852
Date Received: 10/01/19
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	K100106-01		K100106-02		K100106-03		K100106-04	
Client Sample I.D.:	MP-1 (A9I0852-03)		MW-19 (A9I0852-04)		MW-13 (A9I0852-08)		MW-12 (A9I0852-09)	
Date/Time Sampled:	9/26/19 9:30		9/26/19 10:10		9/26/19 11:50		9/26/19 12:40	
Date/Time Analyzed:	10/10/19 9:53		10/10/19 10:07		10/10/19 10:18		10/10/19 10:30	
QC Batch No.:	191010GC8A1		191010GC8A1		191010GC8A1		191010GC8A1	
Analyst Initials:	CM		CM		CM		CM	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L
Ethene	ND	1.0	3.1	1.0	ND	1.0	1.1	1.0
Ethane	1.8	1.0	23	1.0	23	1.0	18	1.0
Methane	500	1.0	5,400	1.0	5,700	1.0	6,000	1.0

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 10/14/19

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A9I0852
Date Received: 10/01/19
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	K100106-05							
Client Sample I.D.:	MW-26 (A9I0852-12)							
Date/Time Sampled:	9/26/19 8:22							
Date/Time Analyzed:	10/10/19 10:41							
QC Batch No.:	191010GC8A1							
Analyst Initials:	CM							
Dilution Factor:	1.0							
ANALYTE	Result ug/L	RL ug/L						
Ethene	ND	1.0						
Ethane	ND	1.0						
Methane	1,100	1.0						

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 10/14/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191010GC8A1

Matrix: Air

Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	10/10/19 8:55			10/10/19 9:20		10/10/19 9:41					
Analyst Initials:	CM			CM		CM					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,300	114	1,270	111	2.8	70	130	30
Ethane	ND	1.0	1,230	1,310	107	1,290	105	1.7	70	130	30
Methane	ND	1.0	654	669	102	657	100	1.8	70	130	30

ND= Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____
Mark Johnson
Operations Manager

Date 10/14/19

The cover letter is an integral part of this analytical report

Apex Laboratories, LLC

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

Thursday, October 17, 2019

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

RE: A9I0898 - Shore Terminal-Vancouver - Nustar VAN 3Q19

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 A9I0898, which was received by the laboratory on 9/27/2019 at 4:00:00PM.

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	2.2 degC	Cooler #2	0.1 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

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

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-3	A9I0898-01	Water	09/27/19 08:25	09/27/19 16:00
MW-2	A9I0898-02	Water	09/27/19 09:15	09/27/19 16:00
MW-6	A9I0898-03	Water	09/27/19 10:00	09/27/19 16:00
MW-1	A9I0898-04	Water	09/27/19 10:45	09/27/19 16:00
MGMS3-60	A9I0898-05	Water	09/27/19 12:30	09/27/19 16:00
MGMS3-40	A9I0898-06	Water	09/27/19 12:50	09/27/19 16:00
MGMS3-40 DUP	A9I0898-07	Water	09/27/19 12:50	09/27/19 16:00
MW-24i	A9I0898-08	Water	09/27/19 08:40	09/27/19 16:00
MW-24d	A9I0898-09	Water	09/27/19 10:24	09/27/19 16:00
MGMS1-40	A9I0898-10	Water	09/27/19 11:24	09/27/19 16:00
MGMS1-60	A9I0898-11	Water	09/27/19 12:02	09/27/19 16:00
MGMS2-60	A9I0898-12	Water	09/27/19 13:45	09/27/19 16:00
MGMS2-40	A9I0898-13	Water	09/27/19 14:04	09/27/19 16:00

Apex Laboratories

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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:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL CASE NARRATIVE

Work Order: A9I0898

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology.

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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9I0898-01)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/30/19 23:45	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1-Dichloroethane	**7.00**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2-Dichloroethane (EDC)	**0.472**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
cis-1,2-Dichloroethene	**72.3**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
trans-1,2-Dichloroethene	**1.25**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2-Dichloropropane	**1.32**	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Tetrachloroethene (PCE)	**130**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,1,1-Trichloroethane	**1.70**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9I0898-01)				**Matrix: Water**		**Batch: 9091430**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/30/19 23:45	EPA 8260C	
Trichloroethene (TCE)	**32.9**	---	0.400	ug/L	1	09/30/19 23:45	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/30/19 23:45	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/30/19 23:45	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*96 %*	*Limits: 80-120 %*	*1*	*09/30/19 23:45*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*09/30/19 23:45*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*	*80-120 %*	*1*	*09/30/19 23:45*	*EPA 8260C*	
MW-3 (A9I0898-01RE1)				**Matrix: Water**		**Batch: 9100474**		
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 20:40	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits: 80-120 %*	*1*	*10/01/19 20:40*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*10/01/19 20:40*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*	*80-120 %*	*1*	*10/01/19 20:40*	*EPA 8260C*	
MW-2 (A9I0898-02RE1)				**Matrix: Water**		**Batch: 9100474**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 19:46	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	

Apex Laboratories

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-2 (A9I0898-02RE1)				**Matrix: Water**		**Batch: 9100474**		
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Methylene chloride	ND	---	10.0	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 19:46	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 19:46	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 19:46	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 19:46	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*100 %*	*Limits:*	*80-120 %*	*10/01/19 19:46*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*10/01/19 19:46*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*10/01/19 19:46*	*EPA 8260C*	
MW-6 (A9I0898-03)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 00:39	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9I0898-03)				**Matrix: Water**		**Batch: 9091430**		
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 00:39	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 00:39	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 00:39	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 00:39	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*94 %*	*Limits:*	*80-120 %*	*10/01/19 00:39*	*EPA 8260C*	
Toluene-d8 (Surr)			*105 %*		*80-120 %*	*10/01/19 00:39*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*90 %*		*80-120 %*	*10/01/19 00:39*	*EPA 8260C*	
MW-1 (A9I0898-04)				**Matrix: Water**		**Batch: 9091430**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-1 (A9I0898-04)				**Matrix: Water**		**Batch: 9091430**		
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 01:05	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1-Dichloroethane	**8.66**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1-Dichloroethene	**0.569**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
cis-1,2-Dichloroethene	**106**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
trans-1,2-Dichloroethene	**1.78**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2-Dichloropropane	**0.703**	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	
Tetrachloroethene (PCE)	**19.1**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1,1-Trichloroethane	**0.448**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 01:05	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-1 (A9I0898-04)				**Matrix: Water**		**Batch: 9091430**		
Trichloroethene (TCE)	**18.4**	---	0.400	ug/L	1	10/01/19 01:05	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 01:05	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 01:05	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 94 %*		*Limits: 80-120 %*	*1*	*10/01/19 01:05*	*EPA 8260C*	
Toluene-d8 (Surr)		*106 %*		*80-120 %*	*1*	*10/01/19 01:05*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*	*1*	*10/01/19 01:05*	*EPA 8260C*	
MW-1 (A9I0898-04RE1)				**Matrix: Water**		**Batch: 9100474**		
Vinyl chloride	**2.97**	---	0.400	ug/L	1	10/01/19 21:07	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*	*1*	*10/01/19 21:07*	*EPA 8260C*	
Toluene-d8 (Surr)		*100 %*		*80-120 %*	*1*	*10/01/19 21:07*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*	*1*	*10/01/19 21:07*	*EPA 8260C*	
MGMS3-60 (A9I0898-05)				**Matrix: Water**		**Batch: 9100476**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1-Dichloroethane	**1.13**	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
cis-1,2-Dichloroethene	**21.8**	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-60 (A9I0898-05)				**Matrix: Water**		**Batch: 9100476**		
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Tetrachloroethene (PCE)	**1.03**	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 14:52	EPA 8260C	
Trichloroethene (TCE)	**1.23**	---	0.400	ug/L	1	10/01/19 14:52	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 14:52	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 14:52	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*96 %*	*Limits:* *80-120 %*	*1*	*10/01/19 14:52*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*	*80-120 %*	*1*	*10/01/19 14:52*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*	*80-120 %*	*1*	*10/01/19 14:52*	*EPA 8260C*	
MGMS3-60 (A9I0898-05RE1)				**Matrix: Water**		**Batch: 9100534**		
Vinyl chloride	**3.98**	---	0.400	ug/L	1	10/02/19 15:59	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:* *80-120 %*	*1*	*10/02/19 15:59*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*	*80-120 %*	*1*	*10/02/19 15:59*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*103 %*	*80-120 %*	*1*	*10/02/19 15:59*	*EPA 8260C*	
MGMS3-40 (A9I0898-06)				**Matrix: Water**		**Batch: 9100532**		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9I0898-06)				**Matrix: Water**		**Batch: 9100532**		
Chloroform	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1-Dichloroethane	**5.09**	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
cis-1,2-Dichloroethene	**80.5**	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Tetrachloroethene (PCE)	**0.497**	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/19 22:36	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/19 22:36	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/19 22:36	EPA 8260C	
Vinyl chloride	**106**	---	0.400	ug/L	1	10/02/19 22:36	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 90 %*		*Limits: 80-120 %*	*1*	*10/02/19 22:36*	*EPA 8260C*	
Toluene-d8 (Surr)			*107 %*	*80-120 %*	*1*	*10/02/19 22:36*	*EPA 8260C*	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9I0898-06)				**Matrix: Water**		**Batch: 9100532**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 94 %*	*Limits: 80-120 %*		*1*	*10/02/19 22:36*	*EPA 8260C*	
MGMS3-40 DUP (A9I0898-07)				**Matrix: Water**		**Batch: 9100532**		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1-Dichloroethane	**5.09**	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1-Dichloroethene	**0.413**	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
cis-1,2-Dichloroethene	**80.4**	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 DUP (A9I0898-07)				**Matrix: Water**		**Batch: 9100532**		
Tetrachloroethene (PCE)	**0.578**	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/19 23:03	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/19 23:03	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:03	EPA 8260C	
Vinyl chloride	**104**	---	0.400	ug/L	1	10/02/19 23:03	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*89 %*	*Limits:*	*80-120 %*	*1*	*10/02/19 23:03*	*EPA 8260C*	
Toluene-d8 (Surr)			*108 %*		*80-120 %*	*1*	*10/02/19 23:03*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*94 %*		*80-120 %*	*1*	*10/02/19 23:03*	*EPA 8260C*	
MW-24i (A9I0898-08)				**Matrix: Water**		**Batch: 9100476**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A9I0898-08)				**Matrix: Water**		**Batch: 9100476**		
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 15:19	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 15:19	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 15:19	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 15:19	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery: 94 %*		*Limits: 80-120 %*	*1*	*10/01/19 15:19*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*	*80-120 %*	*1*	*10/01/19 15:19*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*96 %*	*80-120 %*	*1*	*10/01/19 15:19*	*EPA 8260C*	
MW-24d (A9I0898-09)				**Matrix: Water**		**Batch: 9100476**		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24d (A9I0898-09)				**Matrix: Water**		**Batch: 9100476**		
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1-Dichloroethane	**0.415**	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
cis-1,2-Dichloroethene	**0.995**	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Tetrachloroethene (PCE)	**1.62**	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/19 16:13	EPA 8260C	
Trichloroethene (TCE)	**0.845**	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/19 16:13	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/19 16:13	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/19 16:13	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*93 %*	*Limits:*	*80-120 %*	*10/01/19 16:13*	*EPA 8260C*	
Toluene-d8 (Surr)			*106 %*		*80-120 %*	*10/01/19 16:13*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*95 %*		*80-120 %*	*10/01/19 16:13*	*EPA 8260C*	
MGMS1-40 (A9I0898-10)				**Matrix: Water**		**Batch: 9100532**		
Bromobenzene	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Bromochloromethane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-40 (A9I0898-10)				**Matrix: Water**		**Batch: 9100532**		
Bromodichloromethane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Bromoform	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Bromomethane	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
Carbon tetrachloride	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Chlorobenzene	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Chloroethane	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
Chloroform	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Chloromethane	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
2-Chlorotoluene	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
4-Chlorotoluene	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Dibromochloromethane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Dibromomethane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1-Dichloroethane	**156**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1-Dichloroethene	**30.5**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
cis-1,2-Dichloroethene	**3240**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
trans-1,2-Dichloroethene	**53.9**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1-Dichloropropene	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Hexachlorobutadiene	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
Methylene chloride	ND	---	100	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Tetrachloroethene (PCE)	**212**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Trichloroethene (TCE)	**434**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-40 (A9I0898-10)				**Matrix: Water**		**Batch: 9100532**		
Trichlorofluoromethane	ND	---	40.0	ug/L	20	10/03/19 01:18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	10/03/19 01:18	EPA 8260C	
Vinyl chloride	**113**	---	8.00	ug/L	20	10/03/19 01:18	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits: 80-120 %*	*1*	*10/03/19 01:18*	*EPA 8260C*	
Toluene-d8 (Surr)			*108 %*	*80-120 %*	*1*	*10/03/19 01:18*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*93 %*	*80-120 %*	*1*	*10/03/19 01:18*	*EPA 8260C*	
MGMS1-60 (A9I0898-11)				**Matrix: Water**		**Batch: 9100534**		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1-Dichloroethane	**4.58**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1-Dichloroethene	**0.443**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
cis-1,2-Dichloroethene	**27.9**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-60 (A9I0898-11)				**Matrix: Water**		**Batch: 9100534**		
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Tetrachloroethene (PCE)	**33.2**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/19 21:48	EPA 8260C	
Trichloroethene (TCE)	**19.0**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/19 21:48	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/19 21:48	EPA 8260C	
Vinyl chloride	**7.89**	---	0.400	ug/L	1	10/02/19 21:48	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*10/02/19 21:48*	*EPA 8260C*	
Toluene-d8 (Surr)			*104 %*	*80-120 %*	*1*	*10/02/19 21:48*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*10/02/19 21:48*	*EPA 8260C*	
MGMS2-60 (A9I0898-12)				**Matrix: Water**		**Batch: 9100532**		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A9I0898-12)				**Matrix: Water**		**Batch: 9100532**		
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1-Dichloroethane	**1.59**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
cis-1,2-Dichloroethene	**35.2**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
trans-1,2-Dichloroethene	**0.470**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
Tetrachloroethene (PCE)	**25.0**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/19 23:30	EPA 8260C	
Trichloroethene (TCE)	**13.8**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/19 23:30	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:30	EPA 8260C	
Vinyl chloride	**3.08**	---	0.400	ug/L	1	10/02/19 23:30	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits:*	*80-120 %*	*1*	*10/02/19 23:30*	*EPA 8260C*	
Toluene-d8 (Surr)			*107 %*		*80-120 %*	*1*	*10/02/19 23:30*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*90 %*		*80-120 %*	*1*	*10/02/19 23:30*	*EPA 8260C*	
MGMS2-40 (A9I0898-13)				**Matrix: Water**		**Batch: 9100532**		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9I0898-13)				**Matrix: Water**		**Batch: 9100532**		
Chloroform	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1-Dichloroethane	**11.2**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1-Dichloroethene	**0.729**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
cis-1,2-Dichloroethene	**73.8**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Tetrachloroethene (PCE)	**17.0**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/19 23:57	EPA 8260C	
Trichloroethene (TCE)	**13.1**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/19 23:57	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/19 23:57	EPA 8260C	
Vinyl chloride	**101**	---	0.400	ug/L	1	10/02/19 23:57	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*90 %*	*Limits:*	*80-120 %*	*1*	*10/02/19 23:57*	*EPA 8260C*	
Toluene-d8 (Surr)			*108 %*		*80-120 %*	*1*	*10/02/19 23:57*	*EPA 8260C*	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9I0898-13)				**Matrix: Water**		**Batch: 9100532**		
Surrogate: 4-Bromofluorobenzene (Surr)		*Recovery: 93 %*	*Limits: 80-120 %*		*1*	*10/02/19 23:57*	*EPA 8260C*	

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9I0898-01)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**2.04**	---	0.0200	mg/L	1	10/02/19 15:20	SM 4500-NH3 G	
MW-2 (A9I0898-02)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**9.82**	---	0.100	mg/L	5	10/02/19 15:29	SM 4500-NH3 G	
MW-6 (A9I0898-03)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**6.36**	---	0.0400	mg/L	2	10/02/19 15:31	SM 4500-NH3 G	
MW-1 (A9I0898-04)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**56.9**	---	2.00	mg/L	100	10/02/19 15:32	SM 4500-NH3 G	
MGMS3-60 (A9I0898-05)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/19 15:34	SM 4500-NH3 G	
MGMS3-40 (A9I0898-06RE1)				**Matrix: Water**			**Batch: 9100700**	
Ammonia as N	**1.14**	---	0.0200	mg/L	1	10/04/19 19:23	SM 4500-NH3 G	
MGMS3-40 DUP (A9I0898-07)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**1.26**	---	0.0200	mg/L	1	10/02/19 15:37	SM 4500-NH3 G	
MW-24i (A9I0898-08)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**0.116**	---	0.0200	mg/L	1	10/02/19 15:38	SM 4500-NH3 G	
MW-24d (A9I0898-09)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**0.0500**	---	0.0200	mg/L	1	10/02/19 15:40	SM 4500-NH3 G	
MGMS1-40 (A9I0898-10)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**233**	---	2.00	mg/L	100	10/02/19 15:41	SM 4500-NH3 G	
MGMS1-60 (A9I0898-11)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/19 15:43	SM 4500-NH3 G	
MGMS2-60 (A9I0898-12)				**Matrix: Water**			**Batch: 9100540**	
Ammonia as N	**0.719**	---	0.0200	mg/L	1	10/02/19 15:52	SM 4500-NH3 G	
MGMS2-40 (A9I0898-13)				**Matrix: Water**			**Batch: 9100540**	

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9I0898-13)				**Matrix: Water**		**Batch: 9100540**		
Ammonia as N	**78.9**	---	0.400	mg/L	20	10/02/19 15:53	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9I0898-01RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**3.90**	---	0.250	mg/L	1	09/28/19 15:01	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 15:01	EPA 300.0	
MW-2 (A9I0898-02)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 15:23	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 15:23	EPA 300.0	
MW-6 (A9I0898-03)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 16:28	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 16:28	EPA 300.0	
MW-1 (A9I0898-04)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**44.0**	---	1.25	mg/L	5	09/28/19 17:32	EPA 300.0	
MW-1 (A9I0898-04RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 17:54	EPA 300.0	
MGMS3-60 (A9I0898-05)				**Matrix: Water**				
Batch: 9091413								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 18:15	EPA 300.0	
MGMS3-60 (A9I0898-05RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/29/19 10:32	EPA 300.0	
MGMS3-40 (A9I0898-06)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 18:37	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 18:37	EPA 300.0	
MGMS3-40 DUP (A9I0898-07)				**Matrix: Water**				

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 DUP (A9I0898-07)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 18:59	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 18:59	EPA 300.0	
MW-24i (A9I0898-08)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 19:20	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 19:20	EPA 300.0	
MW-24d (A9I0898-09)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**3.76**	---	0.250	mg/L	1	09/28/19 20:25	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 20:25	EPA 300.0	
MGMS1-40 (A9I0898-10)				**Matrix: Water**				
Batch: 9091413								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 20:46	EPA 300.0	
MGMS1-40 (A9I0898-10RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**84.1**	---	5.00	mg/L	20	09/29/19 10:54	EPA 300.0	
MGMS1-60 (A9I0898-11RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**2.58**	---	0.250	mg/L	1	09/28/19 22:13	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 22:13	EPA 300.0	
MGMS2-60 (A9I0898-12)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 22:34	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 22:34	EPA 300.0	
MGMS2-40 (A9I0898-13)				**Matrix: Water**				
Batch: 9091413								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/19 22:56	EPA 300.0	

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9I0898-13RE1)				**Matrix: Water**				
Batch: 9091413								
Nitrate-Nitrogen	**1.34**	---	0.250	mg/L	1	09/29/19 11:58	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9I0898-06)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**2.86**	---	1.00	mg/L	1	10/01/19 15:14	SM 5310 C	
MW-24i (A9I0898-08)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	ND	---	1.00	mg/L	1	10/01/19 15:44	SM 5310 C	
MGMS1-40 (A9I0898-10)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**6.32**	---	1.00	mg/L	1	10/01/19 16:14	SM 5310 C	
MGMS2-40 (A9I0898-13)				**Matrix: Water**				
Batch: 9091432								
Total Organic Carbon	**4.76**	---	1.00	mg/L	1	10/01/19 16:44	SM 5310 C	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Blank (9091430-BLK1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 15:11								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*92 %*		*80-120 %*			*"*					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Bromochloromethane	22.3	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Bromodichloromethane	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Bromoform	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Bromomethane	27.1	---	5.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	23.9	---	1.00	ug/L	1	20.0	---	119	80 - 120%	---	---	
Chlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Chloroethane	26.7	---	5.00	ug/L	1	20.0	---	**133**	**80 - 120%**	---	---	Q-56
Chloroform	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloromethane	21.2	---	5.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
2-Chlorotoluene	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
4-Chlorotoluene	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
Dibromochloromethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Dibromomethane	20.1	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
LCS (9091430-BS1)		Prepared: 09/30/19 13:00		Analyzed: 09/30/19 14:17								
1,3-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,4-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Dichlorodifluoromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,1-Dichloroethane	21.1	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.8	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloroethene	22.4	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
cis-1,2-Dichloroethene	21.2	---	0.400	ug/L	1	20.0	---	106	80 - 120%	---	---	
trans-1,2-Dichloroethene	21.4	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2-Dichloropropane	20.7	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,3-Dichloropropane	21.1	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
2,2-Dichloropropane	27.0	---	1.00	ug/L	1	20.0	---	**135**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
cis-1,3-Dichloropropene	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.6	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Hexachlorobutadiene	18.6	---	5.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
Methylene chloride	20.0	---	3.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.8	---	0.500	ug/L	1	20.0	---	114	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.7	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.1	---	2.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
1,1,1-Trichloroethane	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Trichloroethene (TCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
Trichlorofluoromethane	28.9	---	2.00	ug/L	1	20.0	---	**145**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Vinyl chloride	26.2	---	0.400	ug/L	1	20.0	---	**131**	**80 - 120%**	---	---	Q-56
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*103 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
Matrix Spike (9091430-MS1)		Prepared: 09/30/19 14:46		Analyzed: 10/01/19 01:32								

QC Source Sample: MW-1 (A9I0898-04)

EPA 8260C

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Matrix Spike (9091430-MS1)		Prepared: 09/30/19 14:46		Analyzed: 10/01/19 01:32								
QC Source Sample: MW-1 (A9I0898-04)												
Bromobenzene	20.9	---	0.500	ug/L	1	20.0	ND	104	80 - 120%	---	---	
Bromochloromethane	25.5	---	1.00	ug/L	1	20.0	ND	**128**	**78 - 123%**	---	---	Q-01
Bromodichloromethane	21.9	---	1.00	ug/L	1	20.0	ND	110	79 - 125%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	ND	112	66 - 130%	---	---	
Bromomethane	27.7	---	5.00	ug/L	1	20.0	ND	138	53 - 141%	---	---	Q-54g
Carbon tetrachloride	26.2	---	1.00	ug/L	1	20.0	ND	131	72 - 136%	---	---	
Chlorobenzene	22.0	---	0.500	ug/L	1	20.0	ND	110	80 - 120%	---	---	
Chloroethane	27.8	---	5.00	ug/L	1	20.0	ND	**139**	**60 - 138%**	---	---	Q-54e
Chloroform	21.5	---	1.00	ug/L	1	20.0	ND	107	79 - 124%	---	---	
Chloromethane	23.9	---	5.00	ug/L	1	20.0	ND	120	50 - 139%	---	---	
2-Chlorotoluene	20.4	---	1.00	ug/L	1	20.0	ND	102	79 - 122%	---	---	
4-Chlorotoluene	21.8	---	1.00	ug/L	1	20.0	ND	109	78 - 122%	---	---	
Dibromochloromethane	21.8	---	1.00	ug/L	1	20.0	ND	109	74 - 126%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	ND	93	62 - 128%	---	---	
1,2-Dibromoethane (EDB)	21.7	---	0.500	ug/L	1	20.0	ND	108	77 - 121%	---	---	
Dibromomethane	21.5	---	1.00	ug/L	1	20.0	ND	107	79 - 123%	---	---	
1,2-Dichlorobenzene	21.0	---	0.500	ug/L	1	20.0	ND	105	80 - 120%	---	---	
1,3-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	ND	106	80 - 120%	---	---	
1,4-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	ND	104	79 - 120%	---	---	
Dichlorodifluoromethane	22.1	---	1.00	ug/L	1	20.0	ND	111	32 - 152%	---	---	
1,1-Dichloroethane	32.3	---	0.400	ug/L	1	20.0	8.66	118	77 - 125%	---	---	
1,2-Dichloroethane (EDC)	23.3	---	0.400	ug/L	1	20.0	ND	116	73 - 128%	---	---	
1,1-Dichloroethene	25.6	---	0.400	ug/L	1	20.0	0.569	125	71 - 131%	---	---	
cis-1,2-Dichloroethene	132	---	0.400	ug/L	1	20.0	106	**128**	**78 - 123%**	---	---	Q-03
trans-1,2-Dichloroethene	25.3	---	0.400	ug/L	1	20.0	1.78	118	75 - 124%	---	---	
1,2-Dichloropropane	23.9	---	0.500	ug/L	1	20.0	0.703	116	78 - 122%	---	---	
1,3-Dichloropropane	22.7	---	1.00	ug/L	1	20.0	ND	114	80 - 120%	---	---	
2,2-Dichloropropane	22.4	---	1.00	ug/L	1	20.0	ND	112	60 - 139%	---	---	Q-54g
1,1-Dichloropropene	23.5	---	1.00	ug/L	1	20.0	ND	118	79 - 125%	---	---	
cis-1,3-Dichloropropene	22.0	---	1.00	ug/L	1	20.0	ND	110	75 - 124%	---	---	
trans-1,3-Dichloropropene	22.8	---	1.00	ug/L	1	20.0	ND	114	73 - 127%	---	---	
Hexachlorobutadiene	19.0	---	5.00	ug/L	1	20.0	ND	95	66 - 134%	---	---	
Methylene chloride	20.9	---	3.00	ug/L	1	20.0	ND	105	74 - 124%	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9091430 - EPA 5030B							**Water**					
Matrix Spike (9091430-MS1)		Prepared: 09/30/19 14:46		Analyzed: 10/01/19 01:32								
QC Source Sample: MW-1 (A9I0898-04)												
1,1,1,2-Tetrachloroethane	22.3	---	0.400	ug/L	1	20.0	ND	111	78 - 124%	---	---	
1,1,2,2-Tetrachloroethane	24.5	---	0.500	ug/L	1	20.0	ND	**123**	**71 - 121%**	---	---	Q-01
Tetrachloroethene (PCE)	40.8	---	0.400	ug/L	1	20.0	19.1	109	74 - 129%	---	---	
1,2,3-Trichlorobenzene	19.2	---	2.00	ug/L	1	20.0	ND	96	69 - 129%	---	---	
1,2,4-Trichlorobenzene	19.7	---	2.00	ug/L	1	20.0	ND	98	69 - 130%	---	---	
1,1,1-Trichloroethane	22.6	---	0.400	ug/L	1	20.0	0.448	111	74 - 131%	---	---	
1,1,2-Trichloroethane	22.4	---	0.500	ug/L	1	20.0	ND	112	80 - 120%	---	---	
Trichloroethene (TCE)	39.5	---	0.400	ug/L	1	20.0	18.4	106	79 - 123%	---	---	
Trichlorofluoromethane	30.7	---	2.00	ug/L	1	20.0	ND	**154**	**65 - 141%**	---	---	Q-54k
1,2,3-Trichloropropane	21.2	---	1.00	ug/L	1	20.0	ND	106	73 - 122%	---	---	
Vinyl chloride	31.5	---	0.400	ug/L	1	20.0	3.99	**138**	**58 - 137%**	---	---	Q-54c
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 95 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*104 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*			*"*					

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	10.0	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
Blank (9100474-BLK1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:58								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 100 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*100 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
EPA 8260C												
Bromobenzene	18.7	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	
Bromochloromethane	19.7	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Bromodichloromethane	18.2	---	1.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
Bromoform	12.2	---	1.00	ug/L	1	20.0	---	**61**	**80 - 120%**	---	---	Q-55
Bromomethane	24.7	---	5.00	ug/L	1	20.0	---	**124**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	15.2	---	1.00	ug/L	1	20.0	---	**76**	**80 - 120%**	---	---	Q-55
Chlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Chloroform	20.1	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloromethane	19.9	---	5.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
2-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
4-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Dibromochloromethane	14.3	---	1.00	ug/L	1	20.0	---	**71**	**80 - 120%**	---	---	Q-55
1,2-Dibromo-3-chloropropane	15.5	---	5.00	ug/L	1	20.0	---	**78**	**80 - 120%**	---	---	Q-55
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Dibromomethane	20.2	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100474 - EPA 5030B							**Water**					
LCS (9100474-BS1)		Prepared: 10/01/19 10:30		Analyzed: 10/01/19 12:04								
1,3-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Dichlorodifluoromethane	19.5	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1-Dichloroethane	20.3	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
cis-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
trans-1,2-Dichloroethene	19.7	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloropropane	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
2,2-Dichloropropane	20.9	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloropropene	20.5	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
cis-1,3-Dichloropropene	17.7	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
trans-1,3-Dichloropropene	17.3	---	1.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
Hexachlorobutadiene	22.4	---	5.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Methylene chloride	19.2	---	10.0	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	16.3	---	0.400	ug/L	1	20.0	---	81	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,2,3-Trichlorobenzene	24.1	---	2.00	ug/L	1	20.0	---	**121**	**80 - 120%**	---	---	Q-56
1,2,4-Trichlorobenzene	21.7	---	2.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,1,1-Trichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1,2-Trichloroethane	19.7	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
Trichlorofluoromethane	22.3	---	2.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
Vinyl chloride	21.0	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 99 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100476 - EPA 5030B							**Water**					
Blank (9100476-BLK1)		Prepared: 10/01/19 10:00		Analyzed: 10/01/19 12:10								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100476 - EPA 5030B							**Water**					
Blank (9100476-BLK1)		Prepared: 10/01/19 10:00		Analyzed: 10/01/19 12:10								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 94 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					
LCS (9100476-BS1)		Prepared: 10/01/19 10:00		Analyzed: 10/01/19 11:16								
EPA 8260C												
Bromobenzene	21.3	---	0.500	ug/L	1	20.0	---	106	80 - 120%	---	---	
Bromochloromethane	24.2	---	1.00	ug/L	1	20.0	---	**121**	**80 - 120%**	---	---	Q-56
Bromodichloromethane	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Bromoform	21.7	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Bromomethane	26.8	---	5.00	ug/L	1	20.0	---	**134**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	25.0	---	1.00	ug/L	1	20.0	---	**125**	**80 - 120%**	---	---	Q-56
Chlorobenzene	21.4	---	0.500	ug/L	1	20.0	---	107	80 - 120%	---	---	
Chloroethane	25.8	---	5.00	ug/L	1	20.0	---	**129**	**80 - 120%**	---	---	Q-56
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Chloromethane	22.5	---	5.00	ug/L	1	20.0	---	113	80 - 120%	---	---	
2-Chlorotoluene	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
4-Chlorotoluene	22.0	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
Dibromochloromethane	20.5	---	1.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	18.2	---	5.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.4	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Dibromomethane	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100476 - EPA 5030B							**Water**					
LCS (9100476-BS1)		Prepared: 10/01/19 10:00		Analyzed: 10/01/19 11:16								
1,3-Dichlorobenzene	21.4	---	0.500	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,4-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Dichlorodifluoromethane	21.3	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,1-Dichloroethane	22.7	---	0.400	ug/L	1	20.0	---	114	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	22.0	---	0.400	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1-Dichloroethene	23.5	---	0.400	ug/L	1	20.0	---	117	80 - 120%	---	---	
cis-1,2-Dichloroethene	22.2	---	0.400	ug/L	1	20.0	---	111	80 - 120%	---	---	
trans-1,2-Dichloroethene	22.5	---	0.400	ug/L	1	20.0	---	113	80 - 120%	---	---	
1,2-Dichloropropane	22.2	---	0.500	ug/L	1	20.0	---	111	80 - 120%	---	---	
1,3-Dichloropropane	21.7	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
2,2-Dichloropropane	28.5	---	1.00	ug/L	1	20.0	---	**142**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	22.3	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
cis-1,3-Dichloropropene	22.7	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
trans-1,3-Dichloropropene	22.9	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Hexachlorobutadiene	21.3	---	5.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
Methylene chloride	20.7	---	5.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	21.0	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	24.3	---	0.500	ug/L	1	20.0	---	**122**	**80 - 120%**	---	---	Q-56
Tetrachloroethene (PCE)	21.5	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2,3-Trichlorobenzene	20.1	---	2.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2,4-Trichlorobenzene	20.7	---	2.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1,1-Trichloroethane	21.7	---	0.400	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,1,2-Trichloroethane	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Trichloroethene (TCE)	19.6	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
Trichlorofluoromethane	28.7	---	2.00	ug/L	1	20.0	---	**143**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Vinyl chloride	26.1	---	0.400	ug/L	1	20.0	---	**130**	**80 - 120%**	---	---	Q-56
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 96 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*104 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					
Duplicate (9100476-DUP1)		Prepared: 10/01/19 11:50		Analyzed: 10/01/19 15:46								

QC Source Sample: MW-24i (A9I0898-08)

EPA 8260C

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100476 - EPA 5030B							**Water**					
Duplicate (9100476-DUP1)		Prepared: 10/01/19 11:50		Analyzed: 10/01/19 15:46								
QC Source Sample: MW-24i (A9I0898-08)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	0.228	---	---	***	**30%**	Q-05
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100476 - EPA 5030B							**Water**					
Duplicate (9100476-DUP1)		Prepared: 10/01/19 11:50 Analyzed: 10/01/19 15:46										
QC Source Sample: MW-24i (A9I0898-08)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 94 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*107 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*97 %*		*80-120 %*			*"*					

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Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100532 - EPA 5030B							**Water**					
Blank (9100532-BLK1)		Prepared: 10/02/19 16:00		Analyzed: 10/02/19 17:39								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100532 - EPA 5030B							**Water**					
Blank (9100532-BLK1)		Prepared: 10/02/19 16:00		Analyzed: 10/02/19 17:39								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 90 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*108 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*94 %*		*80-120 %*			*"*					
LCS (9100532-BS1)		Prepared: 10/02/19 16:00		Analyzed: 10/02/19 16:45								
EPA 8260C												
Bromobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Bromochloromethane	22.7	---	1.00	ug/L	1	20.0	---	113	80 - 120%	---	---	
Bromodichloromethane	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
Bromoform	21.4	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
Bromomethane	24.1	---	5.00	ug/L	1	20.0	---	**121**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Chlorobenzene	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Chloroethane	23.3	---	5.00	ug/L	1	20.0	---	117	80 - 120%	---	---	
Chloroform	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
Chloromethane	20.1	---	5.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
2-Chlorotoluene	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
4-Chlorotoluene	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Dibromochloromethane	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	19.0	---	5.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	21.1	---	0.500	ug/L	1	20.0	---	106	80 - 120%	---	---	
Dibromomethane	18.8	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,2-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100532 - EPA 5030B							**Water**					
LCS (9100532-BS1)		Prepared: 10/02/19 16:00		Analyzed: 10/02/19 16:45								
1,3-Dichlorobenzene	21.8	---	0.500	ug/L	1	20.0	---	109	80 - 120%	---	---	
1,4-Dichlorobenzene	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Dichlorodifluoromethane	19.1	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1-Dichloroethane	20.9	---	0.400	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1-Dichloroethene	22.0	---	0.400	ug/L	1	20.0	---	110	80 - 120%	---	---	
cis-1,2-Dichloroethene	20.5	---	0.400	ug/L	1	20.0	---	103	80 - 120%	---	---	
trans-1,2-Dichloroethene	21.3	---	0.400	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2-Dichloropropane	20.2	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,3-Dichloropropane	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
2,2-Dichloropropane	26.1	---	1.00	ug/L	1	20.0	---	**131**	**80 - 120%**	---	---	Q-56
1,1-Dichloropropene	20.3	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
cis-1,3-Dichloropropene	22.4	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
trans-1,3-Dichloropropene	22.7	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Hexachlorobutadiene	21.4	---	5.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
Methylene chloride	19.6	---	5.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	20.5	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	25.5	---	0.500	ug/L	1	20.0	---	**127**	**80 - 120%**	---	---	Q-56
Tetrachloroethene (PCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2,3-Trichlorobenzene	20.6	---	2.00	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,2,4-Trichlorobenzene	20.1	---	2.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,1,1-Trichloroethane	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1,2-Trichloroethane	21.1	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Trichloroethene (TCE)	17.9	---	0.400	ug/L	1	20.0	---	90	80 - 120%	---	---	
Trichlorofluoromethane	26.5	---	2.00	ug/L	1	20.0	---	**132**	**80 - 120%**	---	---	Q-56
1,2,3-Trichloropropane	22.3	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Vinyl chloride	23.6	---	0.400	ug/L	1	20.0	---	118	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 90 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*106 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*92 %*		*80-120 %*			*"*					
Matrix Spike (9100532-MS1)		Prepared: 10/02/19 17:00		Analyzed: 10/03/19 00:24								

QC Source Sample: MGMS2-40 (A9I0898-13)

EPA 8260C

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100532 - EPA 5030B							**Water**					
Matrix Spike (9100532-MS1)		Prepared: 10/02/19 17:00		Analyzed: 10/03/19 00:24								
QC Source Sample: MGMS2-40 (A9I0898-13)												
Bromobenzene	20.6	---	0.500	ug/L	1	20.0	ND	103	80 - 120%	---	---	
Bromochloromethane	24.0	---	1.00	ug/L	1	20.0	ND	120	78 - 123%	---	---	
Bromodichloromethane	20.6	---	1.00	ug/L	1	20.0	ND	103	79 - 125%	---	---	
Bromoform	21.7	---	1.00	ug/L	1	20.0	ND	109	66 - 130%	---	---	
Bromomethane	26.7	---	5.00	ug/L	1	20.0	ND	133	53 - 141%	---	---	Q-54a
Carbon tetrachloride	24.3	---	1.00	ug/L	1	20.0	ND	121	72 - 136%	---	---	
Chlorobenzene	21.3	---	0.500	ug/L	1	20.0	ND	107	80 - 120%	---	---	
Chloroethane	25.2	---	5.00	ug/L	1	20.0	ND	126	60 - 138%	---	---	
Chloroform	20.4	---	1.00	ug/L	1	20.0	ND	102	79 - 124%	---	---	
Chloromethane	24.2	---	5.00	ug/L	1	20.0	ND	121	50 - 139%	---	---	
2-Chlorotoluene	20.8	---	1.00	ug/L	1	20.0	ND	104	79 - 122%	---	---	
4-Chlorotoluene	22.6	---	1.00	ug/L	1	20.0	ND	113	78 - 122%	---	---	
Dibromochloromethane	21.0	---	1.00	ug/L	1	20.0	ND	105	74 - 126%	---	---	
1,2-Dibromo-3-chloropropane	20.6	---	5.00	ug/L	1	20.0	ND	103	62 - 128%	---	---	
1,2-Dibromoethane (EDB)	21.5	---	0.500	ug/L	1	20.0	ND	108	77 - 121%	---	---	
Dibromomethane	20.4	---	1.00	ug/L	1	20.0	ND	102	79 - 123%	---	---	
1,2-Dichlorobenzene	20.7	---	0.500	ug/L	1	20.0	ND	104	80 - 120%	---	---	
1,3-Dichlorobenzene	21.8	---	0.500	ug/L	1	20.0	ND	109	80 - 120%	---	---	
1,4-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	ND	104	79 - 120%	---	---	
Dichlorodifluoromethane	22.1	---	1.00	ug/L	1	20.0	ND	111	32 - 152%	---	---	
1,1-Dichloroethane	35.8	---	0.400	ug/L	1	20.0	11.2	123	77 - 125%	---	---	
1,2-Dichloroethane (EDC)	21.6	---	0.400	ug/L	1	20.0	ND	108	73 - 128%	---	---	
1,1-Dichloroethene	24.9	---	0.400	ug/L	1	20.0	0.729	121	71 - 131%	---	---	
cis-1,2-Dichloroethene	106	---	0.400	ug/L	1	20.0	73.8	**159**	**78 - 123%**	---	---	Q-03
trans-1,2-Dichloroethene	23.4	---	0.400	ug/L	1	20.0	0.324	116	75 - 124%	---	---	
1,2-Dichloropropane	21.3	---	0.500	ug/L	1	20.0	ND	106	78 - 122%	---	---	
1,3-Dichloropropane	23.0	---	1.00	ug/L	1	20.0	ND	115	80 - 120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	ND	116	60 - 139%	---	---	Q-54c
1,1-Dichloropropene	21.7	---	1.00	ug/L	1	20.0	ND	108	79 - 125%	---	---	
cis-1,3-Dichloropropene	22.6	---	1.00	ug/L	1	20.0	ND	113	75 - 124%	---	---	
trans-1,3-Dichloropropene	23.2	---	1.00	ug/L	1	20.0	ND	116	73 - 127%	---	---	
Hexachlorobutadiene	20.0	---	5.00	ug/L	1	20.0	ND	100	66 - 134%	---	---	
Methylene chloride	20.3	---	5.00	ug/L	1	20.0	ND	102	74 - 124%	---	---	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100532 - EPA 5030B							**Water**					
Matrix Spike (9100532-MS1)		Prepared: 10/02/19 17:00		Analyzed: 10/03/19 00:24								
QC Source Sample: MGMS2-40 (A9I0898-13)												
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	ND	107	78 - 124%	---	---	
1,1,2,2-Tetrachloroethane	26.3	---	0.500	ug/L	1	20.0	ND	**131**	**71 - 121%**	---	---	Q-54n
Tetrachloroethene (PCE)	39.9	---	0.400	ug/L	1	20.0	17.0	114	74 - 129%	---	---	
1,2,3-Trichlorobenzene	20.3	---	2.00	ug/L	1	20.0	ND	101	69 - 129%	---	---	
1,2,4-Trichlorobenzene	20.3	---	2.00	ug/L	1	20.0	ND	102	69 - 130%	---	---	
1,1,1-Trichloroethane	21.0	---	0.400	ug/L	1	20.0	ND	105	74 - 131%	---	---	
1,1,2-Trichloroethane	21.8	---	0.500	ug/L	1	20.0	ND	109	80 - 120%	---	---	
Trichloroethene (TCE)	33.2	---	0.400	ug/L	1	20.0	13.1	100	79 - 123%	---	---	
Trichlorofluoromethane	28.1	---	2.00	ug/L	1	20.0	ND	141	65 - 141%	---	---	Q-54d
1,2,3-Trichloropropane	22.2	---	1.00	ug/L	1	20.0	ND	111	73 - 122%	---	---	
Vinyl chloride	135	---	0.400	ug/L	1	20.0	101	**171**	**58 - 137%**	---	---	Q-03
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 92 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*			*"*					

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100534 - EPA 5030B							**Water**					
Blank (9100534-BLK1)		Prepared: 10/02/19 09:12		Analyzed: 10/02/19 11:57								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100534 - EPA 5030B							**Water**					
Blank (9100534-BLK1)		Prepared: 10/02/19 09:12		Analyzed: 10/02/19 11:57								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 111 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*105 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*101 %*		*80-120 %*			*"*					
LCS (9100534-BS1)		Prepared: 10/02/19 09:12		Analyzed: 10/02/19 11:03								
EPA 8260C												
Bromobenzene	22.2	---	0.500	ug/L	1	20.0	---	111	80 - 120%	---	---	
Bromochloromethane	21.4	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
Bromodichloromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Bromoform	22.7	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Bromomethane	22.7	---	5.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
Carbon tetrachloride	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Chlorobenzene	22.3	---	0.500	ug/L	1	20.0	---	111	80 - 120%	---	---	
Chloroethane	18.0	---	5.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
Chloroform	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
Chloromethane	16.4	---	5.00	ug/L	1	20.0	---	82	80 - 120%	---	---	
2-Chlorotoluene	21.9	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
4-Chlorotoluene	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Dibromochloromethane	21.2	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
1,2-Dibromo-3-chloropropane	21.0	---	5.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	21.0	---	0.500	ug/L	1	20.0	---	105	80 - 120%	---	---	
Dibromomethane	21.7	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,2-Dichlorobenzene	22.1	---	0.500	ug/L	1	20.0	---	111	80 - 120%	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9100534 - EPA 5030B							**Water**					
LCS (9100534-BS1)		Prepared: 10/02/19 09:12		Analyzed: 10/02/19 11:03								
1,3-Dichlorobenzene	22.6	---	0.500	ug/L	1	20.0	---	113	80 - 120%	---	---	
1,4-Dichlorobenzene	21.1	---	0.500	ug/L	1	20.0	---	106	80 - 120%	---	---	
Dichlorodifluoromethane	15.0	---	1.00	ug/L	1	20.0	---	**75**	**80 - 120%**	---	---	Q-55
1,1-Dichloroethane	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	19.3	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1-Dichloroethene	21.0	---	0.400	ug/L	1	20.0	---	105	80 - 120%	---	---	
cis-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
trans-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3-Dichloropropane	20.9	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
2,2-Dichloropropane	22.1	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
1,1-Dichloropropene	20.8	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
cis-1,3-Dichloropropene	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
trans-1,3-Dichloropropene	21.8	---	1.00	ug/L	1	20.0	---	109	80 - 120%	---	---	
Hexachlorobutadiene	18.7	---	5.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Methylene chloride	19.8	---	5.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	22.5	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	22.4	---	0.500	ug/L	1	20.0	---	112	80 - 120%	---	---	
Tetrachloroethene (PCE)	22.0	---	0.400	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,2,3-Trichlorobenzene	20.8	---	2.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,2,4-Trichlorobenzene	18.9	---	2.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1,2-Trichloroethane	21.5	---	0.500	ug/L	1	20.0	---	108	80 - 120%	---	---	
Trichloroethene (TCE)	20.5	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
Trichlorofluoromethane	23.4	---	2.00	ug/L	1	20.0	---	117	80 - 120%	---	---	
1,2,3-Trichloropropane	21.9	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
Vinyl chloride	19.3	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	

Surr: 1,4-Difluorobenzene (Surr)	*Recovery: 104 %*	*Limits: 80-120 %*	*Dilution: 1x*
Toluene-d8 (Surr)	*100 %*	*80-120 %*	*"*
4-Bromofluorobenzene (Surr)	*92 %*	*80-120 %*	*"*

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Lisa Domenighini, Client Services Manager

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9100540 - Method Prep: Aq							**Water**					
Blank (9100540-BLK1)		Prepared: 10/02/19 09:57		Analyzed: 10/02/19 13:48								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9100540-BS1)		Prepared: 10/02/19 09:57		Analyzed: 10/02/19 13:50								
SM 4500-NH3 G												
Ammonia as N	2.01	---	0.0200	mg/L	1	2.00	---	101	90 - 110%	---	---	

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9100700 - Method Prep: Aq							Water					
Blank (9100700-BLK1)		Prepared: 10/04/19 18:27		Analyzed: 10/04/19 18:54								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9100700-BS1)		Prepared: 10/04/19 18:27		Analyzed: 10/04/19 18:55								
SM 4500-NH3 G												
Ammonia as N	2.02	---	0.0200	mg/L	1	2.00	---	101	90 - 110%	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091413 - Method Prep: Aq							**Water**					
Blank (9091413-BLK1)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 12:31								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9091413-BS1)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 12:52								
EPA 300.0												
Nitrate-Nitrogen	2.04	---	0.250	mg/L	1	2.00	---	102	90 - 110%	---	---	
Nitrite-Nitrogen	2.12	---	0.250	mg/L	1	2.00	---	106	90 - 110%	---	---	
Duplicate (9091413-DUP1)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 16:49								
QC Source Sample: MW-6 (A9I0898-03)												
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (9091413-DUP2)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 21:08								
QC Source Sample: MGMS1-40 (A9I0898-10)												
EPA 300.0												
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (9091413-DUP3)		Prepared: 09/28/19 10:00		Analyzed: 09/29/19 11:15								
QC Source Sample: MGMS1-40 (A9I0898-10RE1)												
EPA 300.0												
Nitrate-Nitrogen	**82.3**	---	5.00	mg/L	20	---	84.1	---	---	2	10%	Q-16
Matrix Spike (9091413-MS1)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 17:11								
QC Source Sample: MW-6 (A9I0898-03)												
EPA 300.0												
Nitrate-Nitrogen	2.53	---	0.312	mg/L	1	2.50	ND	101	80 - 120%	---	---	
Nitrite-Nitrogen	2.62	---	0.312	mg/L	1	2.50	ND	105	80 - 120%	---	---	
Matrix Spike (9091413-MS2)		Prepared: 09/28/19 10:00		Analyzed: 09/28/19 21:29								
QC Source Sample: MGMS1-40 (A9I0898-10)												

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091413 - Method Prep: Aq							**Water**					
Matrix Spike (9091413-MS2)		Prepared: 09/28/19 10:00			Analyzed: 09/28/19 21:29							
QC Source Sample: MGMS1-40 (A9I0898-10)												
EPA 300.0												
Nitrite-Nitrogen	2.32	---	0.312	mg/L	1	2.50	ND	93	80 - 120%	---	---	
Matrix Spike (9091413-MS3)		Prepared: 09/28/19 10:00			Analyzed: 09/29/19 11:37							
QC Source Sample: MGMS1-40 (A9I0898-10RE1)												
EPA 300.0												
Nitrate-Nitrogen	123	---	5.00	mg/L	20	40.0	84.1	97	80 - 120%	---	---	Q-16

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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9091432 - Method Prep: Aq							**Water**					
Blank (9091432-BLK1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 06:30								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9091432-BS1)		Prepared: 09/30/19 09:22		Analyzed: 10/01/19 07:00								
SM 5310 C												
Total Organic Carbon	9.73	---	1.00	mg/L	1	10.0	---	97	85 - 115%	---	---	

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SAMPLE PREPARATION INFORMATION

Halogenated 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: 9091430							
A9I0898-01	Water	EPA 8260C	09/27/19 08:25	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0898-03	Water	EPA 8260C	09/27/19 10:00	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
A9I0898-04	Water	EPA 8260C	09/27/19 10:45	09/30/19 14:46	5mL/5mL	5mL/5mL	1.00
Batch: 9100474							
A9I0898-01RE1	Water	EPA 8260C	09/27/19 08:25	10/01/19 13:23	5mL/5mL	5mL/5mL	1.00
A9I0898-02RE1	Water	EPA 8260C	09/27/19 09:15	10/01/19 13:23	5mL/5mL	5mL/5mL	1.00
A9I0898-04RE1	Water	EPA 8260C	09/27/19 10:45	10/01/19 13:23	5mL/5mL	5mL/5mL	1.00
Batch: 9100476							
A9I0898-05	Water	EPA 8260C	09/27/19 12:30	10/01/19 11:50	5mL/5mL	5mL/5mL	1.00
A9I0898-08	Water	EPA 8260C	09/27/19 08:40	10/01/19 11:50	5mL/5mL	5mL/5mL	1.00
A9I0898-09	Water	EPA 8260C	09/27/19 10:24	10/01/19 11:50	5mL/5mL	5mL/5mL	1.00
Batch: 9100532							
A9I0898-06	Water	EPA 8260C	09/27/19 12:50	10/02/19 17:00	5mL/5mL	5mL/5mL	1.00
A9I0898-07	Water	EPA 8260C	09/27/19 12:50	10/02/19 17:00	5mL/5mL	5mL/5mL	1.00
A9I0898-10	Water	EPA 8260C	09/27/19 11:24	10/02/19 17:00	5mL/5mL	5mL/5mL	1.00
A9I0898-12	Water	EPA 8260C	09/27/19 13:45	10/02/19 17:00	5mL/5mL	5mL/5mL	1.00
A9I0898-13	Water	EPA 8260C	09/27/19 14:04	10/02/19 17:00	5mL/5mL	5mL/5mL	1.00
Batch: 9100534							
A9I0898-05RE1	Water	EPA 8260C	09/27/19 12:30	10/02/19 11:58	5mL/5mL	5mL/5mL	1.00
A9I0898-11	Water	EPA 8260C	09/27/19 12:02	10/02/19 11:58	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9100540							
A9I0898-01	Water	SM 4500-NH3 G	09/27/19 08:25	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-02	Water	SM 4500-NH3 G	09/27/19 09:15	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-03	Water	SM 4500-NH3 G	09/27/19 10:00	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-04	Water	SM 4500-NH3 G	09/27/19 10:45	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-05	Water	SM 4500-NH3 G	09/27/19 12:30	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-07	Water	SM 4500-NH3 G	09/27/19 12:50	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-08	Water	SM 4500-NH3 G	09/27/19 08:40	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-09	Water	SM 4500-NH3 G	09/27/19 10:24	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-10	Water	SM 4500-NH3 G	09/27/19 11:24	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

SAMPLE PREPARATION INFORMATION

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9I0898-11	Water	SM 4500-NH3 G	09/27/19 12:02	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-12	Water	SM 4500-NH3 G	09/27/19 13:45	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
A9I0898-13	Water	SM 4500-NH3 G	09/27/19 14:04	10/02/19 09:57	10mL/10mL	10mL/10mL	1.00
Batch: 9100700							
A9I0898-06RE1	Water	SM 4500-NH3 G	09/27/19 12:50	10/04/19 18:27	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091413							
A9I0898-01RE1	Water	EPA 300.0	09/27/19 08:25	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-02	Water	EPA 300.0	09/27/19 09:15	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-03	Water	EPA 300.0	09/27/19 10:00	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-04	Water	EPA 300.0	09/27/19 10:45	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-04RE1	Water	EPA 300.0	09/27/19 10:45	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-05	Water	EPA 300.0	09/27/19 12:30	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-05RE1	Water	EPA 300.0	09/27/19 12:30	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-06	Water	EPA 300.0	09/27/19 12:50	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-07	Water	EPA 300.0	09/27/19 12:50	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-08	Water	EPA 300.0	09/27/19 08:40	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-09	Water	EPA 300.0	09/27/19 10:24	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-10	Water	EPA 300.0	09/27/19 11:24	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-10RE1	Water	EPA 300.0	09/27/19 11:24	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-11RE1	Water	EPA 300.0	09/27/19 12:02	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-12	Water	EPA 300.0	09/27/19 13:45	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-13	Water	EPA 300.0	09/27/19 14:04	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00
A9I0898-13RE1	Water	EPA 300.0	09/27/19 14:04	09/28/19 10:00	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9091432							
A9I0898-06	Water	SM 5310 C	09/27/19 12:50	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00
A9I0898-08	Water	SM 5310 C	09/27/19 08:40	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00
A9I0898-10	Water	SM 5310 C	09/27/19 11:24	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00

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5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

SAMPLE PREPARATION INFORMATION

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9I0898-13	Water	SM 5310 C	09/27/19 14:04	09/30/19 09:22	40mL/40mL	40mL/40mL	1.00

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QUALIFIER DEFINITIONS

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

Apex Laboratories

Q-01	Spike recovery and/or RPD is outside acceptance limits.
Q-03	Spike recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
Q-05	Analyses are not controlled on RPD values from sample and duplicate concentrations that are below 5 times the reporting level.
Q-16	Reanalysis of an original Batch QC sample.
Q-54a	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +1%. The results are reported as Estimated Values.
Q-54c	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +11%. The results are reported as Estimated Values.
Q-54d	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +12%. The results are reported as Estimated Values.
Q-54e	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +13%. The results are reported as Estimated Values.
Q-54g	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +15%. The results are reported as Estimated Values.
Q-54k	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +25%. The results are reported as Estimated Values.
Q-54n	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +7%. The results are reported as Estimated Values.
Q-55	Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C

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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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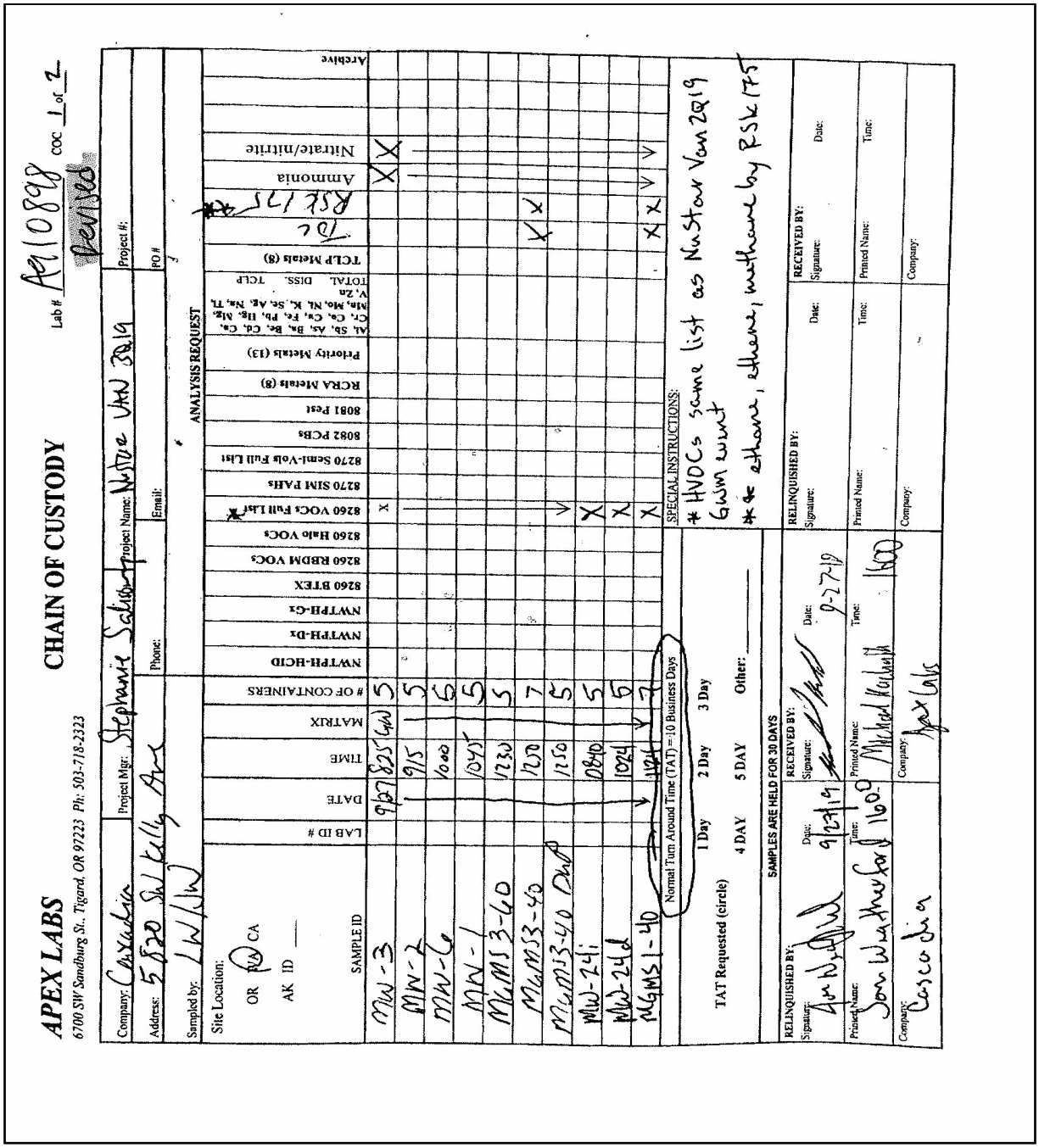

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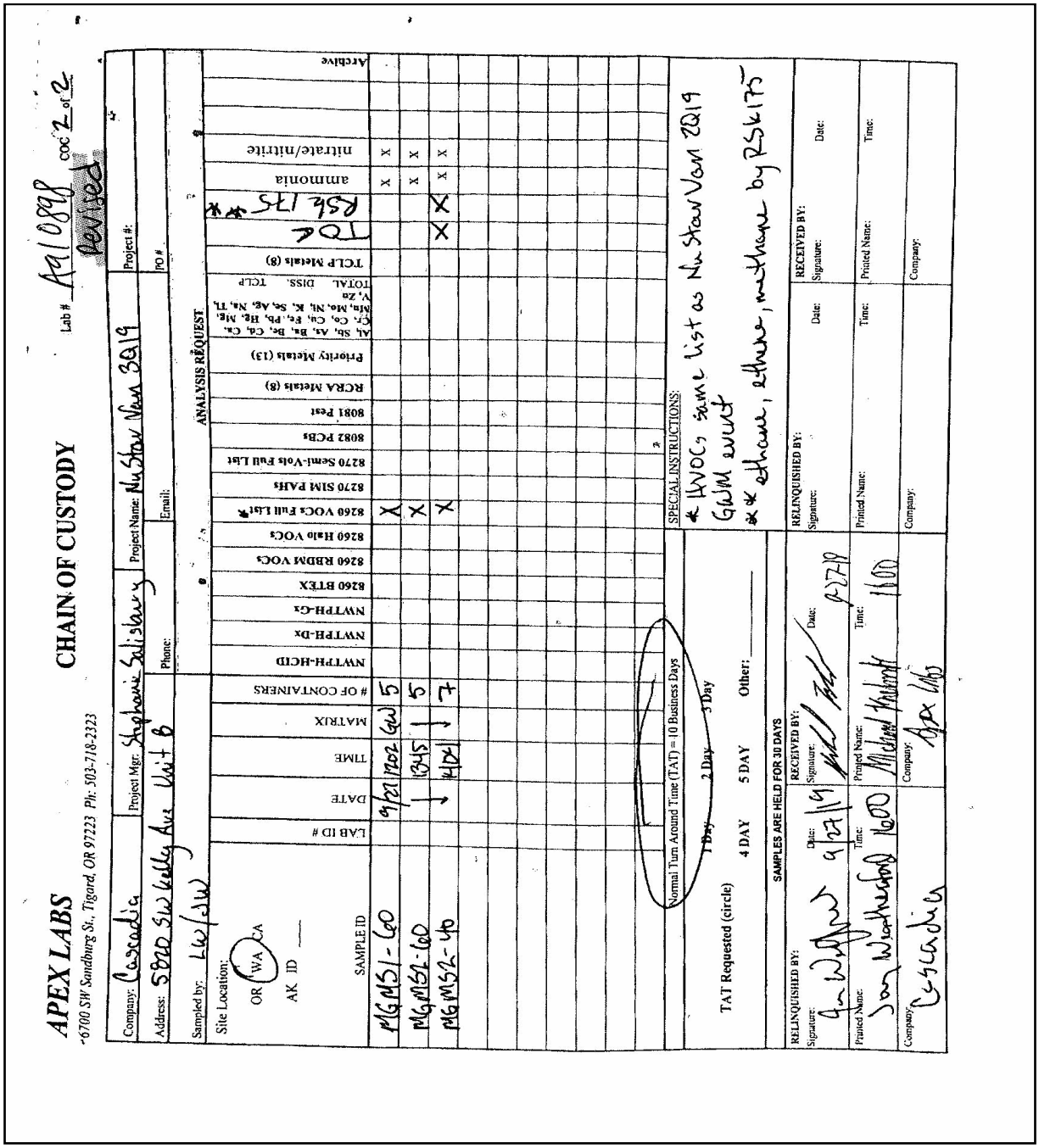

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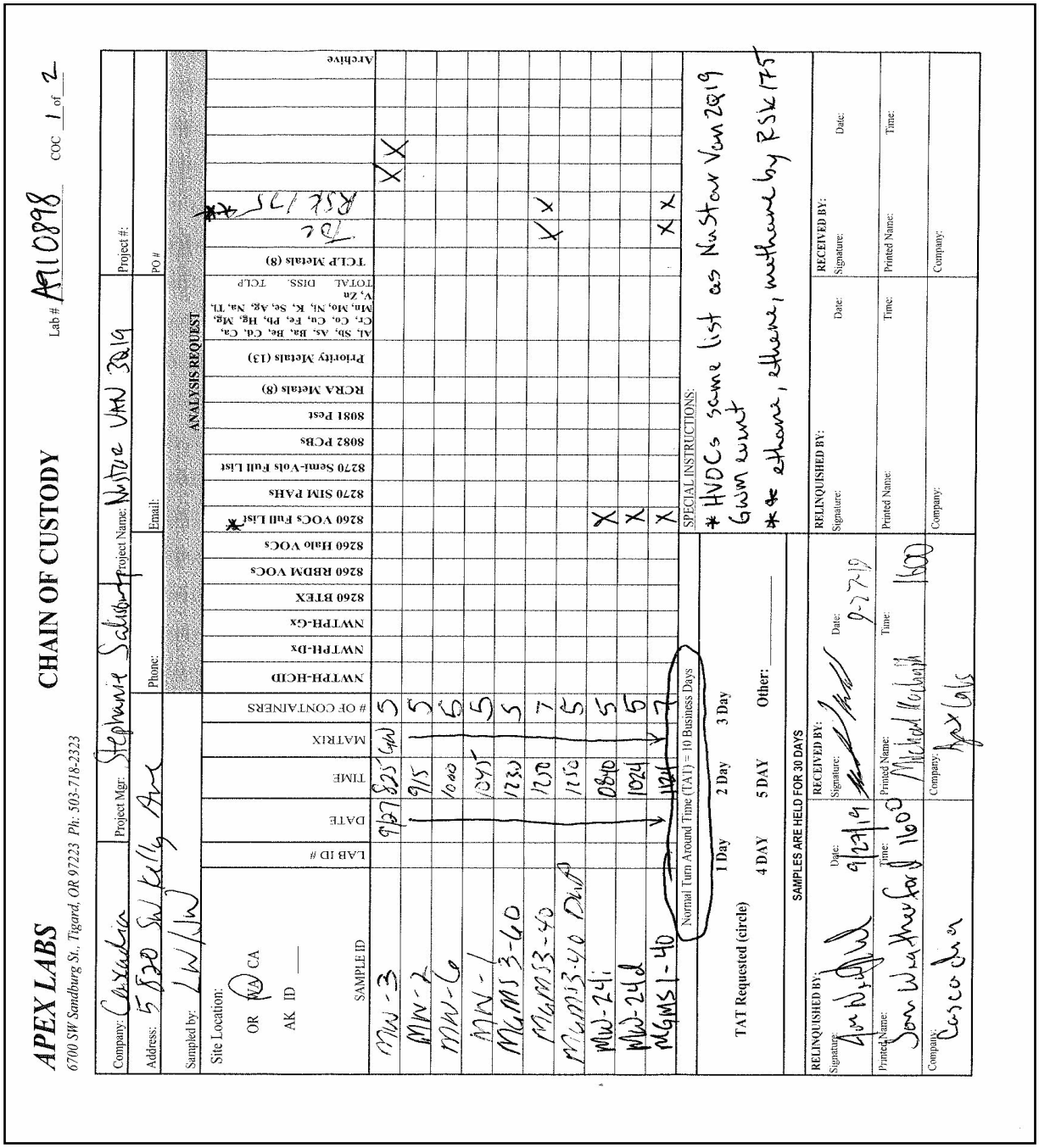


APEX LABS — 6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY — Lab # A9I0898 — COC 1 of 2

Company: Cascadia — Project Mgr: Stephanie Salisbury — Project Name: Nustar VAN 3Q19 — Project #:
Address: 5820 SW Kelly Ave — Phone: — Email: — PO #
Sampled by: LW/JW

Site Location: OR (CA) AK ID ____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	RSK 175**	Archive
MW-3		9/27	825	GW	5															X	X
MW-2			915		5																
MW-6			1040		5																
MW-1			1045		5																
MGMS3-40			1230		5																
MGMS3-40			1250		7															X	X
MGMS3-40 Dup			1250		5																
MW-24i			0840		5							X									
MW-24d			1024		5							X									
MGMS1-40			1124		7							X								X	X

Normal Turn Around Time (TAT) = 10 Business Days

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

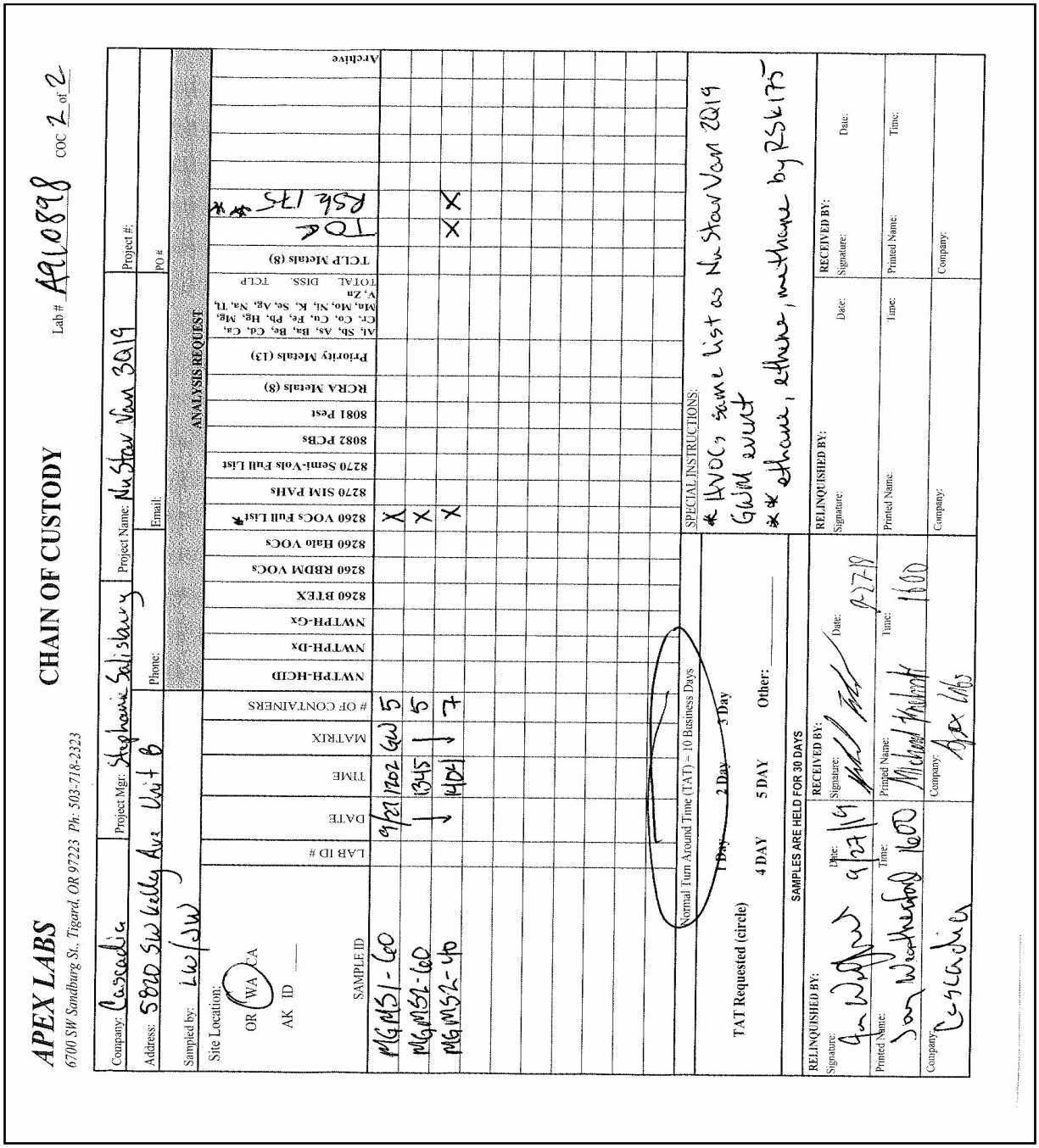
SPECIAL INSTRUCTIONS:
* HVOCs same list as Nustar Van 2Q19 GWM event
** & ethane, ethene, methane by RSK 175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	Date:	Time:	RECEIVED BY:	Date:	Time:	RELINQUISHED BY:	Date:	Time:	RECEIVED BY:	Date:	Time:
Signature:	9/27/19		Signature:	9-27-19		Signature:			Signature:		
Printed Name:		1600	Printed Name:		1600	Printed Name:			Printed Name:		
Company:			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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**



Apex Laboratories

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

Lisa A Domenighini

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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **Nustar VAN 3Q19**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9I0898 - 10 17 19 0742**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9 10898

Project/Project #: Nustar Van 3Q19

Delivery Info:
Date/time received: 9-27-19 @ ~~1610~~ 1600 MR 9-27 By: MR
Delivered by: Apex X Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 9-27-19 @ 1710 By: MR
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)	2.2	0.1					
Received on ice? (Y/N)	Y	Y					
Temp. blanks? (Y/N)	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: 9/27/19 @ 1850 By: CB
All samples intact? Yes X No Comments:

Bottle labels/COCs agree? Yes No X Comments: MGMS1-40 cants read MGMS1-43. Trip Blank provided, not listed on COC. →
(Date on temp poly reads VM)
COC/container discrepancies form initiated? Yes No X NA
Containers/volumes received appropriate for analysis? Yes Y No Comments:

Do VOA vials have visible headspace? Yes No Y NA
Comments MW-3 3/3 vials vis sed
Water samples: pH checked: Yes Y No NA pH appropriate? Yes Y No NA
Comments:

Additional information: TB #2137 → MW24i 5 cants. listed, 7 cants. provided. MGMS2-40 cants. provided read MGMS2-60, matched by time.
Labeled by: CB Witness: Cooler Inspected by: CB See Project Contact Form: Y

AirTECHNOLOGY
Laboratories, Inc.

October 15, 2019

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg Street
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9I0898
Lab Number: K100107-01/04

Enclosed are results for sample(s) received 10/01/19 by Air Technology Laboratories. Sample was received intact and chilled to 3° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

K100107-01/04 9/30/19

SUBCONTRACT ORDER

Apex Laboratories

A9I0898

SENDING LABORATORY:

Apex Laboratories
6700 S.W. Sandburg Street
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 336-0745
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832

01 **Sample Name: MGMS3-40** **Water** **Sampled: 09/27/19 12:50** (A9I0898-06)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/10/19 17:00	10/11/19 12:50	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

02 **Sample Name: MW-24i** **Water** **Sampled: 09/27/19 08:40** (A9I0898-08)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/10/19 17:00	10/11/19 08:40	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Conts. read MGMS1-43

03 **Sample Name: MGMS1-40** **Water** **Sampled: 09/27/19 11:24** (A9I0898-10)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/10/19 17:00	10/11/19 11:24	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

04 **Sample Name: MGMS2-40** **Water** **Sampled: 09/27/19 14:04** (A9I0898-13)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/10/19 17:00	10/11/19 14:04	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Released By	Date	Received By	Date
	9/30/19	UPS (Shipper)	3°C
UPS (Shipper)	10/1/19 1218	Kathy Chavarin	10/01/19 1218

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A9I0898
Date Received: 10/01/19
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	K100107-01		K100107-02		K100107-03		K100107-04	
Client Sample I.D.:	MGMS3-40 (A9I0898-06)		MW-24i (A9I0898-08)		MGMS1-40 (A9I0898-10)		MGMS2-40 (A9I0898-13)	
Date/Time Sampled:	9/27/19 12:50		9/27/19 8:40		9/27/19 11:24		9/27/19 14:04	
Date/Time Analyzed:	10/10/19 10:54		10/10/19 11:06		10/10/19 11:19		10/10/19 11:40	
QC Batch No.:	191010GC8A1		191010GC8A1		191010GC8A1		191010GC8A1	
Analyst Initials:	CM		CM		CM		CM	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L
Ethene	8.4	1.0	1.6	1.0	ND	1.0	1.4	1.0
Ethane	33	1.0	1.9	1.0	9.1	1.0	1.5	1.0
Methane	5,400	1.0	510	1.0	530	1.0	12	1.0

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 10/14/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191010GC8A1

Matrix: Air

Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	10/10/19 8:55			10/10/19 9:20		10/10/19 9:41					
Analyst Initials:	CM			CM		CM					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,300	114	1,270	111	2.8	70	130	30
Ethane	ND	1.0	1,230	1,310	107	1,290	105	1.7	70	130	30
Methane	ND	1.0	654	669	102	657	100	1.8	70	130	30

ND= Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____
Mark Johnson
Operations Manager

Date 10/14/19

The cover letter is an integral part of this analytical report

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

AMENDED REPORT

Monday, January 6, 2020

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

RE: A9L0082 - Shore Terminal-Vancouver - NuStar Vancouver GWM 4Q19

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 A9L0082, which was received by the laboratory on 12/3/2019 at 3:47:00PM.

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 sample reciept, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	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

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

Lisa Domenighini, Client Services Manager

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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MP-1	A9L0082-01	Water	12/03/19 08:20	12/03/19 15:47
MW-19	A9L0082-02	Water	12/03/19 09:28	12/03/19 15:47
MW-19 Dup	A9L0082-03	Water	12/03/19 09:28	12/03/19 15:47
MW-7	A9L0082-04	Water	12/03/19 10:56	12/03/19 15:47
MW-7 Dup	A9L0082-05	Water	12/03/19 10:56	12/03/19 15:47
MW-9	A9L0082-06	Water	12/03/19 11:52	12/03/19 15:47
MW-13	A9L0082-07	Water	12/03/19 13:07	12/03/19 15:47
MW-17	A9L0082-08	Water	12/03/19 14:10	12/03/19 15:47
MW-25i	A9L0082-09	Water	12/03/19 08:20	12/03/19 15:47
MW-26	A9L0082-10	Water	12/03/19 09:10	12/03/19 15:47
MW-24D	A9L0082-11	Water	12/03/19 10:00	12/03/19 15:47
MW-24i	A9L0082-12	Water	12/03/19 10:45	12/03/19 15:47
MW-8	A9L0082-13	Water	12/03/19 11:35	12/03/19 15:47
MW-21i-40	A9L0082-14	Water	12/03/19 12:20	12/03/19 15:47
MW-16	A9L0082-15	Water	12/03/19 13:10	12/03/19 15:47
MW-18i	A9L0082-16	Water	12/03/19 13:50	12/03/19 15:47
MW-20i	A9L0082-17	Water	12/03/19 14:40	12/03/19 15:47

Apex Laboratories

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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

AMENDED REPORT

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL CASE NARRATIVE

Work Order: A9L0082

Amended Report Revision 1:

This report supersedes all previous reports.

Nitrate by IC (300.0/9056A)

The nitrate result for sample MW-8 (Apex Laboratories ID A9L0082-13) was inadvertently omitted from the initial report. The result is reported herein. Upon examination of the data, it was determined that the result is above the upper calibration range of the instrument and qualified accordingly. Sample is beyond the recommended holding time so reanalysis within the calibration range is not recommended.

Dean Strom
Wetchem/Method Development
1/6/2020

Subcontract

This report is not complete without the subcontract laboratory report for RSK 175 from Air Technology.

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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9L0082-01)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Bromochloromethane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
Carbon tetrachloride	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
Chloroform	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1-Dichloroethane	**1.57**	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1-Dichloroethene	**1.80**	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
cis-1,2-Dichloroethene	**40.6**	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
Methylene chloride	ND	---	10.0	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Tetrachloroethene (PCE)	**306**	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	

Apex Laboratories

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9L0082-01)				**Matrix: Water**		**Batch: 9120474**		
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Trichloroethene (TCE)	**57.8**	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	12/04/19 17:04	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	12/04/19 17:04	EPA 8260C	
Vinyl chloride	ND	---	0.800	ug/L	2	12/04/19 17:04	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits: 80-120 %*	*1*	*12/04/19 17:04*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*12/04/19 17:04*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/04/19 17:04*	*EPA 8260C*	
MW-19 (A9L0082-02)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Bromochloromethane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Bromodichloromethane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Bromoform	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Bromomethane	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
Carbon tetrachloride	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Chlorobenzene	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Chloroethane	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
Chloroform	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Chloromethane	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
2-Chlorotoluene	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
4-Chlorotoluene	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Dibromochloromethane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Dibromomethane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,3-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,4-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Dichlorodifluoromethane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1-Dichloroethane	**57.4**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1-Dichloroethene	**28.6**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
cis-1,2-Dichloroethene	**1250**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2-Dichloropropane	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,3-Dichloropropane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
2,2-Dichloropropane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A9L0082-02)				**Matrix: Water**		**Batch: 9120474**		
1,1-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Hexachlorobutadiene	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
Methylene chloride	ND	---	250	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Tetrachloroethene (PCE)	**1670**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	100	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	100	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1,1-Trichloroethane	ND	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
1,1,2-Trichloroethane	ND	---	25.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Trichloroethene (TCE)	**1190**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Trichlorofluoromethane	ND	---	100	ug/L	50	12/04/19 17:31	EPA 8260C	
1,2,3-Trichloropropane	ND	---	50.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Vinyl chloride	**25.6**	---	20.0	ug/L	50	12/04/19 17:31	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/04/19 17:31*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/04/19 17:31*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/04/19 17:31*	*EPA 8260C*	
MW-19 Dup (A9L0082-03)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Bromochloromethane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Bromodichloromethane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Bromoform	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Bromomethane	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
Carbon tetrachloride	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Chlorobenzene	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Chloroethane	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
Chloroform	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Chloromethane	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
2-Chlorotoluene	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
4-Chlorotoluene	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Dibromochloromethane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Dibromomethane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 Dup (A9L0082-03)				**Matrix: Water**		**Batch: 9120474**		
1,3-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,4-Dichlorobenzene	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Dichlorodifluoromethane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1-Dichloroethane	**53.4**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1-Dichloroethene	**27.2**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
cis-1,2-Dichloroethene	**1190**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2-Dichloropropane	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,3-Dichloropropane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
2,2-Dichloropropane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Hexachlorobutadiene	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
Methylene chloride	ND	---	250	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Tetrachloroethene (PCE)	**1650**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	100	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	100	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1,1-Trichloroethane	ND	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
1,1,2-Trichloroethane	ND	---	25.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Trichloroethene (TCE)	**1200**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Trichlorofluoromethane	ND	---	100	ug/L	50	12/04/19 18:25	EPA 8260C	
1,2,3-Trichloropropane	ND	---	50.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Vinyl chloride	**23.2**	---	20.0	ug/L	50	12/04/19 18:25	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 18:25*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/04/19 18:25*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*	*1*	*12/04/19 18:25*	*EPA 8260C*	
MW-7 (A9L0082-04)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 (A9L0082-04)				**Matrix: Water**		**Batch: 9120474**		
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1-Dichloroethane	**4.61**	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1-Dichloroethene	**0.837**	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
cis-1,2-Dichloroethene	**29.4**	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Tetrachloroethene (PCE)	**65.8**	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 11:15	EPA 8260C	
Trichloroethene (TCE)	**31.0**	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 11:15	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:15	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 11:15	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 (A9L0082-04)				**Matrix: Water**		**Batch: 9120474**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/04/19 11:15*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/04/19 11:15*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*	*80-120 %*	*1*	*12/04/19 11:15*	*EPA 8260C*	
MW-7 Dup (A9L0082-05)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1-Dichloroethane	**4.58**	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1-Dichloroethene	**0.839**	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
cis-1,2-Dichloroethene	**29.7**	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 11:41	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 Dup (A9L0082-05)				**Matrix: Water**		**Batch: 9120474**		
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Tetrachloroethene (PCE)	**66.1**	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 11:41	EPA 8260C	
Trichloroethene (TCE)	**31.8**	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 11:41	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 11:41	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 11:41	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 11:41*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*1*	*12/04/19 11:41*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*	*1*	*12/04/19 11:41*	*EPA 8260C*	
MW-9 (A9L0082-06)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A9L0082-06)				**Matrix: Water**		**Batch: 9120474**		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
cis-1,2-Dichloroethene	**2.34**	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Tetrachloroethene (PCE)	**67.5**	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1,1-Trichloroethane	**1.46**	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 12:08	EPA 8260C	
Trichloroethene (TCE)	**24.3**	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 12:08	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:08	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 12:08	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 12:08*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*1*	*12/04/19 12:08*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/04/19 12:08*	*EPA 8260C*	
MW-13 (A9L0082-07)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Chloroethane	ND	---	6.00	ug/L	1	12/04/19 12:35	EPA 8260C	R-02
Chloroform	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 12:35	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-13 (A9L0082-07)				**Matrix: Water**		**Batch: 9120474**		
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1-Dichloroethane	**1.50**	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
cis-1,2-Dichloroethene	**1.06**	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
trans-1,2-Dichloroethene	**0.488**	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 12:35	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 12:35	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 12:35	EPA 8260C	
Vinyl chloride	**1.42**	---	0.400	ug/L	1	12/04/19 12:35	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 12:35*	*EPA 8260C*
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*1*	*12/04/19 12:35*	*EPA 8260C*
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/04/19 12:35*	*EPA 8260C*
MW-17 (A9L0082-08)				**Matrix: Water**		**Batch: 9120474**		

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9L0082-08)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1-Dichloroethane	**0.829**	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
cis-1,2-Dichloroethene	**26.8**	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Tetrachloroethene (PCE)	**5.54**	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A9L0082-08)				**Matrix: Water**		**Batch: 9120474**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 13:02	EPA 8260C	
Trichloroethene (TCE)	**15.1**	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 13:02	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:02	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 13:02	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 13:02*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/04/19 13:02*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 13:02*	*EPA 8260C*	
MW-25i (A9L0082-09)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
cis-1,2-Dichloroethene	**0.536**	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-25i (A9L0082-09)				**Matrix: Water**		**Batch: 9120474**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 13:56	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 13:56	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:56	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 13:56	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:* *80-120 %*	*1*	*12/04/19 13:56*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/04/19 13:56*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/04/19 13:56*	*EPA 8260C*	
MW-26 (A9L0082-10)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Bromochloromethane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Bromodichloromethane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Bromoform	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Bromomethane	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
Carbon tetrachloride	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Chlorobenzene	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Chloroethane	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
Chloroform	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Chloromethane	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
2-Chlorotoluene	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
4-Chlorotoluene	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Dibromochloromethane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Dibromomethane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A9L0082-10)				**Matrix: Water**		**Batch: 9120474**		
1,3-Dichlorobenzene	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Dichlorodifluoromethane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1-Dichloroethane	**2.63**	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1-Dichloroethene	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
cis-1,2-Dichloroethene	**95.0**	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2-Dichloropropane	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
1,3-Dichloropropane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
2,2-Dichloropropane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1-Dichloropropene	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Hexachlorobutadiene	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
Methylene chloride	ND	---	25.0	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Tetrachloroethene (PCE)	**137**	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	10.0	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	10.0	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	2.50	ug/L	5	12/04/19 19:18	EPA 8260C	
Trichloroethene (TCE)	**216**	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Trichlorofluoromethane	ND	---	10.0	ug/L	5	12/04/19 19:18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	5.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Vinyl chloride	ND	---	2.00	ug/L	5	12/04/19 19:18	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 19:18*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/04/19 19:18*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 19:18*	*EPA 8260C*	
MW-24D (A9L0082-11)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A9L0082-11)				**Matrix: Water**		**Batch: 9120474**		
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 14:23	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 14:23	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:23	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 14:23	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A9L0082-11)				**Matrix: Water**		**Batch: 9120474**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits: 80-120 %*	*1*	*12/04/19 14:23*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/04/19 14:23*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*97 %*	*80-120 %*	*1*	*12/04/19 14:23*	*EPA 8260C*	
MW-24i (A9L0082-12)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1-Dichloroethane	**0.775**	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
cis-1,2-Dichloroethene	**3.82**	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 14:50	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A9L0082-12)				**Matrix: Water**		**Batch: 9120474**		
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Tetrachloroethene (PCE)	**8.78**	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 14:50	EPA 8260C	
Trichloroethene (TCE)	**3.72**	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 14:50	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 14:50	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 14:50	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 14:50*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*12/04/19 14:50*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 14:50*	*EPA 8260C*	
MW-8 (A9L0082-13)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A9L0082-13)				**Matrix: Water**		**Batch: 9120474**		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Tetrachloroethene (PCE)	**4.06**	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 13:29	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 13:29	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 13:29	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 13:29	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 13:29*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*1*	*12/04/19 13:29*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 13:29*	*EPA 8260C*	
MW-21i-40 (A9L0082-14)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A9L0082-14)				**Matrix: Water**		**Batch: 9120474**		
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1-Dichloroethane	**2.50**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1-Dichloroethene	**0.614**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
cis-1,2-Dichloroethene	**56.3**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
trans-1,2-Dichloroethene	**0.521**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Tetrachloroethene (PCE)	**32.1**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 15:17	EPA 8260C	
Trichloroethene (TCE)	**19.1**	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 15:17	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:17	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 15:17	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 15:17*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/04/19 15:17*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 15:17*	*EPA 8260C*	
MW-16 (A9L0082-15)				**Matrix: Water**		**Batch: 9120474**		

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Lisa Domenighini, Client Services Manager

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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A9L0082-15)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
cis-1,2-Dichloroethene	**8.75**	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Tetrachloroethene (PCE)	**102**	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,1,1-Trichloroethane	**0.598**	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A9L0082-15)				**Matrix: Water**		**Batch: 9120474**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 15:43	EPA 8260C	
Trichloroethene (TCE)	**19.9**	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 15:43	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 15:43	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 15:43	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits: 80-120 %*	*1*	*12/04/19 15:43*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*12/04/19 15:43*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/04/19 15:43*	*EPA 8260C*	
MW-18i (A9L0082-16)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-18i (A9L0082-16)				**Matrix: Water**		**Batch: 9120474**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Tetrachloroethene (PCE)	**1.30**	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 16:10	EPA 8260C	
Trichloroethene (TCE)	**0.589**	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 16:10	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:10	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 16:10	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits: 80-120 %*	*1*	*12/04/19 16:10*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/04/19 16:10*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/04/19 16:10*	*EPA 8260C*	
MW-20i (A9L0082-17)				**Matrix: Water**		**Batch: 9120474**		
Bromobenzene	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A9L0082-17)				**Matrix: Water**		**Batch: 9120474**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
cis-1,2-Dichloroethene	**8.68**	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Tetrachloroethene (PCE)	**1.37**	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/04/19 16:37	EPA 8260C	
Trichloroethene (TCE)	**0.897**	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/04/19 16:37	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/04/19 16:37	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/04/19 16:37	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*12/04/19 16:37*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/04/19 16:37*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/04/19 16:37*	*EPA 8260C*	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9L0082-01)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**2.39**	---	0.100	mg/L	5	12/04/19 18:22	SM 4500-NH3 G	
MW-19 (A9L0082-02)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**131**	---	2.00	mg/L	100	12/04/19 18:23	SM 4500-NH3 G	
MW-19 Dup (A9L0082-03)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**125**	---	2.00	mg/L	100	12/04/19 18:25	SM 4500-NH3 G	
MW-7 (A9L0082-04)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**33.1**	---	0.200	mg/L	10	12/04/19 17:49	SM 4500-NH3 G	
MW-7 Dup (A9L0082-05)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**34.9**	---	0.200	mg/L	10	12/04/19 17:50	SM 4500-NH3 G	
MW-9 (A9L0082-06)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**0.618**	---	0.0200	mg/L	1	12/04/19 17:38	SM 4500-NH3 G	
MW-13 (A9L0082-07)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**63.2**	---	1.00	mg/L	50	12/04/19 17:52	SM 4500-NH3 G	
MW-17 (A9L0082-08)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**0.353**	---	0.0200	mg/L	1	12/04/19 17:53	SM 4500-NH3 G	
MW-25i (A9L0082-09)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 17:55	SM 4500-NH3 G	
MW-26 (A9L0082-10)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**24.7**	---	0.400	mg/L	20	12/04/19 17:56	SM 4500-NH3 G	
MW-24D (A9L0082-11)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	**0.142**	---	0.0200	mg/L	1	12/04/19 17:58	SM 4500-NH3 G	
MW-24i (A9L0082-12)				**Matrix: Water**		**Batch: 9120479**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 17:59	SM 4500-NH3 G	
MW-8 (A9L0082-13)				**Matrix: Water**		**Batch: 9120479**		

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A9L0082-13)				**Matrix: Water**			**Batch: 9120479**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 18:01	SM 4500-NH3 G	
MW-21i-40 (A9L0082-14)				**Matrix: Water**			**Batch: 9120479**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 18:02	SM 4500-NH3 G	
MW-16 (A9L0082-15)				**Matrix: Water**			**Batch: 9120479**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 18:10	SM 4500-NH3 G	
MW-18i (A9L0082-16)				**Matrix: Water**			**Batch: 9120479**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/04/19 18:11	SM 4500-NH3 G	
MW-20i (A9L0082-17)				**Matrix: Water**			**Batch: 9120479**	
Ammonia as N	**0.0300**	---	0.0200	mg/L	1	12/04/19 18:13	SM 4500-NH3 G	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9L0082-01RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**118**	---	5.00	mg/L	20	12/04/19 11:35	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/03/19 23:01	EPA 300.0	
MW-19 (A9L0082-02)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**129**	---	12.5	mg/L	50	12/03/19 23:22	EPA 300.0	
MW-19 (A9L0082-02RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 11:57	EPA 300.0	
MW-19 Dup (A9L0082-03)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**136**	---	12.5	mg/L	50	12/03/19 23:44	EPA 300.0	
MW-19 Dup (A9L0082-03RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 12:19	EPA 300.0	
MW-7 (A9L0082-04)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**47.4**	---	1.25	mg/L	5	12/04/19 00:05	EPA 300.0	
MW-7 (A9L0082-04RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 00:27	EPA 300.0	
MW-7 Dup (A9L0082-05)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**49.7**	---	1.25	mg/L	5	12/04/19 00:48	EPA 300.0	
MW-7 Dup (A9L0082-05RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 01:53	EPA 300.0	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A9L0082-06)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**101**	---	5.00	mg/L	20	12/04/19 02:15	EPA 300.0	
MW-9 (A9L0082-06RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 02:36	EPA 300.0	
MW-13 (A9L0082-07)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 02:58	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 02:58	EPA 300.0	
MW-17 (A9L0082-08)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**15.9**	---	1.25	mg/L	5	12/04/19 03:19	EPA 300.0	
MW-17 (A9L0082-08RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 03:41	EPA 300.0	
MW-25i (A9L0082-09)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**0.405**	---	0.250	mg/L	1	12/04/19 04:03	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 04:03	EPA 300.0	
MW-26 (A9L0082-10RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 17:06	EPA 300.0	
MW-26 (A9L0082-10RE3)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**279**	---	12.5	mg/L	50	12/04/19 13:04	EPA 300.0	
MW-24D (A9L0082-11)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 06:12	EPA 300.0	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A9L0082-11)				**Matrix: Water**				
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 06:12	EPA 300.0	
MW-24i (A9L0082-12)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**2.86**	---	0.250	mg/L	1	12/04/19 06:33	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 06:33	EPA 300.0	
MW-8 (A9L0082-13)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**276**	---	5.00	mg/L	20	12/04/19 07:38	EPA 300.0	**AMEND, E, X**
MW-8 (A9L0082-13RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 08:00	EPA 300.0	
MW-21i-40 (A9L0082-14)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**4.61**	---	0.250	mg/L	1	12/04/19 08:21	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 08:21	EPA 300.0	
MW-16 (A9L0082-15RE1)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**7.93**	---	0.250	mg/L	1	12/04/19 08:43	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 09:04	EPA 300.0	
MW-18i (A9L0082-16)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**0.846**	---	0.250	mg/L	1	12/04/19 09:26	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 09:26	EPA 300.0	
MW-20i (A9L0082-17)				**Matrix: Water**				
Batch: 9120459								
Nitrate-Nitrogen	**1.84**	---	0.250	mg/L	1	12/04/19 10:31	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 10:31	EPA 300.0	

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

ANALYTICAL SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A9L0082-01)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	**2.27**	---	1.00	mg/L	1	12/04/19 21:52	SM 5310 C	
MW-19 (A9L0082-02)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	**6.88**	---	1.00	mg/L	1	12/04/19 22:22	SM 5310 C	
MW-7 (A9L0082-04RE1)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	**7.51**	---	1.00	mg/L	1	12/05/19 16:10	SM 5310 C	
MW-13 (A9L0082-07)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	**29.1**	---	5.00	mg/L	5	12/05/19 00:22	SM 5310 C	
MW-26 (A9L0082-10)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	**5.56**	---	1.00	mg/L	1	12/05/19 00:52	SM 5310 C	
MW-24i (A9L0082-12)				**Matrix: Water**		**Batch: 9120518**		
Total Organic Carbon	ND	---	1.00	mg/L	1	12/05/19 01:22	SM 5310 C	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
Blank (9120474-BLK1)		Prepared: 12/04/19 08:00		Analyzed: 12/04/19 10:48								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
Blank (9120474-BLK1)		Prepared: 12/04/19 08:00		Analyzed: 12/04/19 10:48								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*101 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*			*"*				
LCS (9120474-BS1)		Prepared: 12/04/19 08:00		Analyzed: 12/04/19 09:54								
EPA 8260C												
Bromobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Bromochloromethane	24.5	---	1.00	ug/L	1	20.0	---	**123**	**80 - 120%**	---	---	Q-56
Bromodichloromethane	22.1	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
Bromoform	25.2	---	1.00	ug/L	1	20.0	---	**126**	**80 - 120%**	---	---	Q-56
Bromomethane	24.4	---	5.00	ug/L	1	20.0	---	**122**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	22.9	---	1.00	ug/L	1	20.0	---	115	80 - 120%	---	---	
Chlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Chloroethane	16.1	---	5.00	ug/L	1	20.0	---	80	80 - 120%	---	---	
Chloroform	21.0	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Chloromethane	18.9	---	5.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
2-Chlorotoluene	18.4	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
4-Chlorotoluene	17.8	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
Dibromochloromethane	25.6	---	1.00	ug/L	1	20.0	---	**128**	**80 - 120%**	---	---	Q-56
1,2-Dibromo-3-chloropropane	18.7	---	5.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Dibromomethane	22.7	---	1.00	ug/L	1	20.0	---	113	80 - 120%	---	---	
1,2-Dichlorobenzene	19.3	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
LCS (9120474-BS1)		Prepared: 12/04/19 08:00		Analyzed: 12/04/19 09:54								
1,3-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,4-Dichlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	95	80 - 120%	---	---	
Dichlorodifluoromethane	22.4	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,1-Dichloroethane	19.7	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	18.9	---	0.400	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	95	80 - 120%	---	---	
cis-1,2-Dichloroethene	19.5	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
trans-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,2-Dichloropropane	20.6	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,3-Dichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
2,2-Dichloropropane	20.0	---	1.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,1-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
cis-1,3-Dichloropropene	19.0	---	1.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
trans-1,3-Dichloropropene	18.9	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
Hexachlorobutadiene	17.2	---	5.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
Methylene chloride	22.0	---	5.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	22.2	---	0.400	ug/L	1	20.0	---	111	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	19.5	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Tetrachloroethene (PCE)	20.6	---	0.400	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,2,4-Trichlorobenzene	17.2	---	2.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
1,1,1-Trichloroethane	19.6	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,1,2-Trichloroethane	20.9	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Trichloroethene (TCE)	22.4	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
Trichlorofluoromethane	20.1	---	2.00	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2,3-Trichloropropane	19.4	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
Vinyl chloride	20.3	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 109 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*97 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*95 %*		*80-120 %*			*"*					
Duplicate (9120474-DUP1)		Prepared: 12/04/19 10:57		Analyzed: 12/04/19 17:58								

QC Source Sample: MW-19 (A9L0082-02)

EPA 8260C

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Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
Duplicate (9120474-DUP1)		Prepared: 12/04/19 10:57 Analyzed: 12/04/19 17:58										
QC Source Sample: MW-19 (A9L0082-02)												
Bromobenzene	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Bromoform	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Bromomethane	ND	---	250	ug/L	50	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Chloroethane	ND	---	250	ug/L	50	---	ND	---	---	---	30%	
Chloroform	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Chloromethane	ND	---	250	ug/L	50	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	250	ug/L	50	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Dibromomethane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
1,1-Dichloroethane	**58.8**	---	20.0	ug/L	50	---	57.4	---	---	2	30%	
1,2-Dichloroethane (EDC)	ND	---	20.0	ug/L	50	---	ND	---	---	---	30%	
1,1-Dichloroethene	**27.4**	---	20.0	ug/L	50	---	28.6	---	---	4	30%	
cis-1,2-Dichloroethene	**1300**	---	20.0	ug/L	50	---	1250	---	---	4	30%	
trans-1,2-Dichloroethene	ND	---	20.0	ug/L	50	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	250	ug/L	50	---	ND	---	---	---	30%	
Methylene chloride	ND	---	250	ug/L	50	---	ND	---	---	---	30%	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
Duplicate (9120474-DUP1)		Prepared: 12/04/19 10:57 Analyzed: 12/04/19 17:58										
QC Source Sample: MW-19 (A9L0082-02)												
1,1,1,2-Tetrachloroethane	ND	---	20.0	ug/L	50	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**1730**	---	20.0	ug/L	50	---	1670	---	---	4	30%	
1,2,3-Trichlorobenzene	ND	---	100	ug/L	50	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	100	ug/L	50	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	20.0	ug/L	50	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	25.0	ug/L	50	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**1270**	---	20.0	ug/L	50	---	1190	---	---	6	30%	
Trichlorofluoromethane	ND	---	100	ug/L	50	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	50.0	ug/L	50	---	ND	---	---	---	30%	
Vinyl chloride	**24.3**	---	20.0	ug/L	50	---	25.6	---	---	5	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 113 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*101 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*98 %*		*80-120 %*			*"*					
Matrix Spike (9120474-MS1)		Prepared: 12/04/19 10:57 Analyzed: 12/04/19 19:45										
QC Source Sample: MW-26 (A9L0082-10)												
EPA 8260C												
Bromobenzene	102	---	2.50	ug/L	5	100	ND	102	80 - 120%	---	---	
Bromochloromethane	127	---	5.00	ug/L	5	100	ND	**127**	**78 - 123%**	---	---	Q-54a
Bromodichloromethane	114	---	5.00	ug/L	5	100	ND	114	79 - 125%	---	---	
Bromoform	130	---	5.00	ug/L	5	100	ND	130	66 - 130%	---	---	Q-54b
Bromomethane	117	---	25.0	ug/L	5	100	ND	117	53 - 141%	---	---	Q-54
Carbon tetrachloride	123	---	5.00	ug/L	5	100	ND	123	72 - 136%	---	---	
Chlorobenzene	106	---	2.50	ug/L	5	100	ND	106	80 - 120%	---	---	
Chloroethane	94.3	---	25.0	ug/L	5	100	ND	94	60 - 138%	---	---	
Chloroform	112	---	5.00	ug/L	5	100	ND	112	79 - 124%	---	---	
Chloromethane	99.7	---	25.0	ug/L	5	100	ND	100	50 - 139%	---	---	
2-Chlorotoluene	97.5	---	5.00	ug/L	5	100	ND	98	79 - 122%	---	---	
4-Chlorotoluene	96.5	---	5.00	ug/L	5	100	ND	97	78 - 122%	---	---	
Dibromochloromethane	134	---	5.00	ug/L	5	100	ND	**134**	**74 - 126%**	---	---	Q-54c
1,2-Dibromo-3-chloropropane	95.2	---	25.0	ug/L	5	100	ND	95	62 - 128%	---	---	
1,2-Dibromoethane (EDB)	103	---	2.50	ug/L	5	100	ND	103	77 - 121%	---	---	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates	Project: Shore Terminal-Vancouver	
5820 SW Kelly Ave Unit B	Project Number: NuStar Vancouver GWM 4(	Report ID:
Portland, OR 97239	Project Manager: Stephanie Salisbury	A9L0082 - 01 06 20 1035

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120474 - EPA 5030B							**Water**					
Matrix Spike (9120474-MS1)		Prepared: 12/04/19 10:57 Analyzed: 12/04/19 19:45										
QC Source Sample: MW-26 (A9L0082-10)												
Dibromomethane	116	---	5.00	ug/L	5	100	ND	116	79 - 123%	---	---	
1,2-Dichlorobenzene	99.3	---	2.50	ug/L	5	100	ND	99	80 - 120%	---	---	
1,3-Dichlorobenzene	102	---	2.50	ug/L	5	100	ND	102	80 - 120%	---	---	
1,4-Dichlorobenzene	101	---	2.50	ug/L	5	100	ND	101	79 - 120%	---	---	
Dichlorodifluoromethane	127	---	5.00	ug/L	5	100	ND	127	32 - 152%	---	---	
1,1-Dichloroethane	110	---	2.00	ug/L	5	100	2.63	107	77 - 125%	---	---	
1,2-Dichloroethane (EDC)	100	---	2.00	ug/L	5	100	ND	100	73 - 128%	---	---	
1,1-Dichloroethene	108	---	2.00	ug/L	5	100	ND	108	71 - 131%	---	---	
cis-1,2-Dichloroethene	208	---	2.00	ug/L	5	100	95.0	113	78 - 123%	---	---	
trans-1,2-Dichloroethene	113	---	2.00	ug/L	5	100	1.58	111	75 - 124%	---	---	
1,2-Dichloropropane	107	---	2.50	ug/L	5	100	ND	107	78 - 122%	---	---	
1,3-Dichloropropane	102	---	5.00	ug/L	5	100	ND	102	80 - 120%	---	---	
2,2-Dichloropropane	91.9	---	5.00	ug/L	5	100	ND	92	60 - 139%	---	---	
1,1-Dichloropropene	105	---	5.00	ug/L	5	100	ND	105	79 - 125%	---	---	
cis-1,3-Dichloropropene	88.8	---	5.00	ug/L	5	100	ND	89	75 - 124%	---	---	
trans-1,3-Dichloropropene	96.7	---	5.00	ug/L	5	100	ND	97	73 - 127%	---	---	
Hexachlorobutadiene	88.5	---	25.0	ug/L	5	100	ND	88	66 - 134%	---	---	
Methylene chloride	116	---	25.0	ug/L	5	100	ND	116	74 - 124%	---	---	
1,1,1,2-Tetrachloroethane	115	---	2.00	ug/L	5	100	ND	115	78 - 124%	---	---	
1,1,2,2-Tetrachloroethane	106	---	2.50	ug/L	5	100	ND	106	71 - 121%	---	---	
Tetrachloroethene (PCE)	249	---	2.00	ug/L	5	100	137	111	74 - 129%	---	---	
1,2,3-Trichlorobenzene	91.6	---	10.0	ug/L	5	100	ND	92	69 - 129%	---	---	
1,2,4-Trichlorobenzene	84.1	---	10.0	ug/L	5	100	ND	84	69 - 130%	---	---	
1,1,1-Trichloroethane	108	---	2.00	ug/L	5	100	ND	108	74 - 131%	---	---	
1,1,2-Trichloroethane	110	---	2.50	ug/L	5	100	ND	110	80 - 120%	---	---	
Trichloroethene (TCE)	338	---	2.00	ug/L	5	100	216	122	79 - 123%	---	---	
Trichlorofluoromethane	117	---	10.0	ug/L	5	100	ND	117	65 - 141%	---	---	
1,2,3-Trichloropropane	100	---	5.00	ug/L	5	100	ND	100	73 - 122%	---	---	
Vinyl chloride	116	---	2.00	ug/L	5	100	ND	116	58 - 137%	---	---	

Surr: 1,4-Difluorobenzene (Surr)	*Recovery: 108 %*	*Limits: 80-120 %*	*Dilution: 1x*
Toluene-d8 (Surr)	*99 %*	*80-120 %*	*"*
4-Bromofluorobenzene (Surr)	*94 %*	*80-120 %*	*"*

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120479 - Method Prep: Aq							**Water**					
Blank (9120479-BLK1)		Prepared: 12/04/19 10:02		Analyzed: 12/04/19 17:32								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9120479-BS1)		Prepared: 12/04/19 10:02		Analyzed: 12/04/19 17:34								
SM 4500-NH3 G												
Ammonia as N	1.88	---	0.0200	mg/L	1	2.00	---	94	90 - 110%	---	---	
Matrix Spike (9120479-MS1)		Prepared: 12/04/19 10:02		Analyzed: 12/04/19 17:40								
QC Source Sample: MW-9 (A9L0082-06)												
SM 4500-NH3 G												
Ammonia as N	2.85	---	0.0250	mg/L	1	2.50	0.618	**89**	**90 - 110%**	---	---	Q-01
Matrix Spike Dup (9120479-MSD1)		Prepared: 12/04/19 10:02		Analyzed: 12/04/19 17:41								
QC Source Sample: MW-9 (A9L0082-06)												
SM 4500-NH3 G												
Ammonia as N	3.15	---	0.0250	mg/L	1	2.50	0.618	101	90 - 110%	10	10%	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120459 - Method Prep: Aq							**Water**					
Blank (9120459-BLK1)		Prepared: 12/03/19 16:05		Analyzed: 12/03/19 21:34								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9120459-BS1)		Prepared: 12/03/19 16:05		Analyzed: 12/03/19 21:56								
EPA 300.0												
Nitrate-Nitrogen	1.87	---	0.250	mg/L	1	2.00	---	93	90 - 110%	---	---	
Nitrite-Nitrogen	1.89	---	0.250	mg/L	1	2.00	---	94	90 - 110%	---	---	
Duplicate (9120459-DUP1)		Prepared: 12/03/19 16:05		Analyzed: 12/04/19 04:24								
QC Source Sample: MW-25i (A9L0082-09)												
EPA 300.0												
Nitrate-Nitrogen	**0.408**	---	0.250	mg/L	1	---	0.405	---	---	0.9	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (9120459-DUP2)		Prepared: 12/03/19 16:05		Analyzed: 12/04/19 06:55								
QC Source Sample: MW-24i (A9L0082-12)												
EPA 300.0												
Nitrate-Nitrogen	**2.86**	---	0.250	mg/L	1	---	2.86	---	---	0.1	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Matrix Spike (9120459-MS1)		Prepared: 12/03/19 16:05		Analyzed: 12/04/19 04:46								
QC Source Sample: MW-25i (A9L0082-09)												
EPA 300.0												
Nitrate-Nitrogen	2.69	---	0.312	mg/L	1	2.50	0.405	91	80 - 120%	---	---	
Nitrite-Nitrogen	2.33	---	0.312	mg/L	1	2.50	ND	93	80 - 120%	---	---	
Matrix Spike (9120459-MS2)		Prepared: 12/03/19 16:05		Analyzed: 12/04/19 07:17								
QC Source Sample: MW-24i (A9L0082-12)												
EPA 300.0												
Nitrate-Nitrogen	5.18	---	0.312	mg/L	1	2.50	2.86	93	80 - 120%	---	---	
Nitrite-Nitrogen	2.34	---	0.312	mg/L	1	2.50	ND	93	80 - 120%	---	---	

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120518 - Method Prep: Aq									Water			
Blank (9120518-BLK1)		Prepared: 12/04/19 14:44		Analyzed: 12/04/19 18:26								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9120518-BS1)		Prepared: 12/04/19 14:44		Analyzed: 12/04/19 18:55								
SM 5310 C												
Total Organic Carbon	9.80	---	1.00	mg/L	1	10.0	---	98	85 - 115%	---	---	
LCS (9120518-BS2)		Prepared: 12/04/19 14:44		Analyzed: 12/04/19 17:56								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		**85 - 115%**	---	---	TOC_I

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

SAMPLE PREPARATION INFORMATION

Halogenated 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: 9120474							
A9L0082-01	Water	EPA 8260C	12/03/19 08:20	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-02	Water	EPA 8260C	12/03/19 09:28	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-03	Water	EPA 8260C	12/03/19 09:28	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-04	Water	EPA 8260C	12/03/19 10:56	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-05	Water	EPA 8260C	12/03/19 10:56	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-06	Water	EPA 8260C	12/03/19 11:52	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-07	Water	EPA 8260C	12/03/19 13:07	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-08	Water	EPA 8260C	12/03/19 14:10	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-09	Water	EPA 8260C	12/03/19 08:20	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-10	Water	EPA 8260C	12/03/19 09:10	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-11	Water	EPA 8260C	12/03/19 10:00	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-12	Water	EPA 8260C	12/03/19 10:45	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-13	Water	EPA 8260C	12/03/19 11:35	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-14	Water	EPA 8260C	12/03/19 12:20	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-15	Water	EPA 8260C	12/03/19 13:10	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-16	Water	EPA 8260C	12/03/19 13:50	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00
A9L0082-17	Water	EPA 8260C	12/03/19 14:40	12/04/19 10:57	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120479							
A9L0082-01	Water	SM 4500-NH3 G	12/03/19 08:20	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-02	Water	SM 4500-NH3 G	12/03/19 09:28	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-03	Water	SM 4500-NH3 G	12/03/19 09:28	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-04	Water	SM 4500-NH3 G	12/03/19 10:56	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-05	Water	SM 4500-NH3 G	12/03/19 10:56	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-06	Water	SM 4500-NH3 G	12/03/19 11:52	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-07	Water	SM 4500-NH3 G	12/03/19 13:07	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-08	Water	SM 4500-NH3 G	12/03/19 14:10	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-09	Water	SM 4500-NH3 G	12/03/19 08:20	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-10	Water	SM 4500-NH3 G	12/03/19 09:10	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-11	Water	SM 4500-NH3 G	12/03/19 10:00	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-12	Water	SM 4500-NH3 G	12/03/19 10:45	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-13	Water	SM 4500-NH3 G	12/03/19 11:35	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00

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AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

SAMPLE PREPARATION INFORMATION

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9L0082-14	Water	SM 4500-NH3 G	12/03/19 12:20	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-15	Water	SM 4500-NH3 G	12/03/19 13:10	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-16	Water	SM 4500-NH3 G	12/03/19 13:50	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00
A9L0082-17	Water	SM 4500-NH3 G	12/03/19 14:40	12/04/19 10:02	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120459							
A9L0082-01RE1	Water	EPA 300.0	12/03/19 08:20	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-02	Water	EPA 300.0	12/03/19 09:28	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-02RE1	Water	EPA 300.0	12/03/19 09:28	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-03	Water	EPA 300.0	12/03/19 09:28	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-03RE1	Water	EPA 300.0	12/03/19 09:28	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-04	Water	EPA 300.0	12/03/19 10:56	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-04RE1	Water	EPA 300.0	12/03/19 10:56	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-05	Water	EPA 300.0	12/03/19 10:56	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-05RE1	Water	EPA 300.0	12/03/19 10:56	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-06	Water	EPA 300.0	12/03/19 11:52	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-06RE1	Water	EPA 300.0	12/03/19 11:52	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-07	Water	EPA 300.0	12/03/19 13:07	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-08	Water	EPA 300.0	12/03/19 14:10	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-08RE1	Water	EPA 300.0	12/03/19 14:10	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-09	Water	EPA 300.0	12/03/19 08:20	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-10RE1	Water	EPA 300.0	12/03/19 09:10	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-10RE3	Water	EPA 300.0	12/03/19 09:10	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-11	Water	EPA 300.0	12/03/19 10:00	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-12	Water	EPA 300.0	12/03/19 10:45	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-13	Water	EPA 300.0	12/03/19 11:35	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-13RE1	Water	EPA 300.0	12/03/19 11:35	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-14	Water	EPA 300.0	12/03/19 12:20	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-15RE1	Water	EPA 300.0	12/03/19 13:10	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-16	Water	EPA 300.0	12/03/19 13:50	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00
A9L0082-17	Water	EPA 300.0	12/03/19 14:40	12/03/19 16:05	5mL/5mL	5mL/5mL	1.00

Apex Laboratories

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

SAMPLE PREPARATION INFORMATION

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120518							
A9L0082-01	Water	SM 5310 C	12/03/19 08:20	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00
A9L0082-02	Water	SM 5310 C	12/03/19 09:28	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00
A9L0082-04RE1	Water	SM 5310 C	12/03/19 10:56	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00
A9L0082-07	Water	SM 5310 C	12/03/19 13:07	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00
A9L0082-10	Water	SM 5310 C	12/03/19 09:10	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00
A9L0082-12	Water	SM 5310 C	12/03/19 10:45	12/04/19 14:44	40mL/40mL	40mL/40mL	1.00

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AMENDED REPORT

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

QUALIFIER DEFINITIONS

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

Apex Laboratories

AMEND	Result for this sample or analyte has been amended from the original report. See Case Narrative for details.
E	Estimated Value. The result is above the calibration range of the instrument.
Q-01	Spike recovery and/or RPD is outside acceptance limits.
Q-54	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +2%. The results are reported as Estimated Values.
Q-54a	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +3%. The results are reported as Estimated Values.
Q-54b	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +6%. The results are reported as Estimated Values.
Q-54c	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +8%. The results are reported as Estimated Values.
Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
R-02	The Reporting Limit for this analyte has been raised to account for interference from coeluting organic compounds present in the sample.
TOC_I	Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)
X	See Case Narrative.

Apex Laboratories

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503-718-2323
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AMENDED REPORT

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

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

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Lisa Domenighini, Client Services Manager

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AMENDED REPORT

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

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

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AMENDED REPORT

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

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

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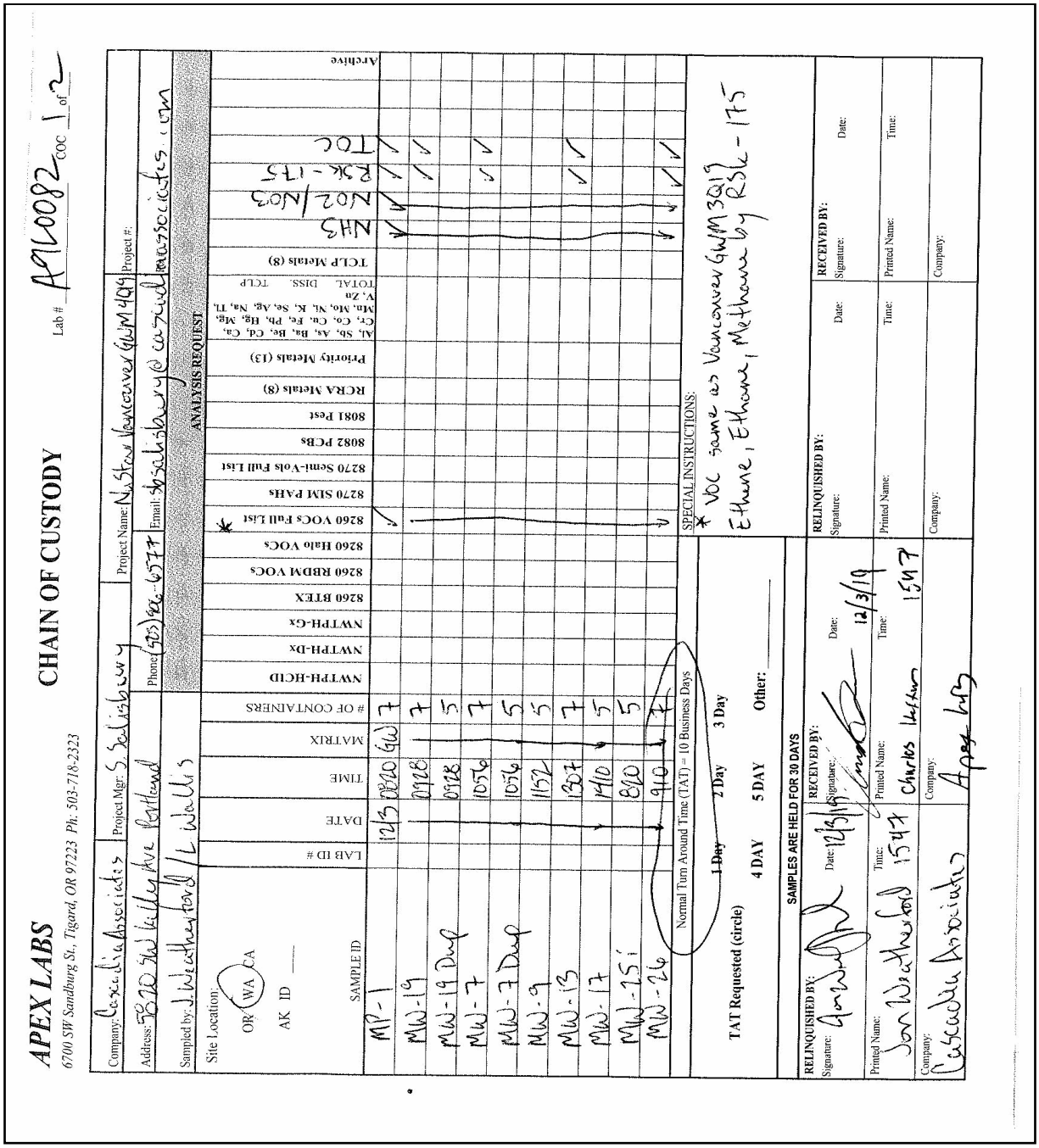
Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**



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

CHAIN OF CUSTODY

Lab # A9L0082 COC 1 of 2

Company: Cascadia Associates | Project Mgr: S. Salisbury | Project Name: NuStar Vancouver GWM 4Q19 | Project #:
Address: 5820 SW Kelly Ave Portland | Phone: (503) 892-6777 | Email: ssalisbury@cascadiaes.com
Sampled by: J. Weatherford / L. Wallis | ANALYSIS REQUEST
Site Location: OR WA CA | AK ID ____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs 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)	NH3	NO2/NO3	RSK-175	TOC	Archive
MP-1		12/3	0820	GW	7							✓												
MW-19			0918		7																	✓	✓	
MW-19 Dup			0928		5																			
MW-7			1056		7																	✓	✓	
MW-7 Dup			1056		5																			
MW-9			1152		5																			
MW-13			1327		7																	✓	✓	
MW-17			1410		5																			
MW-15			810		5																			
MW-26			940		7																	✓	✓	

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:
* VOC same as Vancouver GWM 3Q19
Ethene, Ethane, Methane by RSK-175

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 12/3/19	Date: 12/3/19	Date:	Date:
Printed Name: Jon Weatherford	Printed Name: Charles Hutton	Printed Name:	Printed Name:
Time: 1542	Time: 1542	Time:	Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

Apex Laboratories

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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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

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

CHAIN OF CUSTODY

Lab # A9L0082 COC 2 of 2

Company: Cascadia Associates
Project Mgr: S. Salisbury
Project Name: NuStar Vancouver GWM 4Q19
Project #:
Address: 5820 SW Kelly Unit B Portland
Phone: (509) 900-6577
Email: sbsalisbury@cascadiaassociates.com
Sampled by: J. Weatherford / L. Wallis

Site Location: OR (WA) CA
AK ID ____

ANALYSIS REQUEST: NWTPH-HCID, NWTPH-Dx, NWTPH-Gx, 8260 BTEX, 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), NH3, NO2/NO3, RSK-175, TOC, Archive

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	8260 VOCs Full List*	NH3	NO2/NO3
MW-24D		12/3	1000	GW	5	X	X	X
MW-24i		↓	1045	↓	5	↓	↓	↓
MW-8			1135		5			
MW-21i-40			1220		5			
MW-16			1310		5			
MW-18i			1350		↓			
MW-20i			1440	↓	↓		↓	↓
Trip Blank			–	W	2	↓		

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:
* VOCs same list as NuStar VAN 3Q19 GWM event
# ethane/ethene/methane by RSK-175

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/3/19	Signature: [signature] Date: 12/3/19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1547	Printed Name: Charles Hartman Time: 1547	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Associates	Company: Apex Labs	Company:	Company:

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

AMENDED REPORT

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0082 - 01 06 20 1035**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9 L0082

Project/Project #: Nustar Vancouver GWM 4Q19

Delivery Info:

Date/time received: 12/3/19 @ 1547 By: CFH

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

Cooler Inspection Date/time inspected: 12/3/19 @ 1648 By: CFH

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

Signed/dated by client? Yes X No

Signed/dated by Apex? Yes Y No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	1.1	1.7					
Received on ice? (Y/N)	Y	Y					
Temp. blanks? (Y/N)	Y	Y					
Ice type: (Gel/Real/Other)	Real	Real					
Condition:	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: 12/3/19 @ 1725 By: CFH

All samples intact? Yes X No Comments:

Bottle labels/COCs agree? Yes No X Comments: MW-8 time on sulfuric poly reads 12:35. (2) Trip Blank listed on C/C, not provided.

COC/container discrepancies form initiated? Yes No X NA

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

Do VOA vials have visible headspace? Yes No Y NA

Comments MW16 3/3 HCL voas have visible sediment

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

Comments:

Additional information: MW-19 1/5 HCL voas received empty (labeled) MW-24i lists 5 conts., 7 conts. provided.

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

AirTECHNOLOGY
Laboratories, Inc.

January 2, 2020

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg St.
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9L0082
Lab Number: K120506-01/06

Enclosed are results for sample(s) received 12/05/19 by Air Technology Laboratories. Sample was received intact and chilled to 1° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A9L0082 12/4/19

MD 12/4/19

SENDING LABORATORY:

Apex Laboratories
6700 S.W. Sandburg Street
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 336-0745
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832

K120506-a1a6

Sample Name: MP-1 K120506-01 **Water** **Sampled: 12/03/19 08:20** (A9L0082-01)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 08:20	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Received 1/5 HCL voas empty (labeled)

Sample Name: MW-19 -02 **Water** **Sampled: 12/03/19 09:28** (A9L0082-02)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 09:28	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Sample Name: MW-7 -03 **Water** **Sampled: 12/03/19 10:56** (A9L0082-04)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 10:56	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Sample Name: MW-13 -04 **Water** **Sampled: 12/03/19 13:07** (A9L0082-07)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 13:07	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Tracking#: 1ZX4720R0196556291

Standard TAT

Released By	Date	Received By	Date
	12/4/19	UPS (Shipper)	
UPS (Shipper)			
Released By	Date	Received By	Date
			12/5/19 10:32 1°C

SUBCONTRACT ORDER

Apex Laboratories

A9L0082 pb 12/4/19

Sample Name: MW-26 K120506-05 **Water** **Sampled: 12/03/19 09:10** (A9L0082-10)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 09:10	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

5 conts. listed, 7 conts. provided

Sample Name: MW-24i -06 **Water** **Sampled: 12/03/19 10:45** (A9L0082-12)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/16/19 17:00	12/17/19 10:45	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Tracking #: 1ZX4720R0196556291

Released By	Date	Received By	Date
	12/4/19	UPS (Shipper)	
UPS (Shipper)			
Released By	Date	Received By	Date
		[signature]	12/5/19 10:32 1°C

Client:	**Apex Laboratories**
Attn:	**Lisa Domenighini**
Project Name:	**NA**
Project No.:	**A9L0082**
Date Received:	**12/05/19**
Matrix:	**Water**
Reporting Units:	**ug/L**

RSK175

Lab No.:	K120506-01		K120506-02		K120506-03		K120506-04	
Client Sample I.D.:	MP-1 (A9L0082-01)		MW-19 (A9L0082-02)		MW-7 (A9L0082-04)		MW-13 (A9L0082-07)	
Date/Time Sampled:	12/3/19 8:20		12/3/19 9:28		12/3/19 10:56		12/3/19 13:07	
Date/Time Analyzed:	12/17/19 10:18		12/17/19 10:30		12/17/19 10:41		12/17/19 10:53	
QC Batch No.:	191217GC8A1		191217GC8A1		191217GC8A1		191217GC8A1	
Analyst Initials:	CM		CM		CM		CM	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**
Ethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Ethane	2.8	1.0	9.6	1.0	ND	1.0	20	1.0
Methane	690	1.0	2,900	1.0	840	1.0	6,200	1.0

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 12/21/19

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Client:	**Apex Laboratories**
Attn:	**Lisa Domenighini**
Project Name:	**NA**
Project No.:	**A9L0082**
Date Received:	**12/05/19**
Matrix:	**Water**
Reporting Units:	**ug/L**

RSK175

Lab No.:	K120506-05		K120506-06					
Client Sample I.D.:	MW-26 (A9L0082-10)		MW-24i (A9L0082-12)					
Date/Time Sampled:	12/3/19 9:10		12/3/19 10:45					
Date/Time Analyzed:	12/17/19 11:05		12/17/19 11:16					
QC Batch No.:	191217GC8A1		191217GC8A1					
Analyst Initials:	CM		CM					
Dilution Factor:	1.0		1.0					
ANALYTE	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**				
Ethene	ND	1.0	ND	1.0				
Ethane	ND	1.0	ND	1.0				
Methane	620	1.0	ND	1.0				

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 12/21/19

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191217GC8A1
Matrix: Water
Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	12/17/19 9:20			12/17/19 9:44		12/17/19 10:04					
Analyst Initials:	CM			CM		CM					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec.	High %Rec.	Max. RPD
Ethene	ND	1.0	1,150	**1,320**	115	**1,260**	110	4.8	**70**	**130**	30
Ethane	ND	1.0	1,230	**1,480**	121	**1,420**	116	4.3	**70**	**130**	30
Methane	ND	1.0	654	**786**	120	**753**	115	4.2	**70**	**130**	30

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 12/21/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

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

Monday, December 30, 2019

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

RE: A9L0122 - Shore Terminal-Vancouver - NuStar Vancouver GWM 4Q19--0060-002-004

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 A9L0122, which was received by the laboratory on 12/4/2019 at 4:24:00PM.

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 sample reciept, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	1.6 degC	Cooler #2	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

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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:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MGMS2-60	A9L0122-01	Water	12/04/19 08:00	12/04/19 16:24
MGMS2-110	A9L0122-02	Water	12/04/19 08:20	12/04/19 16:24
MGMS2-132	A9L0122-03	Water	12/04/19 08:20	12/04/19 16:24
MGMS2-40	A9L0122-04	Water	12/04/19 09:20	12/04/19 16:24
MGMS1-60	A9L0122-05	Water	12/04/19 09:50	12/04/19 16:24
MGMS1-43	A9L0122-06	Water	12/04/19 10:15	12/04/19 16:24
MGMS1-110	A9L0122-07	Water	12/04/19 10:45	12/04/19 16:24
MGMS3-40	A9L0122-08	Water	12/04/19 11:40	12/04/19 16:24
MGMS3-40 DUP	A9L0122-09	Water	12/04/19 11:40	12/04/19 16:24
MGMS3-60	A9L0122-10	Water	12/04/19 12:00	12/04/19 16:24
MGMS3-101	A9L0122-11	Water	12/04/19 12:20	12/04/19 16:24
MGMS3-132	A9L0122-12	Water	12/04/19 12:40	12/04/19 16:24
EW-1	A9L0122-13	Water	12/04/19 13:10	12/04/19 16:24
MW-19i	A9L0122-14	Water	12/04/19 13:50	12/04/19 16:24
MW-5	A9L0122-15	Water	12/04/19 14:30	12/04/19 16:24
MW-14	A9L0122-16	Water	12/04/19 12:00	12/04/19 16:24
MW-3	A9L0122-17	Water	12/04/19 08:06	12/04/19 16:24
MW-1	A9L0122-18	Water	12/04/19 09:04	12/04/19 16:24
S-1	A9L0122-19	Water	12/04/19 10:05	12/04/19 16:24
S-2	A9L0122-20	Water	12/04/19 11:03	12/04/19 16:24
MW-10	A9L0122-21	Water	12/04/19 12:47	12/04/19 16:24
MW-22i	A9L0122-22	Water	12/04/19 13:46	12/04/19 16:24
MW-21i-105	A9L0122-23	Water	12/04/19 14:57	12/04/19 16:24

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:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL CASE NARRATIVE

Work Order: A9L0122

Subcontract

This report is not complete without the subcontract laboratory report for RSK 175 from Air Technology.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A9L0122-01)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1-Dichloroethane	**2.03**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1-Dichloroethene	**0.427**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
cis-1,2-Dichloroethene	**54.5**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
trans-1,2-Dichloroethene	**0.422**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Tetrachloroethene (PCE)	**28.9**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A9L0122-01)				**Matrix: Water**		**Batch: 9120576**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 16:14	EPA 8260C	
Trichloroethene (TCE)	**19.4**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 16:14	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:14	EPA 8260C	
Vinyl chloride	**2.85**	---	0.400	ug/L	1	12/05/19 16:14	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/05/19 16:14*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/05/19 16:14*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/05/19 16:14*	*EPA 8260C*	
MGMS2-110 (A9L0122-02)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
cis-1,2-Dichloroethene	**5.49**	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	

Apex Laboratories

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-110 (A9L0122-02)				**Matrix: Water**		**Batch: 9120576**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Tetrachloroethene (PCE)	**4.29**	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 16:41	EPA 8260C	
Trichloroethene (TCE)	**2.73**	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 16:41	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 16:41	EPA 8260C	
Vinyl chloride	**2.32**	---	0.400	ug/L	1	12/05/19 16:41	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 16:41*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/05/19 16:41*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*	*1*	*12/05/19 16:41*	*EPA 8260C*	
MGMS2-132 (A9L0122-03)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-132 (A9L0122-03)				**Matrix: Water**		**Batch: 9120576**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
cis-1,2-Dichloroethene	**7.96**	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Tetrachloroethene (PCE)	**3.66**	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 17:08	EPA 8260C	
Trichloroethene (TCE)	**3.07**	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 17:08	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:08	EPA 8260C	
Vinyl chloride	**3.29**	---	0.400	ug/L	1	12/05/19 17:08	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 17:08*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*12/05/19 17:08*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/05/19 17:08*	*EPA 8260C*	
MGMS2-40 (A9L0122-04)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9L0122-04)				**Matrix: Water**		**Batch: 9120576**		
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1-Dichloroethane	**20.6**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1-Dichloroethene	**0.778**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
cis-1,2-Dichloroethene	**40.5**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Tetrachloroethene (PCE)	**32.3**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 17:35	EPA 8260C	
Trichloroethene (TCE)	**17.9**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 17:35	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 17:35	EPA 8260C	
Vinyl chloride	**65.4**	---	0.400	ug/L	1	12/05/19 17:35	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9L0122-04)				**Matrix: Water**		**Batch: 9120576**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/05/19 17:35*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/05/19 17:35*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/05/19 17:35*	*EPA 8260C*	
MGMS1-60 (A9L0122-05)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1-Dichloroethane	**0.465**	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
cis-1,2-Dichloroethene	**8.86**	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 18:02	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-60 (A9L0122-05)				**Matrix: Water**		**Batch: 9120576**		
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Tetrachloroethene (PCE)	**16.8**	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 18:02	EPA 8260C	
Trichloroethene (TCE)	**9.35**	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 18:02	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:02	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 18:02	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 18:02*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/05/19 18:02*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*	*1*	*12/05/19 18:02*	*EPA 8260C*	
MGMS1-43 (A9L0122-06)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Bromochloromethane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Bromodichloromethane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Bromoform	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Bromomethane	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
Carbon tetrachloride	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Chlorobenzene	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Chloroethane	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
Chloroform	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Chloromethane	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
2-Chlorotoluene	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
4-Chlorotoluene	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Dibromochloromethane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Dibromomethane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1-Dichloroethane	**124**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-43 (A9L0122-06)				**Matrix: Water**		**Batch: 9120576**		
1,1-Dichloroethene	**17.5**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
cis-1,2-Dichloroethene	**2860**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
trans-1,2-Dichloroethene	**40.9**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1-Dichloropropene	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Hexachlorobutadiene	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
Methylene chloride	ND	---	100	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Tetrachloroethene (PCE)	**162**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Trichloroethene (TCE)	**398**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
Trichlorofluoromethane	ND	---	40.0	ug/L	20	12/06/19 01:38	EPA 8260C	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	12/06/19 01:38	EPA 8260C	
Vinyl chloride	**11.8**	---	8.00	ug/L	20	12/06/19 01:38	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*12/06/19 01:38*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*1*	*12/06/19 01:38*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/06/19 01:38*	*EPA 8260C*	
MGMS1-110 (A9L0122-07)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-110 (A9L0122-07)				**Matrix: Water**		**Batch: 9120576**		
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1-Dichloroethane	**4.61**	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1-Dichloroethene	**0.426**	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
cis-1,2-Dichloroethene	**134**	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Tetrachloroethene (PCE)	**14.0**	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 18:29	EPA 8260C	
Trichloroethene (TCE)	**31.9**	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 18:29	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:29	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 18:29	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 18:29*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/05/19 18:29*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*	*1*	*12/05/19 18:29*	*EPA 8260C*	
MGMS3-40 (A9L0122-08)				**Matrix: Water**		**Batch: 9120576**		

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9L0122-08)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1-Dichloroethane	**1.63**	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
cis-1,2-Dichloroethene	**2.57**	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Tetrachloroethene (PCE)	**1.35**	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9L0122-08)				**Matrix: Water**		**Batch: 9120576**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 18:56	EPA 8260C	
Trichloroethene (TCE)	**0.454**	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 18:56	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 18:56	EPA 8260C	
Vinyl chloride	**4.50**	---	0.400	ug/L	1	12/05/19 18:56	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:* *80-120 %*	*1*	*12/05/19 18:56*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/05/19 18:56*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*12/05/19 18:56*	*EPA 8260C*	
MGMS3-40 DUP (A9L0122-09)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1-Dichloroethane	**1.67**	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
cis-1,2-Dichloroethene	**2.66**	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 DUP (A9L0122-09)				**Matrix: Water**		**Batch: 9120576**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Tetrachloroethene (PCE)	**1.13**	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 19:22	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 19:22	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:22	EPA 8260C	
Vinyl chloride	**5.79**	---	0.400	ug/L	1	12/05/19 19:22	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 19:22*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*1*	*12/05/19 19:22*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/05/19 19:22*	*EPA 8260C*	
MGMS3-60 (A9L0122-10)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-60 (A9L0122-10)				**Matrix: Water**		**Batch: 9120576**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
cis-1,2-Dichloroethene	**3.62**	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Tetrachloroethene (PCE)	**1.17**	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 19:49	EPA 8260C	
Trichloroethene (TCE)	**0.634**	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 19:49	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 19:49	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 19:49	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*12/05/19 19:49*	*EPA 8260C*	
Toluene-d8 (Surr)			*103 %*		*80-120 %*	*12/05/19 19:49*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*12/05/19 19:49*	*EPA 8260C*	
MGMS3-101 (A9L0122-11)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-101 (A9L0122-11)				**Matrix: Water**		**Batch: 9120576**		
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
cis-1,2-Dichloroethene	**0.852**	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Tetrachloroethene (PCE)	**1.84**	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 20:16	EPA 8260C	
Trichloroethene (TCE)	**0.958**	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 20:16	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:16	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 20:16	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-101 (A9L0122-11)				**Matrix: Water**		**Batch: 9120576**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:* *80-120 %*	*1*	*12/05/19 20:16*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/05/19 20:16*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/05/19 20:16*	*EPA 8260C*	
MGMS3-132 (A9L0122-12)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
cis-1,2-Dichloroethene	**5.34**	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-132 (A9L0122-12)				**Matrix: Water**		**Batch: 9120576**		
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Tetrachloroethene (PCE)	**8.69**	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 20:43	EPA 8260C	
Trichloroethene (TCE)	**6.21**	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 20:43	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 20:43	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 20:43	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 20:43*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*1*	*12/05/19 20:43*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/05/19 20:43*	*EPA 8260C*	
EW-1 (A9L0122-13)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2-Dichloroethane (EDC)	**0.552**	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A9L0122-13)				**Matrix: Water**		**Batch: 9120576**		
cis-1,2-Dichloroethene	**3.34**	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Tetrachloroethene (PCE)	**28.3**	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1,1-Trichloroethane	**0.488**	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 21:10	EPA 8260C	
Trichloroethene (TCE)	**9.99**	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 21:10	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:10	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 21:10	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 21:10*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*		*80-120 %*	*1*	*12/05/19 21:10*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*1*	*12/05/19 21:10*	*EPA 8260C*	
MW-19i (A9L0122-14)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19i (A9L0122-14)				**Matrix: Water**		**Batch: 9120576**		
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 21:37	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 21:37	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 21:37	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 21:37	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*12/05/19 21:37*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*12/05/19 21:37*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*12/05/19 21:37*	*EPA 8260C*	
MW-5 (A9L0122-15)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A9L0122-15)				**Matrix: Water**		**Batch: 9120576**		
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1-Dichloroethane	**0.817**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1-Dichloroethene	**1.60**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
trans-1,2-Dichloroethene	**1.11**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
Tetrachloroethene (PCE)	**0.925**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 22:03	EPA 8260C	
Trichloroethene (TCE)	**9.85**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A9L0122-15)				**Matrix: Water**		**Batch: 9120576**		
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 22:03	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:03	EPA 8260C	
Vinyl chloride	**10.7**	---	0.400	ug/L	1	12/05/19 22:03	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits: 80-120 %*	*1*	*12/05/19 22:03*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/05/19 22:03*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*12/05/19 22:03*	*EPA 8260C*	
MW-5 (A9L0122-15RE1)				**Matrix: Water**		**Batch: 9120593**		
cis-1,2-Dichloroethene	**632**	---	8.00	ug/L	20	12/06/19 17:59	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*112 %*	*Limits: 80-120 %*	*1*	*12/06/19 17:59*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/06/19 17:59*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/06/19 17:59*	*EPA 8260C*	
MW-14 (A9L0122-16)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1-Dichloroethane	**7.81**	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1-Dichloroethene	**3.17**	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
trans-1,2-Dichloroethene	**2.88**	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A9L0122-16)				**Matrix: Water**		**Batch: 9120576**		
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Tetrachloroethene (PCE)	**107**	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1,1-Trichloroethane	**0.704**	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 22:30	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 22:30	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:30	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 22:30	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*118 %*	*Limits: 80-120 %*	*1*	*12/05/19 22:30*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*12/05/19 22:30*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/05/19 22:30*	*EPA 8260C*	
MW-14 (A9L0122-16RE1)				**Matrix: Water**		**Batch: 9120593**		
cis-1,2-Dichloroethene	**242**	---	4.00	ug/L	10	12/06/19 18:26	EPA 8260C	
Trichloroethene (TCE)	**351**	---	4.00	ug/L	10	12/06/19 18:26	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits: 80-120 %*	*1*	*12/06/19 18:26*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/06/19 18:26*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*12/06/19 18:26*	*EPA 8260C*	
MW-3 (A9L0122-17)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9L0122-17)				**Matrix: Water**		**Batch: 9120576**		
Chloroform	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1-Dichloroethane	**1.54**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
cis-1,2-Dichloroethene	**36.5**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
trans-1,2-Dichloroethene	**1.07**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2-Dichloropropane	**0.634**	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Tetrachloroethene (PCE)	**136**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1,1-Trichloroethane	**1.33**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 22:57	EPA 8260C	
Trichloroethene (TCE)	**36.4**	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 22:57	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 22:57	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 22:57	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits:*	*80-120 %*	*12/05/19 22:57*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*12/05/19 22:57*	*EPA 8260C*	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A9L0122-17)				**Matrix: Water**		**Batch: 9120576**		
Surrogate: 4-Bromofluorobenzene (Surr)			*Recovery: 99 %*	*Limits: 80-120 %*	*1*	*12/05/19 22:57*	*EPA 8260C*	
MW-1 (A9L0122-18)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1-Dichloroethane	**3.22**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
cis-1,2-Dichloroethene	**26.6**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
trans-1,2-Dichloroethene	**0.494**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	

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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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-1 (A9L0122-18)				**Matrix: Water**		**Batch: 9120576**		
Tetrachloroethene (PCE)	**10.6**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 23:24	EPA 8260C	
Trichloroethene (TCE)	**7.39**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 23:24	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:24	EPA 8260C	
Vinyl chloride	**0.670**	---	0.400	ug/L	1	12/05/19 23:24	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*1*	*12/05/19 23:24*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*1*	*12/05/19 23:24*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/05/19 23:24*	*EPA 8260C*	
S-1 (A9L0122-19)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
cis-1,2-Dichloroethene	**0.988**	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-1 (A9L0122-19)				**Matrix: Water**		**Batch: 9120576**		
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Tetrachloroethene (PCE)	**0.971**	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/19 00:17	EPA 8260C	
Trichloroethene (TCE)	**2.86**	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/19 00:17	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/19 00:17	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/19 00:17	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*1*	*12/06/19 00:17*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*1*	*12/06/19 00:17*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*1*	*12/06/19 00:17*	*EPA 8260C*	
S-2 (A9L0122-20)				**Matrix: Water**		**Batch: 9120576**		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A9L0122-20)				**Matrix: Water**		**Batch: 9120576**		
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1-Dichloroethane	**7.12**	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
cis-1,2-Dichloroethene	**30.5**	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/19 23:50	EPA 8260C	
Trichloroethene (TCE)	**1.75**	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/19 23:50	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/19 23:50	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/19 23:50	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*12/05/19 23:50*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*12/05/19 23:50*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*		*80-120 %*	*12/05/19 23:50*	*EPA 8260C*	
MW-10 (A9L0122-21)				**Matrix: Water**		**Batch: 9120593**		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 (A9L0122-21)				**Matrix: Water**		**Batch: 9120593**		
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Tetrachloroethene (PCE)	**1.65**	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/19 12:10	EPA 8260C	
Trichloroethene (TCE)	**1.15**	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 (A9L0122-21)				**Matrix: Water**		**Batch: 9120593**		
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/19 12:10	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:10	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/19 12:10	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits: 80-120 %*	*1*	*12/06/19 12:10*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/06/19 12:10*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*101 %*	*80-120 %*	*1*	*12/06/19 12:10*	*EPA 8260C*	
MW-22i (A9L0122-22)				**Matrix: Water**		**Batch: 9120593**		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1-Dichloroethane	**0.461**	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
cis-1,2-Dichloroethene	**15.2**	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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Tigard, OR 97223
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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-22i (A9L0122-22)				**Matrix: Water**		**Batch: 9120593**		
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Tetrachloroethene (PCE)	**1.94**	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/19 12:37	EPA 8260C	
Trichloroethene (TCE)	**7.35**	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/19 12:37	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/19 12:37	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/19 12:37	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*	*12/06/19 12:37*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*		*80-120 %*	*12/06/19 12:37*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*102 %*		*80-120 %*	*12/06/19 12:37*	*EPA 8260C*	
MW-21i-105 (A9L0122-23)				**Matrix: Water**		**Batch: 9120593**		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A9L0122-23)				**Matrix: Water**		**Batch: 9120593**		
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
cis-1,2-Dichloroethene	**3.09**	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
Tetrachloroethene (PCE)	**5.61**	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/19 13:04	EPA 8260C	
Trichloroethene (TCE)	**2.79**	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/19 13:04	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/19 13:04	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/19 13:04	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits: 80-120 %*	*1*	*12/06/19 13:04*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/06/19 13:04*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/06/19 13:04*	*EPA 8260C*	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A9L0122-01)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**1.15**	---	0.0200	mg/L	1	12/05/19 13:41	SM 4500-NH3 G	
MGMS2-110 (A9L0122-02)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 13:45	SM 4500-NH3 G	
MGMS2-132 (A9L0122-03)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 13:47	SM 4500-NH3 G	
MGMS2-40 (A9L0122-04)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**76.1**	---	0.400	mg/L	20	12/05/19 13:48	SM 4500-NH3 G	
MGMS1-60 (A9L0122-05)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 13:50	SM 4500-NH3 G	
MGMS1-43 (A9L0122-06RE1)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**216**	---	2.00	mg/L	100	12/05/19 14:44	SM 4500-NH3 G	
MGMS1-110 (A9L0122-07)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**0.225**	---	0.0200	mg/L	1	12/05/19 13:53	SM 4500-NH3 G	
MGMS3-40 (A9L0122-08)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**0.906**	---	0.0200	mg/L	1	12/05/19 13:54	SM 4500-NH3 G	
MGMS3-40 DUP (A9L0122-09)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	**0.918**	---	0.0200	mg/L	1	12/05/19 14:02	SM 4500-NH3 G	
MGMS3-60 (A9L0122-10)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 14:03	SM 4500-NH3 G	
MGMS3-101 (A9L0122-11)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 14:05	SM 4500-NH3 G	
MGMS3-132 (A9L0122-12)				**Matrix: Water**		**Batch: 9120568**		
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 14:06	SM 4500-NH3 G	
EW-1 (A9L0122-13)				**Matrix: Water**		**Batch: 9120568**		

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503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A9L0122-13)				**Matrix: Water**			**Batch: 9120568**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 14:08	SM 4500-NH3 G	
MW-19i (A9L0122-14)				**Matrix: Water**			**Batch: 9120568**	
Ammonia as N	**0.169**	---	0.0200	mg/L	1	12/05/19 14:09	SM 4500-NH3 G	
MW-5 (A9L0122-15)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**0.570**	---	0.0200	mg/L	1	12/05/19 14:11	SM 4500-NH3 G	
MW-14 (A9L0122-16RE1)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**245**	---	2.00	mg/L	100	12/05/19 14:47	SM 4500-NH3 G	
MW-3 (A9L0122-17RE1)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**0.212**	---	0.0200	mg/L	1	12/05/19 15:03	SM 4500-NH3 G	
MW-1 (A9L0122-18)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**112**	---	1.00	mg/L	50	12/05/19 14:24	SM 4500-NH3 G	
S-1 (A9L0122-19)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/05/19 14:26	SM 4500-NH3 G	
S-2 (A9L0122-20RE2)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**6.83**	---	0.0400	mg/L	2	12/05/19 15:04	SM 4500-NH3 G	
MW-10 (A9L0122-21RE1)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**36.6**	---	0.400	mg/L	20	12/05/19 14:50	SM 4500-NH3 G	
MW-22i (A9L0122-22)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**0.395**	---	0.0200	mg/L	1	12/05/19 14:30	SM 4500-NH3 G	
MW-21i-105 (A9L0122-23)				**Matrix: Water**			**Batch: 9120569**	
Ammonia as N	**42.5**	---	0.200	mg/L	10	12/05/19 14:32	SM 4500-NH3 G	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A9L0122-01)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 22:30	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 22:30	EPA 300.0	
MGMS2-110 (A9L0122-02)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.400**	---	0.250	mg/L	1	12/04/19 23:34	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 23:34	EPA 300.0	
MGMS2-132 (A9L0122-03)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 23:56	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/04/19 23:56	EPA 300.0	
MGMS2-40 (A9L0122-04)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 00:17	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 00:17	EPA 300.0	
MGMS1-60 (A9L0122-05)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.732**	---	0.250	mg/L	1	12/05/19 01:22	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 01:22	EPA 300.0	
MGMS1-43 (A9L0122-06)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**45.3**	---	1.25	mg/L	5	12/05/19 01:44	EPA 300.0	
MGMS1-43 (A9L0122-06RE1)				**Matrix: Water**				
Batch: 9120529								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 02:05	EPA 300.0	
MGMS1-110 (A9L0122-07)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.587**	---	0.250	mg/L	1	12/05/19 02:27	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 02:27	EPA 300.0	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A9L0122-08)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 02:48	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 02:48	EPA 300.0	
MGMS3-40 DUP (A9L0122-09)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 03:10	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 03:10	EPA 300.0	
MGMS3-60 (A9L0122-10)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.364**	---	0.250	mg/L	1	12/05/19 03:31	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 03:31	EPA 300.0	
MGMS3-101 (A9L0122-11)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.451**	---	0.250	mg/L	1	12/05/19 03:53	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 03:53	EPA 300.0	
MGMS3-132 (A9L0122-12)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.629**	---	0.250	mg/L	1	12/05/19 04:15	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 04:15	EPA 300.0	
EW-1 (A9L0122-13)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**0.708**	---	0.250	mg/L	1	12/05/19 06:02	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 06:02	EPA 300.0	
MW-19i (A9L0122-14)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 06:24	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 06:24	EPA 300.0	
MW-5 (A9L0122-15)				**Matrix: Water**				
Batch: 9120529								

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A9L0122-15)				**Matrix: Water**				
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 06:46	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 06:46	EPA 300.0	
MW-14 (A9L0122-16RE1)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**85.5**	---	2.50	mg/L	10	12/05/19 20:14	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 07:29	EPA 300.0	
MW-3 (A9L0122-17)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**11.5**	---	1.25	mg/L	5	12/05/19 07:50	EPA 300.0	
MW-3 (A9L0122-17RE1)				**Matrix: Water**				
Batch: 9120529								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 08:12	EPA 300.0	
MW-1 (A9L0122-18RE1)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**134**	---	5.00	mg/L	20	12/05/19 20:35	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 08:55	EPA 300.0	
S-1 (A9L0122-19)				**Matrix: Water**				
Batch: 9120529								
Nitrate-Nitrogen	**2.04**	---	0.250	mg/L	1	12/05/19 10:00	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 10:00	EPA 300.0	
S-2 (A9L0122-20)				**Matrix: Water**				
Batch: 9120532								
Nitrate-Nitrogen	**0.408**	---	0.250	mg/L	1	12/05/19 11:04	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 11:04	EPA 300.0	
MW-10 (A9L0122-21)				**Matrix: Water**				
Batch: 9120532								
Nitrate-Nitrogen	**460**	---	12.5	mg/L	50	12/05/19 12:09	EPA 300.0	
MW-10 (A9L0122-21RE1)				**Matrix: Water**				

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5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 (A9L0122-21RE1)				**Matrix: Water**				
Batch: 9120532								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 13:14	EPA 300.0	
MW-22i (A9L0122-22)				**Matrix: Water**				
Batch: 9120532								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 12:31	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/19 12:31	EPA 300.0	
MW-21i-105 (A9L0122-23)				**Matrix: Water**				
Batch: 9120532								
Nitrate-Nitrogen	**4.15**	---	0.500	mg/L	2	12/05/19 12:52	EPA 300.0	
Nitrite-Nitrogen	**2.11**	---	0.500	mg/L	2	12/05/19 12:52	EPA 300.0	

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5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
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ANALYTICAL SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A9L0122-04)				**Matrix: Water**		**Batch: 9120648**		
Total Organic Carbon	**5.01**	---	1.00	mg/L	1	12/09/19 17:51	SM 5310 C	
MGMS1-43 (A9L0122-06)				**Matrix: Water**		**Batch: 9120648**		
Total Organic Carbon	**5.60**	---	1.00	mg/L	1	12/09/19 18:21	SM 5310 C	
MGMS3-40 (A9L0122-08)				**Matrix: Water**		**Batch: 9120648**		
Total Organic Carbon	**2.69**	---	1.00	mg/L	1	12/09/19 19:50	SM 5310 C	
MW-14 (A9L0122-16RE1)				**Matrix: Water**		**Batch: 9120648**		
Total Organic Carbon	**50.0**	---	5.00	mg/L	5	12/10/19 14:00	SM 5310 C	

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5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
Blank (9120576-BLK1)		Prepared: 12/05/19 13:00		Analyzed: 12/05/19 15:47								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
Blank (9120576-BLK1)		Prepared: 12/05/19 13:00		Analyzed: 12/05/19 15:47								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*100 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*100 %*		*80-120 %*			*"*				
LCS (9120576-BS1)		Prepared: 12/05/19 13:00		Analyzed: 12/05/19 14:53								
EPA 8260C												
Bromobenzene	18.6	---	0.500	ug/L	1	20.0	---	93	80 - 120%	---	---	
Bromochloromethane	24.4	---	1.00	ug/L	1	20.0	---	**122**	**80 - 120%**	---	---	Q-56
Bromodichloromethane	21.7	---	1.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
Bromoform	24.6	---	1.00	ug/L	1	20.0	---	**123**	**80 - 120%**	---	---	Q-56
Bromomethane	21.0	---	5.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
Carbon tetrachloride	22.2	---	1.00	ug/L	1	20.0	---	111	80 - 120%	---	---	
Chlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
Chloroethane	14.8	---	5.00	ug/L	1	20.0	---	**74**	**80 - 120%**	---	---	Q-55
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Chloromethane	18.0	---	5.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
2-Chlorotoluene	17.5	---	1.00	ug/L	1	20.0	---	88	80 - 120%	---	---	
4-Chlorotoluene	17.6	---	1.00	ug/L	1	20.0	---	88	80 - 120%	---	---	
Dibromochloromethane	25.3	---	1.00	ug/L	1	20.0	---	**127**	**80 - 120%**	---	---	Q-56
1,2-Dibromo-3-chloropropane	18.2	---	5.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Dibromomethane	22.5	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,2-Dichlorobenzene	18.4	---	0.500	ug/L	1	20.0	---	92	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
LCS (9120576-BS1)		Prepared: 12/05/19 13:00		Analyzed: 12/05/19 14:53								
1,3-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80 - 120%	---	---	
Dichlorodifluoromethane	21.5	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,1-Dichloroethane	19.6	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	95	80 - 120%	---	---	
cis-1,2-Dichloroethene	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
trans-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
1,3-Dichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
2,2-Dichloropropane	19.4	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1-Dichloropropene	19.2	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
cis-1,3-Dichloropropene	18.5	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
trans-1,3-Dichloropropene	18.2	---	1.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
Hexachlorobutadiene	16.4	---	5.00	ug/L	1	20.0	---	82	80 - 120%	---	---	
Methylene chloride	22.0	---	5.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	22.0	---	0.400	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	19.7	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Tetrachloroethene (PCE)	19.9	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2,3-Trichlorobenzene	17.6	---	2.00	ug/L	1	20.0	---	88	80 - 120%	---	---	
1,2,4-Trichlorobenzene	16.7	---	2.00	ug/L	1	20.0	---	83	80 - 120%	---	---	
1,1,1-Trichloroethane	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1,2-Trichloroethane	20.5	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
Trichloroethene (TCE)	21.9	---	0.400	ug/L	1	20.0	---	110	80 - 120%	---	---	
Trichlorofluoromethane	20.5	---	2.00	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2,3-Trichloropropane	19.3	---	1.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
Vinyl chloride	19.9	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 110 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*93 %*		*80-120 %*			*"*					
Duplicate (9120576-DUP1)		Prepared: 12/05/19 15:44		Analyzed: 12/06/19 02:04								

QC Source Sample: MGMS1-43 (A9L0122-06)

EPA 8260C

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
Duplicate (9120576-DUP1)		Prepared: 12/05/19 15:44	Analyzed: 12/06/19 02:04									
QC Source Sample: MGMS1-43 (A9L0122-06)												
Bromobenzene	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Bromoform	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Bromomethane	ND	---	100	ug/L	20	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Chloroethane	ND	---	100	ug/L	20	---	ND	---	---	---	30%	
Chloroform	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Chloromethane	ND	---	100	ug/L	20	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Dibromomethane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
1,1-Dichloroethane	**123**	---	8.00	ug/L	20	---	124	---	---	1	30%	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	---	ND	---	---	---	30%	
1,1-Dichloroethene	**17.3**	---	8.00	ug/L	20	---	17.5	---	---	1	30%	
cis-1,2-Dichloroethene	**2920**	---	8.00	ug/L	20	---	2860	---	---	2	30%	
trans-1,2-Dichloroethene	**39.0**	---	8.00	ug/L	20	---	40.9	---	---	5	30%	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	100	ug/L	20	---	ND	---	---	---	30%	
Methylene chloride	ND	---	100	ug/L	20	---	ND	---	---	---	30%	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
Duplicate (9120576-DUP1)		Prepared: 12/05/19 15:44	Analyzed: 12/06/19 02:04									
QC Source Sample: MGMS1-43 (A9L0122-06)												
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**162**	---	8.00	ug/L	20	---	162	---	---	0.3	30%	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**395**	---	8.00	ug/L	20	---	398	---	---	0.9	30%	
Trichlorofluoromethane	ND	---	40.0	ug/L	20	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	---	ND	---	---	---	30%	
Vinyl chloride	**11.4**	---	8.00	ug/L	20	---	11.8	---	---	4	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 113 %*	*Limits: 80-120 %*				*Dilution: 1x*					
Toluene-d8 (Surr)		*102 %*	*80-120 %*				*"*					
4-Bromofluorobenzene (Surr)		*100 %*	*80-120 %*				*"*					
Matrix Spike (9120576-MS1)		Prepared: 12/05/19 15:44	Analyzed: 12/06/19 00:44									
QC Source Sample: S-1 (A9L0122-19)												
EPA 8260C												
Bromobenzene	20.5	---	0.500	ug/L	1	20.0	ND	103	80 - 120%	---	---	
Bromochloromethane	26.0	---	1.00	ug/L	1	20.0	ND	**130**	**78 - 123%**	---	---	Q-54a
Bromodichloromethane	23.2	---	1.00	ug/L	1	20.0	ND	116	79 - 125%	---	---	
Bromoform	25.9	---	1.00	ug/L	1	20.0	ND	130	66 - 130%	---	---	Q-54b
Bromomethane	27.3	---	5.00	ug/L	1	20.0	ND	136	53 - 141%	---	---	
Carbon tetrachloride	25.0	---	1.00	ug/L	1	20.0	ND	125	72 - 136%	---	---	
Chlorobenzene	21.2	---	0.500	ug/L	1	20.0	ND	106	80 - 120%	---	---	
Chloroethane	19.6	---	5.00	ug/L	1	20.0	ND	98	60 - 138%	---	---	Q-54d
Chloroform	22.7	---	1.00	ug/L	1	20.0	ND	114	79 - 124%	---	---	
Chloromethane	21.4	---	5.00	ug/L	1	20.0	ND	107	50 - 139%	---	---	
2-Chlorotoluene	19.8	---	1.00	ug/L	1	20.0	ND	99	79 - 122%	---	---	
4-Chlorotoluene	19.6	---	1.00	ug/L	1	20.0	ND	98	78 - 122%	---	---	
Dibromochloromethane	26.7	---	1.00	ug/L	1	20.0	ND	**134**	**74 - 126%**	---	---	Q-54c
1,2-Dibromo-3-chloropropane	19.4	---	5.00	ug/L	1	20.0	ND	97	62 - 128%	---	---	
1,2-Dibromoethane (EDB)	20.9	---	0.500	ug/L	1	20.0	ND	104	77 - 121%	---	---	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120576 - EPA 5030B							**Water**					
Matrix Spike (9120576-MS1)		Prepared: 12/05/19 15:44		Analyzed: 12/06/19 00:44								
QC Source Sample: S-1 (A9L0122-19)												
Dibromomethane	23.8	---	1.00	ug/L	1	20.0	ND	119	79 - 123%	---	---	
1,2-Dichlorobenzene	20.2	---	0.500	ug/L	1	20.0	ND	101	80 - 120%	---	---	
1,3-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	ND	102	80 - 120%	---	---	
1,4-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	ND	101	79 - 120%	---	---	
Dichlorodifluoromethane	25.3	---	1.00	ug/L	1	20.0	ND	126	32 - 152%	---	---	
1,1-Dichloroethane	22.0	---	0.400	ug/L	1	20.0	ND	110	77 - 125%	---	---	
1,2-Dichloroethane (EDC)	20.3	---	0.400	ug/L	1	20.0	ND	102	73 - 128%	---	---	
1,1-Dichloroethene	22.3	---	0.400	ug/L	1	20.0	ND	111	71 - 131%	---	---	
cis-1,2-Dichloroethene	22.4	---	0.400	ug/L	1	20.0	0.988	107	78 - 123%	---	---	
trans-1,2-Dichloroethene	22.5	---	0.400	ug/L	1	20.0	ND	113	75 - 124%	---	---	
1,2-Dichloropropane	21.8	---	0.500	ug/L	1	20.0	ND	109	78 - 122%	---	---	
1,3-Dichloropropane	20.7	---	1.00	ug/L	1	20.0	ND	103	80 - 120%	---	---	
2,2-Dichloropropane	18.3	---	1.00	ug/L	1	20.0	ND	92	60 - 139%	---	---	
1,1-Dichloropropene	21.6	---	1.00	ug/L	1	20.0	ND	108	79 - 125%	---	---	
cis-1,3-Dichloropropene	17.8	---	1.00	ug/L	1	20.0	ND	89	75 - 124%	---	---	
trans-1,3-Dichloropropene	19.3	---	1.00	ug/L	1	20.0	ND	97	73 - 127%	---	---	
Hexachlorobutadiene	17.7	---	5.00	ug/L	1	20.0	ND	88	66 - 134%	---	---	
Methylene chloride	23.2	---	5.00	ug/L	1	20.0	ND	116	74 - 124%	---	---	
1,1,1,2-Tetrachloroethane	23.5	---	0.400	ug/L	1	20.0	ND	117	78 - 124%	---	---	
1,1,2,2-Tetrachloroethane	21.5	---	0.500	ug/L	1	20.0	ND	108	71 - 121%	---	---	
Tetrachloroethene (PCE)	23.1	---	0.400	ug/L	1	20.0	0.971	110	74 - 129%	---	---	
1,2,3-Trichlorobenzene	18.0	---	2.00	ug/L	1	20.0	ND	90	69 - 129%	---	---	
1,2,4-Trichlorobenzene	16.8	---	2.00	ug/L	1	20.0	ND	84	69 - 130%	---	---	
1,1,1-Trichloroethane	21.7	---	0.400	ug/L	1	20.0	ND	108	74 - 131%	---	---	
1,1,2-Trichloroethane	21.9	---	0.500	ug/L	1	20.0	ND	110	80 - 120%	---	---	
Trichloroethene (TCE)	26.4	---	0.400	ug/L	1	20.0	2.86	118	79 - 123%	---	---	
Trichlorofluoromethane	24.7	---	2.00	ug/L	1	20.0	ND	124	65 - 141%	---	---	
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	ND	104	73 - 122%	---	---	
Vinyl chloride	23.5	---	0.400	ug/L	1	20.0	ND	118	58 - 137%	---	---	

Surr: 1,4-Difluorobenzene (Surr)	*Recovery: 109 %*	*Limits: 80-120 %*	*Dilution: 1x*
Toluene-d8 (Surr)	*99 %*	*80-120 %*	*"*
4-Bromofluorobenzene (Surr)	*94 %*	*80-120 %*	*"*

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120593 - EPA 5030B							**Water**					
Blank (9120593-BLK1)		Prepared: 12/06/19 09:00		Analyzed: 12/06/19 11:16								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120593 - EPA 5030B							**Water**					
Blank (9120593-BLK1)		Prepared: 12/06/19 09:00		Analyzed: 12/06/19 11:16								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 113 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*100 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*101 %*		*80-120 %*			*"*					
LCS (9120593-BS1)		Prepared: 12/06/19 09:00		Analyzed: 12/06/19 10:23								
EPA 8260C												
Bromobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Bromochloromethane	25.3	---	1.00	ug/L	1	20.0	---	**127**	**80 - 120%**	---	---	Q-56
Bromodichloromethane	22.4	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
Bromoform	26.1	---	1.00	ug/L	1	20.0	---	**130**	**80 - 120%**	---	---	Q-56
Bromomethane	24.6	---	5.00	ug/L	1	20.0	---	**123**	**80 - 120%**	---	---	Q-56
Carbon tetrachloride	23.0	---	1.00	ug/L	1	20.0	---	115	80 - 120%	---	---	
Chlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Chloroethane	17.0	---	5.00	ug/L	1	20.0	---	85	80 - 120%	---	---	
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	106	80 - 120%	---	---	
Chloromethane	18.0	---	5.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
2-Chlorotoluene	18.7	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
4-Chlorotoluene	17.9	---	1.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
Dibromochloromethane	26.0	---	1.00	ug/L	1	20.0	---	**130**	**80 - 120%**	---	---	Q-56
1,2-Dibromo-3-chloropropane	19.5	---	5.00	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	19.7	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Dibromomethane	22.8	---	1.00	ug/L	1	20.0	---	114	80 - 120%	---	---	
1,2-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120593 - EPA 5030B							**Water**					
LCS (9120593-BS1)		Prepared: 12/06/19 09:00		Analyzed: 12/06/19 10:23								
1,3-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80 - 120%	---	---	
Dichlorodifluoromethane	20.9	---	1.00	ug/L	1	20.0	---	104	80 - 120%	---	---	
1,1-Dichloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	18.8	---	0.400	ug/L	1	20.0	---	94	80 - 120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
cis-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
trans-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dichloropropane	20.5	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,3-Dichloropropane	19.1	---	1.00	ug/L	1	20.0	---	95	80 - 120%	---	---	
2,2-Dichloropropane	17.7	---	1.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
1,1-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
cis-1,3-Dichloropropene	18.2	---	1.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
trans-1,3-Dichloropropene	18.0	---	1.00	ug/L	1	20.0	---	90	80 - 120%	---	---	
Hexachlorobutadiene	17.8	---	5.00	ug/L	1	20.0	---	89	80 - 120%	---	---	
Methylene chloride	22.5	---	5.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	22.2	---	0.400	ug/L	1	20.0	---	111	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	19.6	---	0.500	ug/L	1	20.0	---	98	80 - 120%	---	---	
Tetrachloroethene (PCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.6	---	2.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
1,2,4-Trichlorobenzene	17.3	---	2.00	ug/L	1	20.0	---	86	80 - 120%	---	---	
1,1,1-Trichloroethane	19.5	---	0.400	ug/L	1	20.0	---	97	80 - 120%	---	---	
1,1,2-Trichloroethane	20.6	---	0.500	ug/L	1	20.0	---	103	80 - 120%	---	---	
Trichloroethene (TCE)	22.9	---	0.400	ug/L	1	20.0	---	114	80 - 120%	---	---	
Trichlorofluoromethane	21.6	---	2.00	ug/L	1	20.0	---	108	80 - 120%	---	---	
1,2,3-Trichloropropane	19.3	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
Vinyl chloride	20.1	---	0.400	ug/L	1	20.0	---	101	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 111 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*98 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*96 %*		*80-120 %*			*"*					
Duplicate (9120593-DUP1)		Prepared: 12/06/19 10:54		Analyzed: 12/06/19 13:31								

QC Source Sample: MW-21i-105 (A9L0122-23)

EPA 8260C

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120593 - EPA 5030B							**Water**					
Duplicate (9120593-DUP1)		Prepared: 12/06/19 10:54	Analyzed: 12/06/19 13:31									
QC Source Sample: MW-21i-105 (A9L0122-23)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
cis-1,2-Dichloroethene	**3.07**	---	0.400	ug/L	1	---	3.09	---	---	0.8	30%	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	

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EPA ID: OR01039

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120593 - EPA 5030B							**Water**					
Duplicate (9120593-DUP1)		Prepared: 12/06/19 10:54 Analyzed: 12/06/19 13:31										
QC Source Sample: MW-21i-105 (A9L0122-23)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	**5.78**	---	0.400	ug/L	1	---	5.61	---	---	3	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	**2.74**	---	0.400	ug/L	1	---	2.79	---	---	2	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 115 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*100 %*		*80-120 %*			*"*					

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120568 - Method Prep: Aq							**Water**					
Blank (9120568-BLK1)		Prepared: 12/05/19 11:43		Analyzed: 12/05/19 13:18								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9120568-BS1)		Prepared: 12/05/19 11:43		Analyzed: 12/05/19 13:20								
SM 4500-NH3 G												
Ammonia as N	2.20	---	0.0200	mg/L	1	2.00	---	110	90 - 110%	---	---	
Matrix Spike (9120568-MS1)		Prepared: 12/05/19 11:43		Analyzed: 12/05/19 13:42								
QC Source Sample: MGMS2-60 (A9L0122-01)												
SM 4500-NH3 G												
Ammonia as N	3.50	---	0.0250	mg/L	1	2.50	1.15	94	90 - 110%	---	---	
Matrix Spike Dup (9120568-MSD1)		Prepared: 12/05/19 11:43		Analyzed: 12/05/19 13:44								
QC Source Sample: MGMS2-60 (A9L0122-01)												
SM 4500-NH3 G												
Ammonia as N	3.58	---	0.0250	mg/L	1	2.50	1.15	97	90 - 110%	2	10%	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120569 - Method Prep: Aq							**Water**					
Blank (9120569-BLK1)		Prepared: 12/05/19 11:45		Analyzed: 12/05/19 13:21								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9120569-BS1)		Prepared: 12/05/19 11:45		Analyzed: 12/05/19 13:23								
SM 4500-NH3 G												
Ammonia as N	2.08	---	0.0200	mg/L	1	2.00	---	104	90 - 110%	---	---	
Matrix Spike (9120569-MS1)		Prepared: 12/05/19 11:45		Analyzed: 12/05/19 14:12								
QC Source Sample: MW-5 (A9L0122-15)												
SM 4500-NH3 G												
Ammonia as N	2.71	---	0.0250	mg/L	1	2.50	0.570	**85**	**90 - 110%**	---	---	Q-01
Matrix Spike Dup (9120569-MSD1)		Prepared: 12/05/19 11:45		Analyzed: 12/05/19 14:14								
QC Source Sample: MW-5 (A9L0122-15)												
SM 4500-NH3 G												
Ammonia as N	2.95	---	0.0250	mg/L	1	2.50	0.570	95	90 - 110%	9	10%	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120529 - Method Prep: Aq							**Water**					
Blank (9120529-BLK1)		Prepared: 12/04/19 18:16		Analyzed: 12/04/19 21:03								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9120529-BS1)		Prepared: 12/04/19 18:16		Analyzed: 12/04/19 21:25								
EPA 300.0												
Nitrate-Nitrogen	2.02	---	0.250	mg/L	1	2.00	---	101	90 - 110%	---	---	
Nitrite-Nitrogen	2.02	---	0.250	mg/L	1	2.00	---	101	90 - 110%	---	---	
Duplicate (9120529-DUP1)		Prepared: 12/04/19 18:16		Analyzed: 12/04/19 22:51								
QC Source Sample: MGMS2-60 (A9L0122-01)												
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (9120529-DUP2)		Prepared: 12/04/19 18:16		Analyzed: 12/05/19 04:36								
QC Source Sample: MGMS3-132 (A9L0122-12)												
EPA 300.0												
Nitrate-Nitrogen	**0.617**	---	0.250	mg/L	1	---	0.629	---	---	2	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Matrix Spike (9120529-MS1)		Prepared: 12/04/19 18:16		Analyzed: 12/04/19 23:13								
QC Source Sample: MGMS2-60 (A9L0122-01)												
EPA 300.0												
Nitrate-Nitrogen	2.63	---	0.312	mg/L	1	2.50	ND	105	80 - 120%	---	---	
Nitrite-Nitrogen	2.54	---	0.312	mg/L	1	2.50	ND	102	80 - 120%	---	---	
Matrix Spike (9120529-MS2)		Prepared: 12/04/19 18:16		Analyzed: 12/05/19 05:41								
QC Source Sample: MGMS3-132 (A9L0122-12)												
EPA 300.0												
Nitrate-Nitrogen	3.14	---	0.312	mg/L	1	2.50	0.629	100	80 - 120%	---	---	
Nitrite-Nitrogen	2.53	---	0.312	mg/L	1	2.50	ND	101	80 - 120%	---	---	

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120532 - Method Prep: Aq							**Water**					
Blank (9120532-BLK1)		Prepared: 12/04/19 19:19		Analyzed: 12/05/19 10:21								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9120532-BS1)		Prepared: 12/04/19 19:19		Analyzed: 12/05/19 10:43								
EPA 300.0												
Nitrate-Nitrogen	2.03	---	0.250	mg/L	1	2.00	---	101	90 - 110%	---	---	
Nitrite-Nitrogen	2.03	---	0.250	mg/L	1	2.00	---	102	90 - 110%	---	---	
Duplicate (9120532-DUP1)		Prepared: 12/04/19 19:19		Analyzed: 12/05/19 11:26								
QC Source Sample: S-2 (A9L0122-20)												
EPA 300.0												
Nitrate-Nitrogen	**0.399**	---	0.250	mg/L	1	---	0.408	---	---	2	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Matrix Spike (9120532-MS1)		Prepared: 12/04/19 19:19		Analyzed: 12/05/19 11:47								
QC Source Sample: S-2 (A9L0122-20)												
EPA 300.0												
Nitrate-Nitrogen	2.81	---	0.312	mg/L	1	2.50	0.408	96	80 - 120%	---	---	
Nitrite-Nitrogen	2.44	---	0.312	mg/L	1	2.50	ND	98	80 - 120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120648 - Method Prep: Aq							**Water**					
Blank (9120648-BLK1)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 14:25								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9120648-BS1)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 14:55								
SM 5310 C												
Total Organic Carbon	10.2	---	1.00	mg/L	1	10.0	---	102	85 - 115%	---	---	
LCS (9120648-BS2)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 13:56								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		**85 - 115%**	---	---	TOC_I

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SAMPLE PREPARATION INFORMATION

Halogenated 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: 9120576							
A9L0122-01	Water	EPA 8260C	12/04/19 08:00	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-02	Water	EPA 8260C	12/04/19 08:20	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-03	Water	EPA 8260C	12/04/19 08:20	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-04	Water	EPA 8260C	12/04/19 09:20	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-05	Water	EPA 8260C	12/04/19 09:50	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-06	Water	EPA 8260C	12/04/19 10:15	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-07	Water	EPA 8260C	12/04/19 10:45	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-08	Water	EPA 8260C	12/04/19 11:40	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-09	Water	EPA 8260C	12/04/19 11:40	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-10	Water	EPA 8260C	12/04/19 12:00	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-11	Water	EPA 8260C	12/04/19 12:20	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-12	Water	EPA 8260C	12/04/19 12:40	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-13	Water	EPA 8260C	12/04/19 13:10	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-14	Water	EPA 8260C	12/04/19 13:50	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-15	Water	EPA 8260C	12/04/19 14:30	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-16	Water	EPA 8260C	12/04/19 12:00	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-17	Water	EPA 8260C	12/04/19 08:06	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-18	Water	EPA 8260C	12/04/19 09:04	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-19	Water	EPA 8260C	12/04/19 10:05	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
A9L0122-20	Water	EPA 8260C	12/04/19 11:03	12/05/19 15:44	5mL/5mL	5mL/5mL	1.00
Batch: 9120593							
A9L0122-15RE1	Water	EPA 8260C	12/04/19 14:30	12/06/19 10:54	5mL/5mL	5mL/5mL	1.00
A9L0122-16RE1	Water	EPA 8260C	12/04/19 12:00	12/06/19 10:54	5mL/5mL	5mL/5mL	1.00
A9L0122-21	Water	EPA 8260C	12/04/19 12:47	12/06/19 10:54	5mL/5mL	5mL/5mL	1.00
A9L0122-22	Water	EPA 8260C	12/04/19 13:46	12/06/19 10:54	5mL/5mL	5mL/5mL	1.00
A9L0122-23	Water	EPA 8260C	12/04/19 14:57	12/06/19 10:54	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120568							
A9L0122-01	Water	SM 4500-NH3 G	12/04/19 08:00	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-02	Water	SM 4500-NH3 G	12/04/19 08:20	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-03	Water	SM 4500-NH3 G	12/04/19 08:20	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-04	Water	SM 4500-NH3 G	12/04/19 09:20	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

SAMPLE PREPARATION INFORMATION

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9L0122-05	Water	SM 4500-NH3 G	12/04/19 09:50	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-06RE1	Water	SM 4500-NH3 G	12/04/19 10:15	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-07	Water	SM 4500-NH3 G	12/04/19 10:45	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-08	Water	SM 4500-NH3 G	12/04/19 11:40	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-09	Water	SM 4500-NH3 G	12/04/19 11:40	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-10	Water	SM 4500-NH3 G	12/04/19 12:00	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-11	Water	SM 4500-NH3 G	12/04/19 12:20	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-12	Water	SM 4500-NH3 G	12/04/19 12:40	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-13	Water	SM 4500-NH3 G	12/04/19 13:10	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
A9L0122-14	Water	SM 4500-NH3 G	12/04/19 13:50	12/05/19 11:43	10mL/10mL	10mL/10mL	1.00
Batch: 9120569							
A9L0122-15	Water	SM 4500-NH3 G	12/04/19 14:30	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-16RE1	Water	SM 4500-NH3 G	12/04/19 12:00	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-17RE1	Water	SM 4500-NH3 G	12/04/19 08:06	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-18	Water	SM 4500-NH3 G	12/04/19 09:04	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-19	Water	SM 4500-NH3 G	12/04/19 10:05	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-20RE2	Water	SM 4500-NH3 G	12/04/19 11:03	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-21RE1	Water	SM 4500-NH3 G	12/04/19 12:47	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-22	Water	SM 4500-NH3 G	12/04/19 13:46	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00
A9L0122-23	Water	SM 4500-NH3 G	12/04/19 14:57	12/05/19 11:45	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120529							
A9L0122-01	Water	EPA 300.0	12/04/19 08:00	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-02	Water	EPA 300.0	12/04/19 08:20	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-03	Water	EPA 300.0	12/04/19 08:20	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-04	Water	EPA 300.0	12/04/19 09:20	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-05	Water	EPA 300.0	12/04/19 09:50	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-06	Water	EPA 300.0	12/04/19 10:15	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-06RE1	Water	EPA 300.0	12/04/19 10:15	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-07	Water	EPA 300.0	12/04/19 10:45	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-08	Water	EPA 300.0	12/04/19 11:40	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-09	Water	EPA 300.0	12/04/19 11:40	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-10	Water	EPA 300.0	12/04/19 12:00	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00

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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A9L0122-11	Water	EPA 300.0	12/04/19 12:20	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-12	Water	EPA 300.0	12/04/19 12:40	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-13	Water	EPA 300.0	12/04/19 13:10	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-14	Water	EPA 300.0	12/04/19 13:50	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-15	Water	EPA 300.0	12/04/19 14:30	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-16RE1	Water	EPA 300.0	12/04/19 12:00	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-17	Water	EPA 300.0	12/04/19 08:06	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-17RE1	Water	EPA 300.0	12/04/19 08:06	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-18RE1	Water	EPA 300.0	12/04/19 09:04	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
A9L0122-19	Water	EPA 300.0	12/04/19 10:05	12/04/19 18:16	5mL/5mL	5mL/5mL	1.00
Batch: 9120532							
A9L0122-20	Water	EPA 300.0	12/04/19 11:03	12/04/19 19:19	5mL/5mL	5mL/5mL	1.00
A9L0122-21	Water	EPA 300.0	12/04/19 12:47	12/04/19 19:19	5mL/5mL	5mL/5mL	1.00
A9L0122-21RE1	Water	EPA 300.0	12/04/19 12:47	12/04/19 19:19	5mL/5mL	5mL/5mL	1.00
A9L0122-22	Water	EPA 300.0	12/04/19 13:46	12/04/19 19:19	5mL/5mL	5mL/5mL	1.00
A9L0122-23	Water	EPA 300.0	12/04/19 14:57	12/04/19 19:19	5mL/5mL	5mL/5mL	1.00

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120648							
A9L0122-04	Water	SM 5310 C	12/04/19 09:20	12/09/19 08:42	40mL/40mL	40mL/40mL	1.00
A9L0122-06	Water	SM 5310 C	12/04/19 10:15	12/09/19 08:42	40mL/40mL	40mL/40mL	1.00
A9L0122-08	Water	SM 5310 C	12/04/19 11:40	12/09/19 08:42	40mL/40mL	40mL/40mL	1.00
A9L0122-16RE1	Water	SM 5310 C	12/04/19 12:00	12/09/19 08:42	40mL/40mL	40mL/40mL	1.00

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Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

QUALIFIER DEFINITIONS

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

Apex Laboratories

Q-01	Spike recovery and/or RPD is outside acceptance limits.
Q-54a	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +2%. The results are reported as Estimated Values.
Q-54b	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +3%. The results are reported as Estimated Values.
Q-54c	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +7%. The results are reported as Estimated Values.
Q-54d	Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -6%. The results are reported as Estimated Values.
Q-55	Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
TOC_I	Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

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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:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

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

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Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

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

Cascadia Associates	Project:	**Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number:	**NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager:	**Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

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

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

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

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

Lisa Domenighini, Client Services Manager

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

APEX LABS

CHAIN OF CUSTODY

Lab # A9L0122 COC 1 of 3

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: NuStar VAN 4Q19 GWM Project #: 0060-002-004

Address: 5820 SW Kelly Ave, Suite B Phone: 503-906-6577 Fax: Email: SSalisbury@cascadia-associates.c...

Sampled by: Lindsay W / Jon W

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	NH3	NO2/NO3	RSK-175 #	TOC
1	MGMS2-60		12/4	800	GW	5				X													X	X		
2	MGMS2-110		↓	820	↓	5				↓													↓	↓		
3	MGMS2-132		↓	850	↓	5				↓													↓	↓		
4	MGMS2-40		↓	920	↓	7				↓													↓	↓	X	X
5	MGMS1-60		↓	950	↓	5				↓													↓	↓		
6	MGMS1-43		↓	1015	↓	7				↓													↓	↓	X	X
7	MGMS1-110		↓	1045	↓	5				↓													↓	↓		
8	MGMS3-40		↓	1140	↓	7				↓													↓	↓	X	X
9	MGMS3-40 DUP		↓	1140	↓	5				↓													↓	↓		
10	MGMS3-60		↓	1200	↓	5				↓													↓	↓		

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

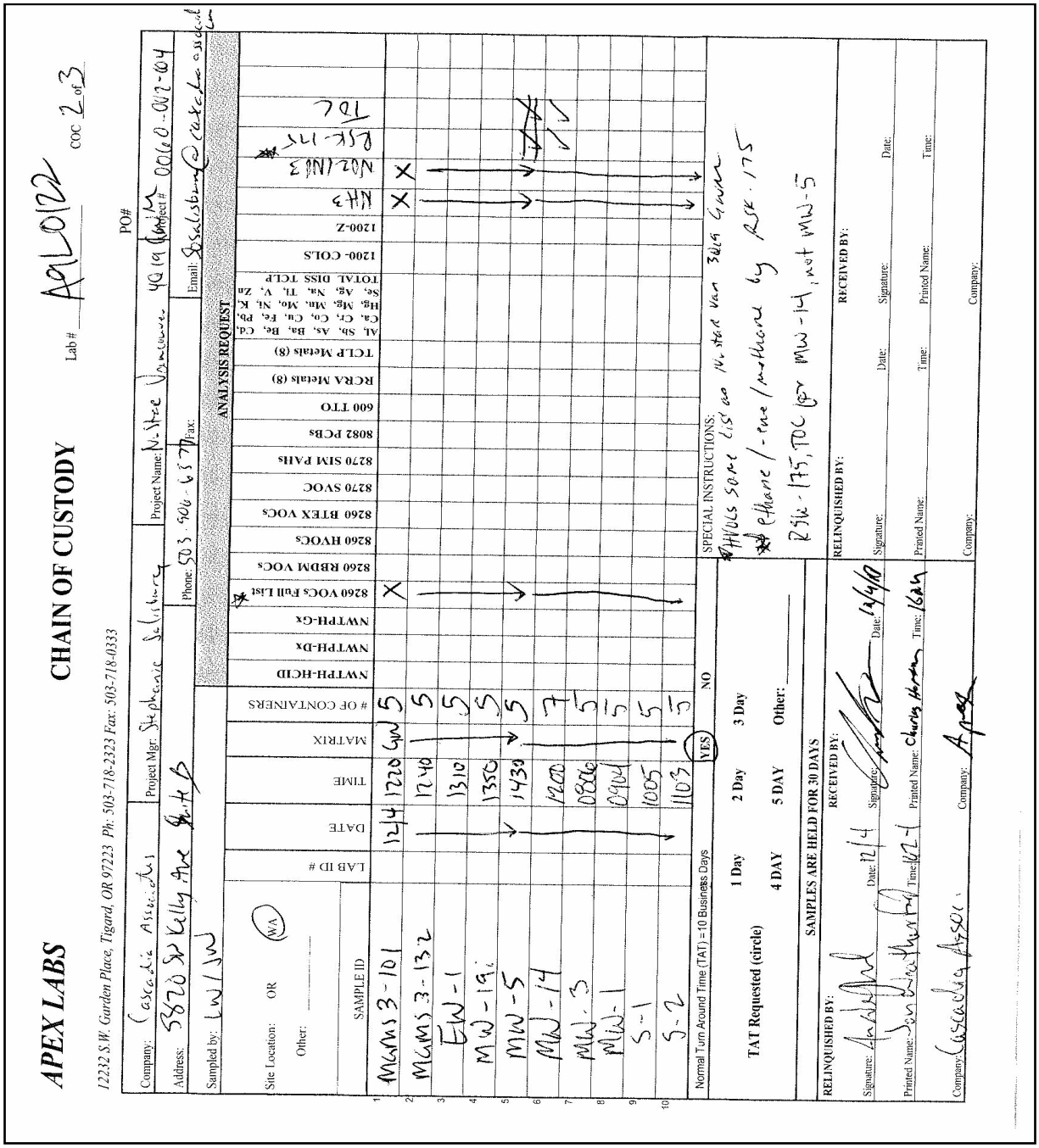
SPECIAL INSTRUCTIONS:
* VOCs same list as NuStar VAN 3Q19 GWM
# Ethane/ethene/methane by RSK175

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 12/4	Signature: [signature] Date: 12/4/19	Signature: Date:	Signature: Date:
Printed Name: Jon Weatherford Time: 1624	Printed Name: Charles Hastings Time: 1624	Printed Name: Time:	Printed Name: Time:
Company: Cascadia Assoc.	Company: Apex	Company:	Company:

Apex Laboratories, LLC

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**



Apex Laboratories

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
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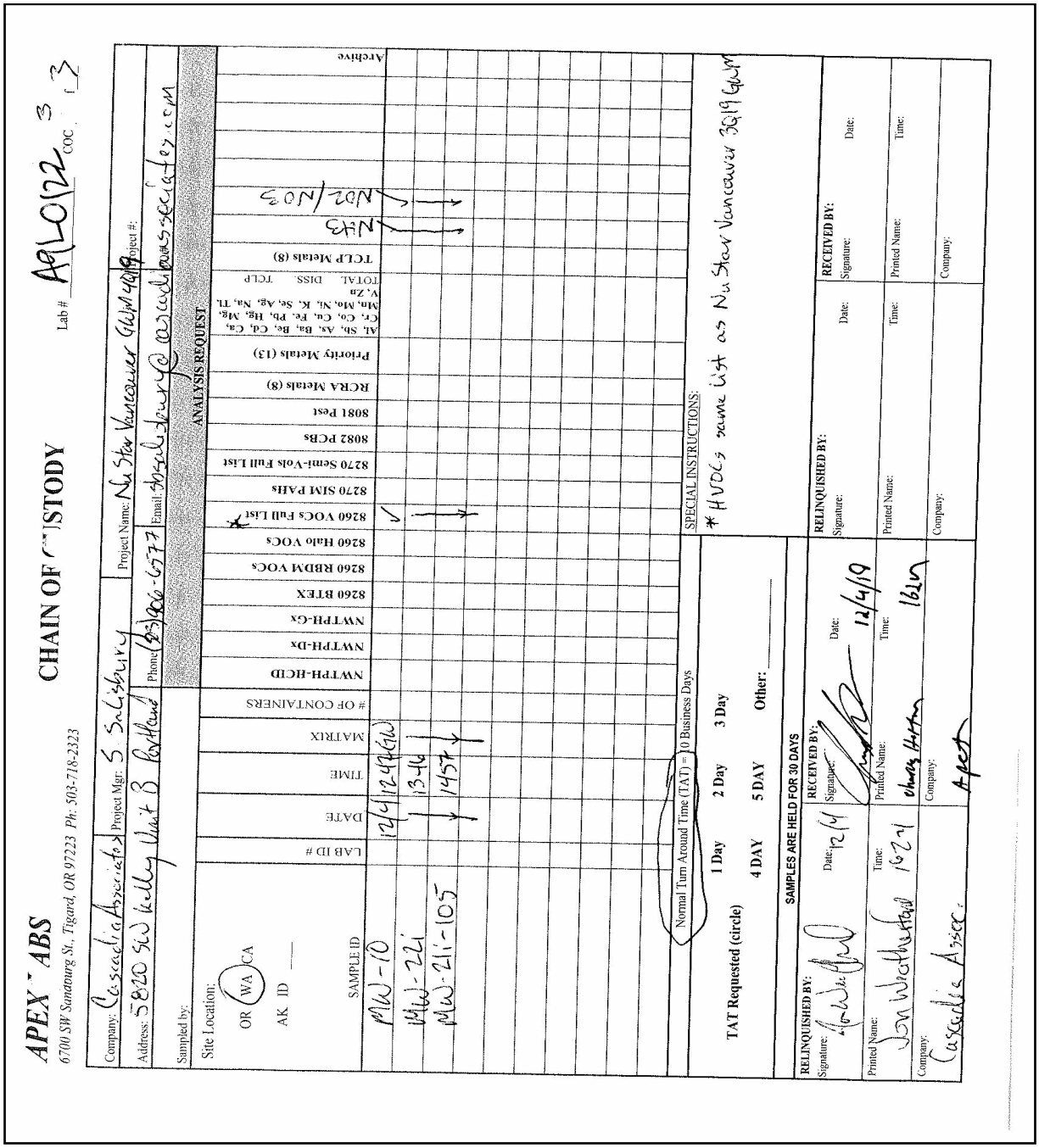
503-718-2323
EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**



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

CHAIN OF CUSTODY

Lab # A9L0122 COC 1 of 3

Company: Cascadia Associates | Project Mgr: S Salisbury | Project Name: NuStar Vancouver GWM 4Q19 | Project #:
Address: 5820 SW Kelly Unit B Portland | Phone: (503)906-6777 | Email: ssalisbury@cascadiaassociates.com
Sampled by:
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	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	TCLP Metals (8) TOTAL DISS TCLP	Archive
MW-10		12/4	1249	GW								✓								
MW-22			1346																	
MW-21-105			1457																	

Normal Turn Around Time (TAT) = 10 Business Days

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

SPECIAL INSTRUCTIONS:
* HVOCs same list as NuStar Vancouver 3Q19 GWM

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	Date:	Time:	RECEIVED BY:	Date:	Time:
Signature:	12/4		Signature:	12/4/19	
Printed Name:		1627	Printed Name:		1627
Company:	Cascadia Assoc.		Company:	Apex	

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

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

Apex Laboratories

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **NuStar Vancouver GWM 4(**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0122 - 12 30 19 1129**

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9L0122

Project/Project #: Nustar VAN 4619 0060-002-004

Delivery Info:

Date/time received: 12/4/19 @ 1624 By: CFH

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

Cooler Inspection Date/time inspected: 12/4/19 @ 1751 By: CFH

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

Signed/dated by client? Yes Y No ___

Signed/dated by Apex? Yes X No ___

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	1.6	1.1					
Received on ice? (Y/N)	Y	Y					
Temp. blanks? (Y/N)	Y	Y					
Ice type: (Gel/Real/Other)	Real	Real					
Condition:	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: 12/4/19 @ ___ By: ___

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 Y No ___ NA ___

Comments 4/3 5-2 HS

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

Comments: ___

Additional information: ___

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

Apex Laboratories

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Lisa A Domenighini

Lisa Domenighini, Client Services Manager

AirTECHNOLOGY
Laboratories, Inc.

January 2, 2020

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg St.
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9L0122
Lab Number: K120605-01/04

Enclosed are results for sample(s) received 12/06/19 by Air Technology Laboratories. Sample was received intact and chilled to 4° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A9L0122

NRP 12/5/19

K120605-01/04

MAD 12/5/19

SENDING LABORATORY:

Apex Laboratories
6700 S.W. Sandburg Street
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 336-0745
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832

Sample Name: MGMS2-40 **Water** **Sampled: 12/04/19 09:20** (A9L0122-04)

01

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) *Containers Supplied:* (D)40 mL VOA - HCL (E)40 mL VOA - HCL	12/17/19 17:00	12/18/19 09:20	

Sample Name: MGMS1-43 **Water** **Sampled: 12/04/19 10:15** (A9L0122-06)

02

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) *Containers Supplied:* (D)40 mL VOA - HCL (E)40 mL VOA - HCL	12/17/19 17:00	12/18/19 10:15	

Sample Name: MGMS3-40 **Water** **Sampled: 12/04/19 11:40** (A9L0122-08)

03

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) *Containers Supplied:* (D)40 mL VOA - HCL (E)40 mL VOA - HCL	12/17/19 17:00	12/18/19 11:40	

Sample Name: MW-14 **Water** **Sampled: 12/04/19 12:00** (A9L0122-16)

04

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) *Containers Supplied:* (D)40 mL VOA - HCL (E)40 mL VOA - HCL	12/17/19 17:00	12/18/19 12:00	

Standard TAT

4°C

Released By	Date	Received By	Date
[signature]	12-5-19	UPS (Shipper)	
UPS (Shipper)		[signature]	12/6/19 1082
Released By	Date	Received By	Date

Client:	**Apex Laboratories**
Attn:	**Lisa Domenighini**
Project Name:	**NA**
Project No.:	**A9L0122**
Date Received:	**12/06/19**
Matrix:	**Water**
Reporting Units:	**ug/L**

RSK175

Lab No.:	K120605-01		K120605-02		K120605-03		K120605-04	
Client Sample I.D.:	MGMS2-40 (A9L0122-04)		MGMS1-43 (A9L0122-06)		MGMS3-40 (A9L0122-08)		MW-14 (A9L0122-16)	
Date/Time Sampled:	12/4/19 9:20		12/4/19 10:15		12/4/19 11:40		12/4/19 12:00	
Date/Time Analyzed:	12/17/19 11:31		12/17/19 11:42		12/17/19 11:54		12/17/19 12:05	
QC Batch No.:	191217GC8A1		191217GC8A1		191217GC8A1		191217GC8A1	
Analyst Initials:	CM		CM		CM		CM	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**	**Result ug/L**	**RL ug/L**
Ethene	4.2	1.0	ND	1.0	ND	1.0	ND	1.0
Ethane	4.8	1.0	14	1.0	6.6	1.0	ND	1.0
Methane	24	1.0	300	1.0	5,400	1.0	54	1.0

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 12/21/19

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191217GC8A1
Matrix: Water
Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	12/17/19 9:20			12/17/19 9:44		12/17/19 10:04					
Analyst Initials:	CM			CM		CM					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec.	High %Rec.	Max. RPD
Ethene	ND	1.0	1,150	**1,320**	115	**1,260**	110	4.8	**70**	**130**	30
Ethane	ND	1.0	1,230	**1,480**	121	**1,420**	116	4.3	**70**	**130**	30
Methane	ND	1.0	654	**786**	120	**753**	115	4.2	**70**	**130**	30

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 12/21/19
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Apex Laboratories, LLC

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

Monday, December 30, 2019

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

RE: A9L0164 - Shore Terminal-Vancouver - 0060-002-004

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 A9L0164, which was received by the laboratory on 12/5/2019 at 4:15:00PM.

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 sample reciept, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	1.8	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

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-12	A9L0164-01	Water	12/05/19 08:03	12/05/19 16:15
MW-12-Dup	A9L0164-02	Water	12/05/19 08:03	12/05/19 16:15
MW-2	A9L0164-03	Water	12/05/19 09:20	12/05/19 16:15
MW-6	A9L0164-04	Water	12/05/19 10:07	12/05/19 16:15
MW-23i	A9L0164-05	Water	12/05/19 11:28	12/05/19 16:15

Apex Laboratories

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Lisa Domenighini, Client Services Manager

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL CASE NARRATIVE

Work Order: A9L0164

Subcontract

This report is not complete without the subcontract laboratory report for RSK 175 from Air Technology.

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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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9L0164-01)				**Matrix: Water**		**Batch: 9120635**		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
cis-1,2-Dichloroethene	**2.61**	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Tetrachloroethene (PCE)	**2.37**	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9L0164-01)				**Matrix: Water**		**Batch: 9120635**		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/19 17:59	EPA 8260C	
Trichloroethene (TCE)	**1.41**	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/19 17:59	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/19 17:59	EPA 8260C	
Vinyl chloride	**0.413**	---	0.400	ug/L	1	12/07/19 17:59	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:* *80-120 %*	*1*	*12/07/19 17:59*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*12/07/19 17:59*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*99 %*	*80-120 %*	*1*	*12/07/19 17:59*	*EPA 8260C*	
MW-12-Dup (A9L0164-02)				**Matrix: Water**		**Batch: 9120635**		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
cis-1,2-Dichloroethene	**2.51**	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12-Dup (A9L0164-02)				**Matrix: Water**		**Batch: 9120635**		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Tetrachloroethene (PCE)	**2.18**	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/19 18:26	EPA 8260C	
Trichloroethene (TCE)	**1.23**	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/19 18:26	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:26	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/19 18:26	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/07/19 18:26*	*EPA 8260C*	
Toluene-d8 (Surr)			*100 %*	*80-120 %*	*1*	*12/07/19 18:26*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/07/19 18:26*	*EPA 8260C*	
MW-2 (A9L0164-03)				**Matrix: Water**		**Batch: 9120635**		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	

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Lisa Domenighini, Client Services Manager

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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-2 (A9L0164-03)				**Matrix: Water**		**Batch: 9120635**		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/19 18:53	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/19 18:53	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/19 18:53	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/19 18:53	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*114 %*	*Limits:*	*80-120 %*	*12/07/19 18:53*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*		*80-120 %*	*12/07/19 18:53*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*		*80-120 %*	*12/07/19 18:53*	*EPA 8260C*	
MW-6 (A9L0164-04)				**Matrix: Water**		**Batch: 9120635**		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/19 19:20	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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9L0164-04)				**Matrix: Water**		**Batch: 9120635**		
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/19 19:20	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/19 19:20	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:20	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/19 19:20	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A9L0164-04)				**Matrix: Water**		**Batch: 9120635**		
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*115 %*	*Limits: 80-120 %*	*1*	*12/07/19 19:20*	*EPA 8260C*	
Toluene-d8 (Surr)			*101 %*	*80-120 %*	*1*	*12/07/19 19:20*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*98 %*	*80-120 %*	*1*	*12/07/19 19:20*	*EPA 8260C*	
MW-23i (A9L0164-05)				**Matrix: Water**		**Batch: 9120635**		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Methylene chloride	ND	---	5.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	

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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: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A9L0164-05)				**Matrix: Water**		**Batch: 9120635**		
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/19 19:46	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/19 19:46	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/19 19:46	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/19 19:46	EPA 8260C	
Surrogate: 1,4-Difluorobenzene (Surr)		*Recovery:*	*113 %*	*Limits: 80-120 %*	*1*	*12/07/19 19:46*	*EPA 8260C*	
Toluene-d8 (Surr)			*102 %*	*80-120 %*	*1*	*12/07/19 19:46*	*EPA 8260C*	
4-Bromofluorobenzene (Surr)			*100 %*	*80-120 %*	*1*	*12/07/19 19:46*	*EPA 8260C*	

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5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9L0164-01)				**Matrix: Water**			**Batch: 9120615**	
Ammonia as N	**22.8**	---	0.200	mg/L	10	12/06/19 15:14	SM 4500-NH3 G	
MW-12-Dup (A9L0164-02)				**Matrix: Water**			**Batch: 9120615**	
Ammonia as N	**20.2**	---	0.200	mg/L	10	12/06/19 15:16	SM 4500-NH3 G	
MW-2 (A9L0164-03)				**Matrix: Water**			**Batch: 9120615**	
Ammonia as N	**9.72**	---	0.0400	mg/L	2	12/06/19 15:17	SM 4500-NH3 G	
MW-6 (A9L0164-04)				**Matrix: Water**			**Batch: 9120615**	
Ammonia as N	**2.18**	---	0.0200	mg/L	1	12/06/19 15:19	SM 4500-NH3 G	
MW-23i (A9L0164-05)				**Matrix: Water**			**Batch: 9120615**	
Ammonia as N	ND	---	0.0200	mg/L	1	12/06/19 15:26	SM 4500-NH3 G	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9L0164-01)				**Matrix: Water**				
Batch: 9120599								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 16:15	EPA 300.0	
MW-12 (A9L0164-01RE1)				**Matrix: Water**				
Batch: 9120599								
Nitrate-Nitrogen	**36.4**	---	2.50	mg/L	10	12/06/19 19:29	EPA 300.0	
MW-12-Dup (A9L0164-02)				**Matrix: Water**				
Batch: 9120599								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 16:37	EPA 300.0	
MW-12-Dup (A9L0164-02RE1)				**Matrix: Water**				
Batch: 9120599								
Nitrate-Nitrogen	**35.6**	---	2.50	mg/L	10	12/06/19 19:51	EPA 300.0	
MW-2 (A9L0164-03)				**Matrix: Water**				
Batch: 9120599								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 16:58	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 16:58	EPA 300.0	
MW-6 (A9L0164-04)				**Matrix: Water**				
Batch: 9120599								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 18:03	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 18:03	EPA 300.0	
MW-23i (A9L0164-05)				**Matrix: Water**				
Batch: 9120599								
Nitrate-Nitrogen	**0.534**	---	0.250	mg/L	1	12/06/19 18:25	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/19 18:25	EPA 300.0	

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

ANALYTICAL SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A9L0164-01)				**Matrix: Water**		**Batch: 9120648**		
Total Organic Carbon	**23.8**	---	2.00	mg/L	2	12/09/19 20:51	SM 5310 C	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120635 - EPA 5030B							Water					
Blank (9120635-BLK1)		Prepared: 12/07/19 08:30			Analyzed: 12/07/19 10:51							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	5.00	ug/L	1	---	---	---	---	---	---	

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EPA ID: OR01039

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120635 - EPA 5030B							**Water**					
Blank (9120635-BLK1)		Prepared: 12/07/19 08:30		Analyzed: 12/07/19 10:51								
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery:*	*111 %*	*Limits:*	*80-120 %*		*Dilution:*	*1x*				
Toluene-d8 (Surr)			*101 %*		*80-120 %*			*"*				
4-Bromofluorobenzene (Surr)			*101 %*		*80-120 %*			*"*				
LCS (9120635-BS1)		Prepared: 12/07/19 08:30		Analyzed: 12/07/19 09:57								
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Bromochloromethane	24.6	---	1.00	ug/L	1	20.0	---	**123**	**80 - 120%**	---	---	Q-56
Bromodichloromethane	22.1	---	1.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
Bromoform	25.3	---	1.00	ug/L	1	20.0	---	**126**	**80 - 120%**	---	---	Q-56
Bromomethane	24.0	---	5.00	ug/L	1	20.0	---	120	80 - 120%	---	---	
Carbon tetrachloride	23.1	---	1.00	ug/L	1	20.0	---	115	80 - 120%	---	---	
Chlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80 - 120%	---	---	
Chloroethane	17.5	---	5.00	ug/L	1	20.0	---	87	80 - 120%	---	---	
Chloroform	21.4	---	1.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
Chloromethane	18.3	---	5.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
2-Chlorotoluene	19.1	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
4-Chlorotoluene	18.6	---	1.00	ug/L	1	20.0	---	93	80 - 120%	---	---	
Dibromochloromethane	25.6	---	1.00	ug/L	1	20.0	---	**128**	**80 - 120%**	---	---	Q-56
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
1,2-Dibromoethane (EDB)	20.0	---	0.500	ug/L	1	20.0	---	100	80 - 120%	---	---	
Dibromomethane	22.5	---	1.00	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	

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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

Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated 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 9120635 - EPA 5030B							**Water**					
LCS (9120635-BS1)		Prepared: 12/07/19 08:30		Analyzed: 12/07/19 09:57								
1,3-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80 - 120%	---	---	
Dichlorodifluoromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80 - 120%	---	---	
1,1-Dichloroethane	20.1	---	0.400	ug/L	1	20.0	---	100	80 - 120%	---	---	
1,2-Dichloroethane (EDC)	19.2	---	0.400	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1-Dichloroethene	19.7	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
cis-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80 - 120%	---	---	
trans-1,2-Dichloroethene	20.5	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80 - 120%	---	---	
1,3-Dichloropropane	19.5	---	1.00	ug/L	1	20.0	---	98	80 - 120%	---	---	
2,2-Dichloropropane	19.3	---	1.00	ug/L	1	20.0	---	96	80 - 120%	---	---	
1,1-Dichloropropene	19.8	---	1.00	ug/L	1	20.0	---	99	80 - 120%	---	---	
cis-1,3-Dichloropropene	18.7	---	1.00	ug/L	1	20.0	---	94	80 - 120%	---	---	
trans-1,3-Dichloropropene	18.5	---	1.00	ug/L	1	20.0	---	92	80 - 120%	---	---	
Hexachlorobutadiene	17.5	---	5.00	ug/L	1	20.0	---	87	80 - 120%	---	---	
Methylene chloride	22.0	---	5.00	ug/L	1	20.0	---	110	80 - 120%	---	---	
1,1,1,2-Tetrachloroethane	22.5	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
1,1,2,2-Tetrachloroethane	20.9	---	0.500	ug/L	1	20.0	---	104	80 - 120%	---	---	
Tetrachloroethene (PCE)	20.7	---	0.400	ug/L	1	20.0	---	103	80 - 120%	---	---	
1,2,3-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80 - 120%	---	---	
1,2,4-Trichlorobenzene	17.0	---	2.00	ug/L	1	20.0	---	85	80 - 120%	---	---	
1,1,1-Trichloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80 - 120%	---	---	
1,1,2-Trichloroethane	21.2	---	0.500	ug/L	1	20.0	---	106	80 - 120%	---	---	
Trichloroethene (TCE)	22.4	---	0.400	ug/L	1	20.0	---	112	80 - 120%	---	---	
Trichlorofluoromethane	21.4	---	2.00	ug/L	1	20.0	---	107	80 - 120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	101	80 - 120%	---	---	
Vinyl chloride	20.3	---	0.400	ug/L	1	20.0	---	102	80 - 120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		*Recovery: 108 %*		*Limits: 80-120 %*			*Dilution: 1x*					
Toluene-d8 (Surr)		*99 %*		*80-120 %*			*"*					
4-Bromofluorobenzene (Surr)		*96 %*		*80-120 %*			*"*					

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Cascadia Associates	Project: **Shore Terminal-Vancouver**	
5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120615 - Method Prep: Aq							Water					
Blank (9120615-BLK1)		Prepared: 12/06/19 11:59		Analyzed: 12/06/19 15:04								
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (9120615-BS1)		Prepared: 12/06/19 11:59		Analyzed: 12/06/19 15:05								
SM 4500-NH3 G												
Ammonia as N	2.02	---	0.0200	mg/L	1	2.00	---	101	90 - 110%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120599 - Method Prep: Aq							**Water**					
Blank (9120599-BLK1)		Prepared: 12/06/19 08:16		Analyzed: 12/06/19 15:32								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (9120599-BS1)		Prepared: 12/06/19 08:16		Analyzed: 12/06/19 15:54								
EPA 300.0												
Nitrate-Nitrogen	2.07	---	0.250	mg/L	1	2.00	---	104	90 - 110%	---	---	
Nitrite-Nitrogen	2.12	---	0.250	mg/L	1	2.00	---	106	90 - 110%	---	---	
Duplicate (9120599-DUP1)		Prepared: 12/06/19 08:16		Analyzed: 12/06/19 17:20								
QC Source Sample: MW-2 (A9L0164-03)												
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	10%	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Matrix Spike (9120599-MS1)		Prepared: 12/06/19 08:16		Analyzed: 12/06/19 17:42								
QC Source Sample: MW-2 (A9L0164-03)												
EPA 300.0												
Nitrate-Nitrogen	2.62	---	0.312	mg/L	1	2.50	ND	105	80 - 120%	---	---	
Nitrite-Nitrogen	2.68	---	0.312	mg/L	1	2.50	ND	107	80 - 120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 9120648 - Method Prep: Aq							**Water**					
Blank (9120648-BLK1)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 14:25								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (9120648-BS1)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 14:55								
SM 5310 C												
Total Organic Carbon	10.2	---	1.00	mg/L	1	10.0	---	102	85 - 115%	---	---	
LCS (9120648-BS2)		Prepared: 12/09/19 08:42		Analyzed: 12/09/19 13:56								
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		**85 - 115%**	---	---	TOC_I

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SAMPLE PREPARATION INFORMATION

Halogenated 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: 9120635							
A9L0164-01	Water	EPA 8260C	12/05/19 08:03	12/07/19 11:00	5mL/5mL	5mL/5mL	1.00
A9L0164-02	Water	EPA 8260C	12/05/19 08:03	12/07/19 11:00	5mL/5mL	5mL/5mL	1.00
A9L0164-03	Water	EPA 8260C	12/05/19 09:20	12/07/19 11:00	5mL/5mL	5mL/5mL	1.00
A9L0164-04	Water	EPA 8260C	12/05/19 10:07	12/07/19 11:00	5mL/5mL	5mL/5mL	1.00
A9L0164-05	Water	EPA 8260C	12/05/19 11:28	12/07/19 11:00	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120615							
A9L0164-01	Water	SM 4500-NH3 G	12/05/19 08:03	12/06/19 11:59	10mL/10mL	10mL/10mL	1.00
A9L0164-02	Water	SM 4500-NH3 G	12/05/19 08:03	12/06/19 11:59	10mL/10mL	10mL/10mL	1.00
A9L0164-03	Water	SM 4500-NH3 G	12/05/19 09:20	12/06/19 11:59	10mL/10mL	10mL/10mL	1.00
A9L0164-04	Water	SM 4500-NH3 G	12/05/19 10:07	12/06/19 11:59	10mL/10mL	10mL/10mL	1.00
A9L0164-05	Water	SM 4500-NH3 G	12/05/19 11:28	12/06/19 11:59	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120599							
A9L0164-01	Water	EPA 300.0	12/05/19 08:03	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-01RE1	Water	EPA 300.0	12/05/19 08:03	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-02	Water	EPA 300.0	12/05/19 08:03	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-02RE1	Water	EPA 300.0	12/05/19 08:03	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-03	Water	EPA 300.0	12/05/19 09:20	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-04	Water	EPA 300.0	12/05/19 10:07	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00
A9L0164-05	Water	EPA 300.0	12/05/19 11:28	12/06/19 08:16	5mL/5mL	5mL/5mL	1.00

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9120648							
A9L0164-01	Water	SM 5310 C	12/05/19 08:03	12/09/19 08:42	40mL/40mL	40mL/40mL	1.00

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5820 SW Kelly Ave Unit B	Project Number: **0060-002-004**	**Report ID:**
Portland, OR 97239	Project Manager: **Stephanie Salisbury**	**A9L0164 - 12 30 19 1145**

SAMPLE PREPARATION INFORMATION

Total Organic Carbon (Non-Purgeable) by Persulfate Oxidation by Standard Method 5310C

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QUALIFIER DEFINITIONS

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

Apex Laboratories

Q-56	Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
TOC_I	Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

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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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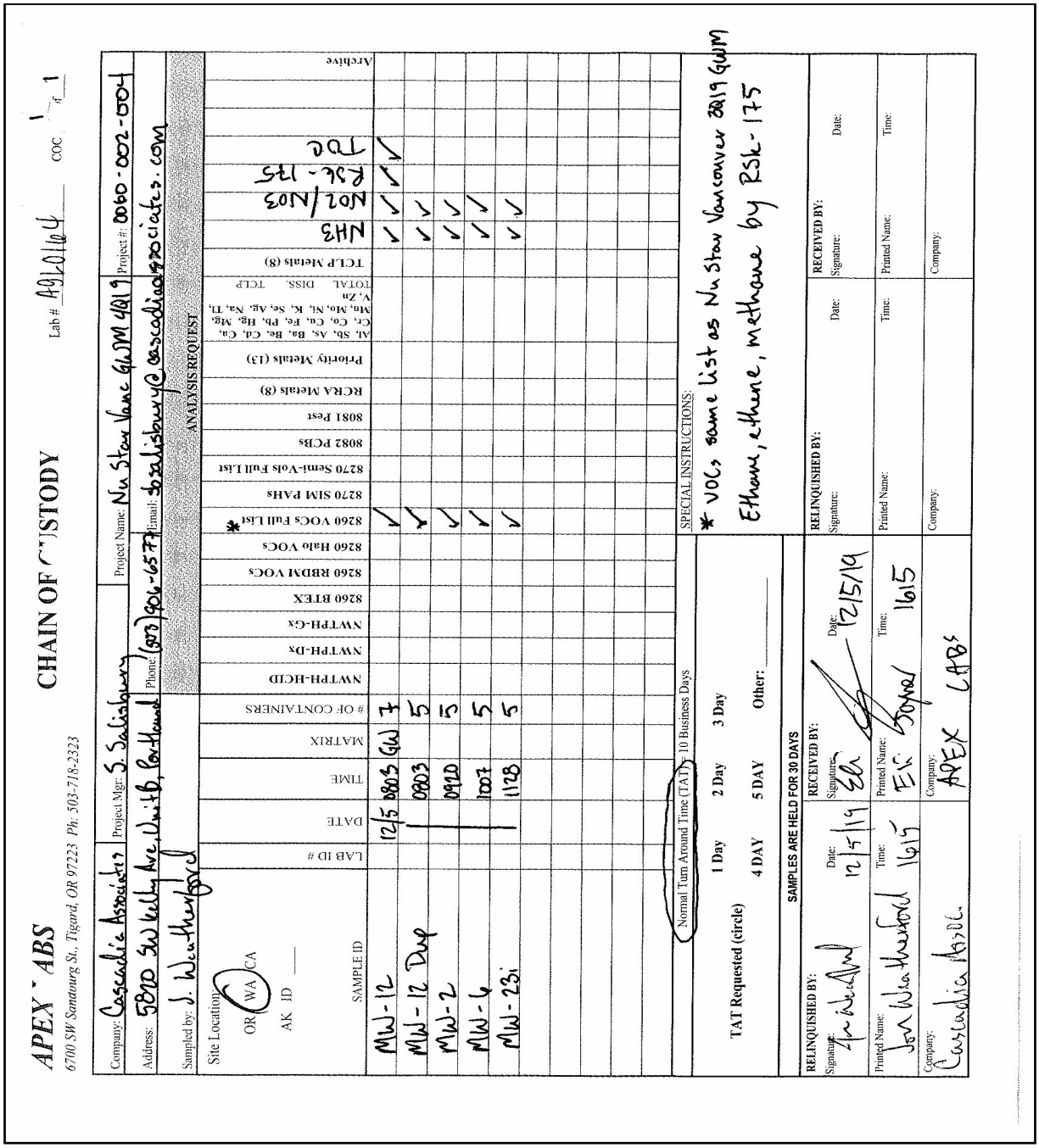

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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A9L0164

Project/Project #: NuStar Vanc GWM4Q2019 0060-002-004

Delivery Info:

Date/time received: 12/5/19 @ 1615 By: ET

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

Cooler Inspection Date/time inspected: 12/5/19 @ 1720 By: ET

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)	1.8						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	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: 12/5/19 @ 1733 By: ET

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 ___

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

Comments: ___

Additional information: ___

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

Apex Laboratories

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

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

AirTECHNOLOGY
Laboratories, Inc.

January 2, 2020

LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

Apex Laboratories
ATTN: Lisa Domenighini
6700 S.W. Sandburg Street
Tigard, OR 97223

LABORATORY TEST RESULTS

Project Reference: A9L0164
Lab Number: K121102-01

Enclosed are results for sample(s) received 12/11/19 by Air Technology Laboratories. Sample was received intact and chilled to 6° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

CFH
JS WAD 12/6/19

SUBCONTRACT ORDER

Apex Laboratories

A9L0164

K1211102-01

SENDING LABORATORY:

Apex Laboratories
6700 S.W. Sandburg Street
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 336-0745
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-12 **Water** **Sampled: 12/05/19 08:03** (A9L0164-01)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/18/19 17:00	12/19/19 08:03	
Containers Supplied:			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Standard TAT

6°C

Released By	Date	Received By	Date
12/10/19 1500		UPS (Shipper)	
UPS (Shipper)			
Released By	Date	Received By	Date
		12/11/19	1230

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A9L0164
Date Received: 12/11/19
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	K121102-01							
Client Sample I.D.:	MW-12 (A9L0164-01)							
Date/Time Sampled:	12/5/19 8:03							
Date/Time Analyzed:	12/17/19 12:17							
QC Batch No.:	191217GC8A1							
Analyst Initials:	CM							
Dilution Factor:	1.0							
ANALYTE	Result ug/L	RL ug/L						
Ethene	ND	1.0						
Ethane	1.2	1.0						
Methane	1,200	1.0						

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 1/2/20
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 191217GC8A1
Matrix: Water
Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	12/17/19 9:20			12/17/19 9:44		12/17/19 10:04					
Analyst Initials:	CM			CM		CM					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec.	High %Rec.	Max. RPD
Ethene	ND	1.0	1,150	**1,320**	115	**1,260**	110	4.8	**70**	**130**	30
Ethane	ND	1.0	1,230	**1,480**	121	**1,420**	116	4.3	**70**	**130**	30
Methane	ND	1.0	654	**786**	120	**753**	115	4.2	**70**	**130**	30

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 1/2/20
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-52078-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
5820 SW Kelly Ave
Suite B
Portland, Oregon 97239

Attn: Stephanie Salisbury

Authorized for release by:
7/15/2019 4:59:02 PM

Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

Table of Contents

Definitions/Glossary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Glossary

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

Case Narrative

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Job ID: 320-52078-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative
320-52078-1

Comments
No additional comments.

Receipt
The samples were received on 7/10/2019 9:07 AM; the samples arrived in good condition, properly preserved and, where required, on ice.

Air - GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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

Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Client Sample ID: SVE_South_PreCarbon_070819 — Lab Sample ID: 320-52078-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
cis-1,2-Dichloroethene	100		83		ug/m3 Air	52.5		TO-15	Total/NA
Tetrachloroethene	16000		140		ug/m3 Air	52.5		TO-15	Total/NA
Trichloroethene	530		110		ug/m3 Air	52.5		TO-15	Total/NA

Client Sample ID: SVE_South_PostCarbon_070819 — Lab Sample ID: 320-52078-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1-Dichloroethene	6.3		3.2		ug/m3 Air	1		TO-15	Total/NA
1,2,4-Trimethylbenzene	8.9		3.9		ug/m3 Air	1		TO-15	Total/NA
1,2-Dichlorobenzene	7.3		2.4		ug/m3 Air	1		TO-15	Total/NA
1,3,5-Trimethylbenzene	4.3		2.0		ug/m3 Air	1		TO-15	Total/NA
1,3-Dichlorobenzene	6.6		2.4		ug/m3 Air	1		TO-15	Total/NA
1,4-Dichlorobenzene	6.8		2.4		ug/m3 Air	1		TO-15	Total/NA
2-Butanone (MEK)	5.0		2.4		ug/m3 Air	1		TO-15	Total/NA
2-Hexanone	1.6		1.6		ug/m3 Air	1		TO-15	Total/NA
4-Ethyltoluene	4.2		2.0		ug/m3 Air	1		TO-15	Total/NA
Acetone	23		12		ug/m3 Air	1		TO-15	Total/NA
Chloromethane	2.6		1.7		ug/m3 Air	1		TO-15	Total/NA
Dichlorodifluoromethane	2.5		2.0		ug/m3 Air	1		TO-15	Total/NA
Methylene Chloride	1.6		1.4		ug/m3 Air	1		TO-15	Total/NA
o-Xylene	1.7		1.7		ug/m3 Air	1		TO-15	Total/NA
Styrene	2.1		1.7		ug/m3 Air	1		TO-15	Total/NA
Tetrachloroethene	7.9		2.7		ug/m3 Air	1		TO-15	Total/NA
Trichlorofluoromethane	3.6		2.2		ug/m3 Air	1		TO-15	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Client Sample ID: SVE_South_PreCarbon_070819
Date Collected: 07/08/19 08:36
Date Received: 07/10/19 09:07
Sample Container: Summa Canister 6L

Lab Sample ID: 320-52078-1
Matrix: Air

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		86		ug/m3 Air			07/13/19 03:29	52.5
1,1,2,2-Tetrachloroethane	ND		140		ug/m3 Air			07/13/19 03:29	52.5
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		160		ug/m3 Air			07/13/19 03:29	52.5
1,1,2-Trichloroethane	ND		110		ug/m3 Air			07/13/19 03:29	52.5
1,1-Dichloroethane	ND		64		ug/m3 Air			07/13/19 03:29	52.5
1,1-Dichloroethene	ND		170		ug/m3 Air			07/13/19 03:29	52.5
1,2,4-Trichlorobenzene	ND		780		ug/m3 Air			07/13/19 03:29	52.5
1,2,4-Trimethylbenzene	ND		210		ug/m3 Air			07/13/19 03:29	52.5
1,2-Dibromoethane (EDB)	ND		320		ug/m3 Air			07/13/19 03:29	52.5
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		150		ug/m3 Air			07/13/19 03:29	52.5
1,2-Dichlorobenzene	ND		130		ug/m3 Air			07/13/19 03:29	52.5
1,2-Dichloroethane	ND		170		ug/m3 Air			07/13/19 03:29	52.5
1,2-Dichloropropane	ND		97		ug/m3 Air			07/13/19 03:29	52.5
1,3,5-Trimethylbenzene	ND		100		ug/m3 Air			07/13/19 03:29	52.5
1,3-Dichlorobenzene	ND		130		ug/m3 Air			07/13/19 03:29	52.5
1,4-Dichlorobenzene	ND		130		ug/m3 Air			07/13/19 03:29	52.5
2-Butanone (MEK)	ND		120		ug/m3 Air			07/13/19 03:29	52.5
2-Hexanone	ND		86		ug/m3 Air			07/13/19 03:29	52.5
4-Ethyltoluene	ND		100		ug/m3 Air			07/13/19 03:29	52.5
4-Methyl-2-pentanone (MIBK)	ND		86		ug/m3 Air			07/13/19 03:29	52.5
Acetone	ND		620		ug/m3 Air			07/13/19 03:29	52.5
Benzene	ND		67		ug/m3 Air			07/13/19 03:29	52.5
Benzyl chloride	ND		220		ug/m3 Air			07/13/19 03:29	52.5
Bromodichloromethane	ND		110		ug/m3 Air			07/13/19 03:29	52.5
Bromoform	ND		220		ug/m3 Air			07/13/19 03:29	52.5
Bromomethane	ND		160		ug/m3 Air			07/13/19 03:29	52.5
Carbon disulfide	ND		130		ug/m3 Air			07/13/19 03:29	52.5
Carbon tetrachloride	ND		260		ug/m3 Air			07/13/19 03:29	52.5
Chlorobenzene	ND		73		ug/m3 Air			07/13/19 03:29	52.5
Chloroethane	ND		110		ug/m3 Air			07/13/19 03:29	52.5
Chloroform	ND		77		ug/m3 Air			07/13/19 03:29	52.5
Chloromethane	ND		87		ug/m3 Air			07/13/19 03:29	52.5
cis-1,2-Dichloroethene	**100**		83		ug/m3 Air			07/13/19 03:29	52.5
cis-1,3-Dichloropropene	ND		95		ug/m3 Air			07/13/19 03:29	52.5
Dibromochloromethane	ND		180		ug/m3 Air			07/13/19 03:29	52.5
Dichlorodifluoromethane	ND		100		ug/m3 Air			07/13/19 03:29	52.5
Ethylbenzene	ND		91		ug/m3 Air			07/13/19 03:29	52.5
Hexachlorobutadiene	ND		1100		ug/m3 Air			07/13/19 03:29	52.5
m,p-Xylene	ND		180		ug/m3 Air			07/13/19 03:29	52.5
Methylene Chloride	ND		73		ug/m3 Air			07/13/19 03:29	52.5
o-Xylene	ND		91		ug/m3 Air			07/13/19 03:29	52.5
Styrene	ND		89		ug/m3 Air			07/13/19 03:29	52.5
Tetrachloroethene	**16000**		140		ug/m3 Air			07/13/19 03:29	52.5
Toluene	ND		79		ug/m3 Air			07/13/19 03:29	52.5
trans-1,2-Dichloroethene	ND		83		ug/m3 Air			07/13/19 03:29	52.5
trans-1,3-Dichloropropene	ND		95		ug/m3 Air			07/13/19 03:29	52.5
Trichloroethene	**530**		110		ug/m3 Air			07/13/19 03:29	52.5
Trichlorofluoromethane	ND		120		ug/m3 Air			07/13/19 03:29	52.5

Client Sample ID: SVE_South_PreCarbon_070819

Lab Sample ID: 320-52078-1

Date Collected: 07/08/19 08:36
Matrix: Air
Date Received: 07/10/19 09:07
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		150		ug/m3 Air			07/13/19 03:29	52.5
Vinyl chloride	ND		54		ug/m3 Air			07/13/19 03:29	52.5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*115*		*70 - 130*		*07/13/19 03:29*	*52.5*
4-Bromofluorobenzene (Surr)	*83*		*70 - 130*		*07/13/19 03:29*	*52.5*
Toluene-d8 (Surr)	*100*		*70 - 130*		*07/13/19 03:29*	*52.5*

Client Sample ID: SVE_South_PostCarbon_070819

Lab Sample ID: 320-52078-2

Date Collected: 07/08/19 08:56
Matrix: Air
Date Received: 07/10/19 09:07
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			07/13/19 04:25	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			07/13/19 04:25	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			07/13/19 04:25	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			07/13/19 04:25	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			07/13/19 04:25	1
1,1-Dichloroethene	**6.3**		3.2		ug/m3 Air			07/13/19 04:25	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			07/13/19 04:25	1
1,2,4-Trimethylbenzene	**8.9**		3.9		ug/m3 Air			07/13/19 04:25	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			07/13/19 04:25	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			07/13/19 04:25	1
1,2-Dichlorobenzene	**7.3**		2.4		ug/m3 Air			07/13/19 04:25	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			07/13/19 04:25	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			07/13/19 04:25	1
1,3,5-Trimethylbenzene	**4.3**		2.0		ug/m3 Air			07/13/19 04:25	1
1,3-Dichlorobenzene	**6.6**		2.4		ug/m3 Air			07/13/19 04:25	1
1,4-Dichlorobenzene	**6.8**		2.4		ug/m3 Air			07/13/19 04:25	1
2-Butanone (MEK)	**5.0**		2.4		ug/m3 Air			07/13/19 04:25	1
2-Hexanone	**1.6**		1.6		ug/m3 Air			07/13/19 04:25	1
4-Ethyltoluene	**4.2**		2.0		ug/m3 Air			07/13/19 04:25	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			07/13/19 04:25	1
Acetone	**23**		12		ug/m3 Air			07/13/19 04:25	1
Benzene	ND		1.3		ug/m3 Air			07/13/19 04:25	1
Benzyl chloride	ND		4.1		ug/m3 Air			07/13/19 04:25	1
Bromodichloromethane	ND		2.0		ug/m3 Air			07/13/19 04:25	1
Bromoform	ND		4.1		ug/m3 Air			07/13/19 04:25	1
Bromomethane	ND		3.1		ug/m3 Air			07/13/19 04:25	1
Carbon disulfide	ND		2.5		ug/m3 Air			07/13/19 04:25	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			07/13/19 04:25	1
Chlorobenzene	ND		1.4		ug/m3 Air			07/13/19 04:25	1
Chloroethane	ND		2.1		ug/m3 Air			07/13/19 04:25	1
Chloroform	ND		1.5		ug/m3 Air			07/13/19 04:25	1
Chloromethane	**2.6**		1.7		ug/m3 Air			07/13/19 04:25	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			07/13/19 04:25	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			07/13/19 04:25	1

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Client Sample ID: SVE_South_PostCarbon_070819
Date Collected: 07/08/19 08:56
Date Received: 07/10/19 09:07
Sample Container: Summa Canister 6L

Lab Sample ID: 320-52078-2
Matrix: Air

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibromochloromethane	ND		3.4		ug/m3 Air			07/13/19 04:25	1
Dichlorodifluoromethane	**2.5**		2.0		ug/m3 Air			07/13/19 04:25	1
Ethylbenzene	ND		1.7		ug/m3 Air			07/13/19 04:25	1
Hexachlorobutadiene	ND		21		ug/m3 Air			07/13/19 04:25	1
m,p-Xylene	ND		3.5		ug/m3 Air			07/13/19 04:25	1
Methylene Chloride	**1.6**		1.4		ug/m3 Air			07/13/19 04:25	1
o-Xylene	**1.7**		1.7		ug/m3 Air			07/13/19 04:25	1
Styrene	**2.1**		1.7		ug/m3 Air			07/13/19 04:25	1
Tetrachloroethene	**7.9**		2.7		ug/m3 Air			07/13/19 04:25	1
Toluene	ND		1.5		ug/m3 Air			07/13/19 04:25	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			07/13/19 04:25	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			07/13/19 04:25	1
Trichloroethene	ND		2.1		ug/m3 Air			07/13/19 04:25	1
Trichlorofluoromethane	**3.6**		2.2		ug/m3 Air			07/13/19 04:25	1
Vinyl acetate	ND		2.8		ug/m3 Air			07/13/19 04:25	1
Vinyl chloride	ND		1.0		ug/m3 Air			07/13/19 04:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*113*		*70 - 130*		*07/13/19 04:25*	*1*
4-Bromofluorobenzene (Surr)	*116*		*70 - 130*		*07/13/19 04:25*	*1*
Toluene-d8 (Surr)	*96*		*70 - 130*		*07/13/19 04:25*	*1*

Surrogate Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Matrix: Air

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)		
Lab Sample ID	Client Sample ID	DCA (70-130)	BFB (70-130)	TOL (70-130)
320-52078-1	SVE_South_PreCarbon_070819	115	83	100
320-52078-2	SVE_South_PostCarbon_070819	113	116	96
LCS 320-307205/3	Lab Control Sample	112	109	110
LCSD 320-307205/4	Lab Control Sample Dup	110	107	111
MB 320-307205/7	Method Blank	107	89	112

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
TOL = Toluene-d8 (Surr)

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 320-307205/7
Matrix: Air
Analysis Batch: 307205

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			07/12/19 14:56	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			07/12/19 14:56	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			07/12/19 14:56	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			07/12/19 14:56	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			07/12/19 14:56	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			07/12/19 14:56	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			07/12/19 14:56	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			07/12/19 14:56	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			07/12/19 14:56	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			07/12/19 14:56	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			07/12/19 14:56	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			07/12/19 14:56	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			07/12/19 14:56	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			07/12/19 14:56	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			07/12/19 14:56	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			07/12/19 14:56	1
2-Butanone (MEK)	ND		2.4		ug/m3 Air			07/12/19 14:56	1
2-Hexanone	ND		1.6		ug/m3 Air			07/12/19 14:56	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			07/12/19 14:56	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			07/12/19 14:56	1
Acetone	ND		12		ug/m3 Air			07/12/19 14:56	1
Benzene	ND		1.3		ug/m3 Air			07/12/19 14:56	1
Benzyl chloride	ND		4.1		ug/m3 Air			07/12/19 14:56	1
Bromodichloromethane	ND		2.0		ug/m3 Air			07/12/19 14:56	1
Bromoform	ND		4.1		ug/m3 Air			07/12/19 14:56	1
Bromomethane	ND		3.1		ug/m3 Air			07/12/19 14:56	1
Carbon disulfide	ND		2.5		ug/m3 Air			07/12/19 14:56	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			07/12/19 14:56	1
Chlorobenzene	ND		1.4		ug/m3 Air			07/12/19 14:56	1
Chloroethane	ND		2.1		ug/m3 Air			07/12/19 14:56	1
Chloroform	ND		1.5		ug/m3 Air			07/12/19 14:56	1
Chloromethane	ND		1.7		ug/m3 Air			07/12/19 14:56	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			07/12/19 14:56	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			07/12/19 14:56	1
Dibromochloromethane	ND		3.4		ug/m3 Air			07/12/19 14:56	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			07/12/19 14:56	1
Ethylbenzene	ND		1.7		ug/m3 Air			07/12/19 14:56	1
Hexachlorobutadiene	ND		21		ug/m3 Air			07/12/19 14:56	1
m,p-Xylene	ND		3.5		ug/m3 Air			07/12/19 14:56	1
Methylene Chloride	ND		1.4		ug/m3 Air			07/12/19 14:56	1
o-Xylene	ND		1.7		ug/m3 Air			07/12/19 14:56	1
Styrene	ND		1.7		ug/m3 Air			07/12/19 14:56	1
Tetrachloroethene	ND		2.7		ug/m3 Air			07/12/19 14:56	1
Toluene	ND		1.5		ug/m3 Air			07/12/19 14:56	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			07/12/19 14:56	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			07/12/19 14:56	1
Trichloroethene	ND		2.1		ug/m3 Air			07/12/19 14:56	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			07/12/19 14:56	1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-307205/7
Matrix: Air
Analysis Batch: 307205

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			07/12/19 14:56	1
Vinyl chloride	ND		1.0		ug/m3 Air			07/12/19 14:56	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*107*		*70 - 130*		*07/12/19 14:56*	*1*
4-Bromofluorobenzene (Surr)	*89*		*70 - 130*		*07/12/19 14:56*	*1*
Toluene-d8 (Surr)	*112*		*70 - 130*		*07/12/19 14:56*	*1*

Lab Sample ID: LCS 320-307205/3
Matrix: Air
Analysis Batch: 307205

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	115	128		ug/m3 Air		110	69 - 129
1,1,2,2-Tetrachloroethane	146	126		ug/m3 Air		87	64 - 124
1,1,2-Trichloro-1,2,2-trifluoroethane	162	153		ug/m3 Air		94	70 - 130
1,1,2-Trichloroethane	116	109		ug/m3 Air		94	64 - 124
1,1-Dichloroethane	86.0	79.9		ug/m3 Air		93	71 - 131
1,1-Dichloroethene	84.3	79.5		ug/m3 Air		94	72 - 132
1,2,4-Trichlorobenzene	156	152		ug/m3 Air		98	58 - 138
1,2,4-Trimethylbenzene	104	97.8		ug/m3 Air		94	60 - 132
1,2-Dibromoethane (EDB)	162	158		ug/m3 Air		97	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	147	138		ug/m3 Air		94	74 - 134
1,2-Dichlorobenzene	127	132		ug/m3 Air		104	62 - 126
1,2-Dichloroethane	86.1	98.3		ug/m3 Air		114	71 - 131
1,2-Dichloropropane	97.6	115		ug/m3 Air		117	72 - 132
1,3,5-Trimethylbenzene	104	93.1		ug/m3 Air		90	65 - 125
1,3-Dichlorobenzene	126	133		ug/m3 Air		106	59 - 130
1,4-Dichlorobenzene	128	139		ug/m3 Air		109	58 - 132
2-Butanone (MEK)	62.5	58.3		ug/m3 Air		93	73 - 133
2-Hexanone	86.3	70.4		ug/m3 Air		82	69 - 129
4-Ethyltoluene	103	96.6		ug/m3 Air		94	66 - 129
4-Methyl-2-pentanone (MIBK)	86.4	74.2		ug/m3 Air		86	74 - 134
Acetone	50.3	51.6		ug/m3 Air		103	65 - 125
Benzene	68.0	64.3		ug/m3 Air		95	68 - 128
Benzyl chloride	109	92.0		ug/m3 Air		85	67 - 127
Bromodichloromethane	141	161		ug/m3 Air		114	71 - 131
Bromoform	218	235		ug/m3 Air		108	66 - 126
Bromomethane	82.1	74.1		ug/m3 Air		90	73 - 134
Carbon disulfide	65.8	57.6		ug/m3 Air		88	71 - 131
Carbon tetrachloride	133	153		ug/m3 Air		115	63 - 126
Chlorobenzene	97.5	94.4		ug/m3 Air		97	63 - 123
Chloroethane	55.8	47.4		ug/m3 Air		85	73 - 133
Chloroform	104	103		ug/m3 Air		100	70 - 130
Chloromethane	43.5	35.9		ug/m3 Air		82	61 - 140
cis-1,2-Dichloroethene	83.9	75.9		ug/m3 Air		90	70 - 130
cis-1,3-Dichloropropene	99.9	107		ug/m3 Air		107	72 - 132

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-307205/3
Matrix: Air
Analysis Batch: 307205

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibromochloromethane	180	190		ug/m3 Air		106	66 - 126
Dichlorodifluoromethane	104	102		ug/m3 Air		97	69 - 129
Ethylbenzene	91.6	86.4		ug/m3 Air		94	64 - 124
Hexachlorobutadiene	224	213		ug/m3 Air		95	58 - 131
m,p-Xylene	183	177		ug/m3 Air		97	65 - 125
Methylene Chloride	73.4	64.5		ug/m3 Air		88	67 - 127
o-Xylene	91.7	87.3		ug/m3 Air		95	65 - 125
Styrene	90.2	87.0		ug/m3 Air		96	67 - 127
Tetrachloroethene	144	141		ug/m3 Air		98	63 - 123
Toluene	79.8	79.0		ug/m3 Air		99	68 - 128
trans-1,2-Dichloroethene	83.7	80.0		ug/m3 Air		96	72 - 132
trans-1,3-Dichloropropene	93.4	95.4		ug/m3 Air		102	66 - 126
Trichloroethene	114	115		ug/m3 Air		101	70 - 130
Trichlorofluoromethane	118	121		ug/m3 Air		103	71 - 131
Vinyl acetate	77.5	78.9		ug/m3 Air		102	65 - 134
Vinyl chloride	54.0	45.6		ug/m3 Air		84	59 - 152

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*112*		*70 - 130*
4-Bromofluorobenzene (Surr)	*109*		*70 - 130*
Toluene-d8 (Surr)	*110*		*70 - 130*

Lab Sample ID: LCSD 320-307205/4
Matrix: Air
Analysis Batch: 307205

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1-Trichloroethane	115	126		ug/m3 Air		109	69 - 129	1	25
1,1,2,2-Tetrachloroethane	146	125		ug/m3 Air		86	64 - 124	1	25
1,1,2-Trichloro-1,2,2-trifluoroethane	162	154		ug/m3 Air		95	70 - 130	1	25
1,1,2-Trichloroethane	116	108		ug/m3 Air		93	64 - 124	1	25
1,1-Dichloroethane	86.0	80.6		ug/m3 Air		94	71 - 131	1	25
1,1-Dichloroethene	84.3	78.5		ug/m3 Air		93	72 - 132	1	25
1,2,4-Trichlorobenzene	156	151		ug/m3 Air		97	58 - 138	1	25
1,2,4-Trimethylbenzene	104	94.8		ug/m3 Air		91	60 - 132	3	25
1,2-Dibromoethane (EDB)	162	156		ug/m3 Air		96	64 - 124	1	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	147	137		ug/m3 Air		93	74 - 134	1	25
1,2-Dichlorobenzene	127	125		ug/m3 Air		98	62 - 126	6	25
1,2-Dichloroethane	86.1	94.5		ug/m3 Air		110	71 - 131	4	25
1,2-Dichloropropane	97.6	110		ug/m3 Air		113	72 - 132	4	25
1,3,5-Trimethylbenzene	104	88.5		ug/m3 Air		85	65 - 125	5	25
1,3-Dichlorobenzene	126	127		ug/m3 Air		101	59 - 130	5	25
1,4-Dichlorobenzene	128	132		ug/m3 Air		103	58 - 132	5	25
2-Butanone (MEK)	62.5	60.6		ug/m3 Air		97	73 - 133	4	25
2-Hexanone	86.3	71.5		ug/m3 Air		83	69 - 129	1	25
4-Ethyltoluene	103	91.8		ug/m3 Air		89	66 - 129	5	25
4-Methyl-2-pentanone (MIBK)	86.4	69.2		ug/m3 Air		80	74 - 134	7	25

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-307205/4
Matrix: Air
Analysis Batch: 307205

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Acetone			50.3	51.8		ug/m3 Air		103	65 - 125	0	25
Benzene			68.0	64.5		ug/m3 Air		95	68 - 128	0	25
Benzyl chloride			109	86.0		ug/m3 Air		79	67 - 127	7	25
Bromodichloromethane			141	155		ug/m3 Air		110	71 - 131	3	25
Bromoform			218	229		ug/m3 Air		105	66 - 126	3	25
Bromomethane			82.1	74.1		ug/m3 Air		90	73 - 134	0	25
Carbon disulfide			65.8	58.2		ug/m3 Air		88	71 - 131	1	25
Carbon tetrachloride			133	149		ug/m3 Air		112	63 - 126	3	25
Chlorobenzene			97.5	92.6		ug/m3 Air		95	63 - 123	2	25
Chloroethane			55.8	47.7		ug/m3 Air		85	73 - 133	1	25
Chloroform			104	103		ug/m3 Air		100	70 - 130	0	25
Chloromethane			43.5	35.1		ug/m3 Air		81	61 - 140	2	25
cis-1,2-Dichloroethene			83.9	76.7		ug/m3 Air		91	70 - 130	1	25
cis-1,3-Dichloropropene			99.9	105		ug/m3 Air		106	72 - 132	1	25
Dibromochloromethane			180	186		ug/m3 Air		103	66 - 126	2	25
Dichlorodifluoromethane			104	97.9		ug/m3 Air		94	69 - 129	4	25
Ethylbenzene			91.6	84.9		ug/m3 Air		93	64 - 124	2	25
Hexachlorobutadiene			224	206		ug/m3 Air		92	58 - 131	3	25
m,p-Xylene			183	174		ug/m3 Air		95	65 - 125	2	25
Methylene Chloride			73.4	63.1		ug/m3 Air		86	67 - 127	2	25
o-Xylene			91.7	86.5		ug/m3 Air		94	65 - 125	1	25
Styrene			90.2	85.4		ug/m3 Air		95	67 - 127	2	25
Tetrachloroethene			144	137		ug/m3 Air		95	63 - 123	3	25
Toluene			79.8	79.4		ug/m3 Air		99	68 - 128	1	25
trans-1,2-Dichloroethene			83.7	79.6		ug/m3 Air		95	72 - 132	0	25
trans-1,3-Dichloropropene			93.4	92.7		ug/m3 Air		99	66 - 126	3	25
Trichloroethene			114	116		ug/m3 Air		101	70 - 130	0	25
Trichlorofluoromethane			118	118		ug/m3 Air		100	71 - 131	3	25
Vinyl acetate			77.5	77.9		ug/m3 Air		101	65 - 134	1	25
Vinyl chloride			54.0	45.3		ug/m3 Air		84	59 - 152	1	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*110*		*70 - 130*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*
Toluene-d8 (Surr)	*111*		*70 - 130*

QC Association Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Air - GC/MS VOA

Analysis Batch: 307205

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-52078-1	SVE_South_PreCarbon_070819	Total/NA	Air	TO-15	
320-52078-2	SVE_South_PostCarbon_070819	Total/NA	Air	TO-15	
MB 320-307205/7	Method Blank	Total/NA	Air	TO-15	
LCS 320-307205/3	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-307205/4	Lab Control Sample Dup	Total/NA	Air	TO-15	

Lab Chronicle

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Client Sample ID: SVE_South_PreCarbon_070819

Lab Sample ID: 320-52078-1

Date Collected: 07/08/19 08:36

Matrix: Air

Date Received: 07/10/19 09:07

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		52.5	6.25 mL	250 mL	307205	07/13/19 03:29	AP1	TAL SAC

Client Sample ID: SVE_South_PostCarbon_070819

Lab Sample ID: 320-52078-2

Date Collected: 07/08/19 08:56

Matrix: Air

Date Received: 07/10/19 09:07

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		1	411 mL	250 mL	307205	07/13/19 04:25	AP1	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Laboratory: Eurofins TestAmerica, Sacramento

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-020	01-20-21
ANAB	DoD		L2468	01-20-21
ANAB	DOE		L2468.01	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-20
California	State Program	9	2897	01-31-20
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State		PH-0691	06-30-21
Connecticut	State Program	1	PH-0691	06-30-21
Florida	NELAP	4	E87570	06-30-20
Florida	NELAP		E87570	06-30-20
Hawaii	State Program	9	N/A	01-29-20
Illinois	NELAP	5	200060	03-17-19 *
Kansas	NELAP	7	E-10375	10-31-19
Louisiana	NELAP	6	30612	06-30-20
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-20-20
New York	NELAP	2	11666	04-01-20
Oregon	NELAP	10	4040	01-29-20
Oregon	NELAP		4040	01-29-20
Pennsylvania	NELAP	3	68-01272	03-31-20
Pennsylvania	NELAP		68-01272	03-31-20
Texas	NELAP	6	T104704399	05-31-20
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-29-20
Vermont	State Program	1	VT-4040	04-16-20
Virginia	NELAP	3	460278	03-14-20
Washington	State Program	10	C581	05-05-20
West Virginia (DW)	State Program	3	9930C	12-31-19
Wyoming	State Program	8	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Laboratory: Eurofins TestAmerica, Seattle

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

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-024	01-19-20
ANAB	Dept. of Defense ELAP		L2236	01-19-22
ANAB	DoD		L2236	01-19-22
ANAB	ISO/IEC 17025		L2236	01-19-22
ANAB	ISO/IEC 17025		L2236	01-19-22
California	State Program	9	2901	11-05-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-19
Oregon	NELAP		WA100007	11-05-19
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-20

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-52078-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
320-52078-1	SVE_South_PreCarbon_070819	Air	07/08/19 08:36	07/10/19 09:07	Air Canister (6-Liter) #34000177
320-52078-2	SVE_South_PostCarbon_070819	Air	07/08/19 08:56	07/10/19 09:07	Air Canister (6-Liter) #8275

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	Client Project Manager: Stephanie Salisbury	Samples Collected By: J Weatherford	COC No: 1 of 1 COCs
Company Name: Cascadia Associates	Phone: (503) 906-6577 x110		
Address: 5820 SW Kelly Ave	Email: ssalisbury@cascadiaassociates.com		
City/State/Zip: Portland, OR 97239	Site Contact:		For Lab Use Only: Walk-in Client: Lab Sampling:
Phone: (503) 906-6577	Tel/Fax		
FAX:	Anaylsis Turnaround Time		Job / SDG No.:
Project Name: NuStar	Standard (Specific): X		(See below for Add'l Items)
Site/Location: Vancouver Main	Rush (Specify):		
P O #			

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Type	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE_South-PreCarbon_070819	7/8/19	0835	7/8/19	0836	-30	-1	3400017		X														
SVE_South_PostCarbon_070819	7/8/19	0835	7/8/19	0836	-30	-2	8275		X														

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

320-52078 Chain of Custody

Special Instructions/QC Requirements & Comments:
Email Results to ssalisbury@cascadiaassociates.com

Samples Shipped by: Jon Weatherford	Date / Time: 7/8/19 1200	Samples Received by:	
Samples Relinquished by:	Date / Time:	Received by: Gabriella Iliev 9:07	7/10/19 ETP-SAC
Relinquished by:	Date / Time:	Received by:	
Lab Use Only: Shipper Name:	Opened by:	Condition:	

Form No. CA-C-WI-003, Rev. 2.9, dated 9/5/2018

Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-52078-1

Login Number: 52078
List Number: 1
Creator: Iliev, Gabriela K

List Source: Eurofins TestAmerica, Sacramento

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

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-54161-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
5820 SW Kelly Ave
Suite B
Portland, Oregon 97239

Attn: Stephanie Salisbury

Authorized for release by:
10/3/2019 4:09:07 PM

Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

Table of Contents

Definitions/Glossary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Qualifiers

Air - GC/MS VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.

Glossary

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

Job ID: 320-54161-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative
320-54161-1

Comments
No additional comments.

Receipt
The samples were received on 9/11/2019 12:46 PM; the samples arrived in good condition, properly preserved and, where required, on ice.

Air - GC/MS VOA
Method(s) TO-15: The continuing calibration verification (CCV) associated with batch 320-327435 recovered above the upper control limit Hexachlorobutadiene. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The following samples are impacted: SVE_South_Post Carbon-090919 (320-54161-1), SVE_South_Pre Carbon-090919 (320-54161-2), (CCVIS 320-327435/2) and (MB 320-327435/9).

Method(s) TO-15: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for analytical batch 320-327435 recovered outside control limits for the following analytes: Hexachlorobutadiene. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

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

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

Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Client Sample ID: SVE_South_Post Carbon-090919 — Lab Sample ID: 320-54161-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1-Dichloroethane	2.8		1.2		ug/m3 Air	1		TO-15	Total/NA
1,1-Dichloroethene	3.6		3.2		ug/m3 Air	1		TO-15	Total/NA
2-Butanone (MEK)	7.8		2.4		ug/m3 Air	1		TO-15	Total/NA
2-Hexanone	1.6		1.6		ug/m3 Air	1		TO-15	Total/NA
Acetone	22		12		ug/m3 Air	1		TO-15	Total/NA
Carbon disulfide	88		2.5		ug/m3 Air	1		TO-15	Total/NA
cis-1,2-Dichloroethene	160		1.6		ug/m3 Air	1		TO-15	Total/NA
trans-1,2-Dichloroethene	9.1		1.6		ug/m3 Air	1		TO-15	Total/NA

Client Sample ID: SVE_South_Pre Carbon-090919 — Lab Sample ID: 320-54161-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1,1-Trichloroethane	48		38		ug/m3 Air	23.3		TO-15	Total/NA
cis-1,2-Dichloroethene	120		37		ug/m3 Air	23.3		TO-15	Total/NA
Tetrachloroethene	15000		79		ug/m3 Air	29.1		TO-15	Total/NA
Trichloroethene	590		50		ug/m3 Air	23.3		TO-15	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Client Sample ID: SVE_South_Post Carbon-090919
Lab Sample ID: 320-54161-1
Date Collected: 09/09/19 08:06
Matrix: Air
Date Received: 09/11/19 12:46
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			10/01/19 23:29	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			10/01/19 23:29	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			10/01/19 23:29	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			10/01/19 23:29	1
1,1-Dichloroethane	**2.8**		1.2		ug/m3 Air			10/01/19 23:29	1
1,1-Dichloroethene	**3.6**		3.2		ug/m3 Air			10/01/19 23:29	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			10/01/19 23:29	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			10/01/19 23:29	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			10/01/19 23:29	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			10/01/19 23:29	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 23:29	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			10/01/19 23:29	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			10/01/19 23:29	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			10/01/19 23:29	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 23:29	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 23:29	1
2-Butanone (MEK)	**7.8**		2.4		ug/m3 Air			10/01/19 23:29	1
2-Hexanone	**1.6**		1.6		ug/m3 Air			10/01/19 23:29	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			10/01/19 23:29	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			10/01/19 23:29	1
Acetone	**22**		12		ug/m3 Air			10/01/19 23:29	1
Benzene	ND		1.3		ug/m3 Air			10/01/19 23:29	1
Benzyl chloride	ND		4.1		ug/m3 Air			10/01/19 23:29	1
Bromodichloromethane	ND		2.0		ug/m3 Air			10/01/19 23:29	1
Bromoform	ND		4.1		ug/m3 Air			10/01/19 23:29	1
Bromomethane	ND		3.1		ug/m3 Air			10/01/19 23:29	1
Carbon disulfide	**88**		2.5		ug/m3 Air			10/01/19 23:29	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			10/01/19 23:29	1
Chlorobenzene	ND		1.4		ug/m3 Air			10/01/19 23:29	1
Chloroethane	ND		2.1		ug/m3 Air			10/01/19 23:29	1
Chloroform	ND		1.5		ug/m3 Air			10/01/19 23:29	1
Chloromethane	ND		1.7		ug/m3 Air			10/01/19 23:29	1
cis-1,2-Dichloroethene	**160**		1.6		ug/m3 Air			10/01/19 23:29	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			10/01/19 23:29	1
Dibromochloromethane	ND		3.4		ug/m3 Air			10/01/19 23:29	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			10/01/19 23:29	1
Ethylbenzene	ND		1.7		ug/m3 Air			10/01/19 23:29	1
Hexachlorobutadiene	ND	*	21		ug/m3 Air			10/01/19 23:29	1
m,p-Xylene	ND		3.5		ug/m3 Air			10/01/19 23:29	1
Methylene Chloride	ND		1.4		ug/m3 Air			10/01/19 23:29	1
o-Xylene	ND		1.7		ug/m3 Air			10/01/19 23:29	1
Styrene	ND		1.7		ug/m3 Air			10/01/19 23:29	1
Tetrachloroethene	ND		2.7		ug/m3 Air			10/01/19 23:29	1
Toluene	ND		1.5		ug/m3 Air			10/01/19 23:29	1
trans-1,2-Dichloroethene	**9.1**		1.6		ug/m3 Air			10/01/19 23:29	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			10/01/19 23:29	1
Trichloroethene	ND		2.1		ug/m3 Air			10/01/19 23:29	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			10/01/19 23:29	1

Client Sample ID: SVE_South_Post Carbon-090919

Lab Sample ID: 320-54161-1
Date Collected: 09/09/19 08:06
Matrix: Air
Date Received: 09/11/19 12:46
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			10/01/19 23:29	1
Vinyl chloride	ND		1.0		ug/m3 Air			10/01/19 23:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*		*10/01/19 23:29*	*1*
4-Bromofluorobenzene (Surr)	*80*		*70 - 130*		*10/01/19 23:29*	*1*
Toluene-d8 (Surr)	*96*		*70 - 130*		*10/01/19 23:29*	*1*

Client Sample ID: SVE_South_Pre Carbon-090919

Lab Sample ID: 320-54161-2
Date Collected: 09/09/19 08:16
Matrix: Air
Date Received: 09/11/19 12:46
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	**48**		38		ug/m3 Air			10/02/19 00:23	23.3
1,1,2,2-Tetrachloroethane	ND		64		ug/m3 Air			10/02/19 00:23	23.3
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		71		ug/m3 Air			10/02/19 00:23	23.3
1,1,2-Trichloroethane	ND		51		ug/m3 Air			10/02/19 00:23	23.3
1,1-Dichloroethane	ND		28		ug/m3 Air			10/02/19 00:23	23.3
1,1-Dichloroethene	ND		74		ug/m3 Air			10/02/19 00:23	23.3
1,2,4-Trichlorobenzene	ND		350		ug/m3 Air			10/02/19 00:23	23.3
1,2,4-Trimethylbenzene	ND		92		ug/m3 Air			10/02/19 00:23	23.3
1,2-Dibromoethane (EDB)	ND		140		ug/m3 Air			10/02/19 00:23	23.3
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		65		ug/m3 Air			10/02/19 00:23	23.3
1,2-Dichlorobenzene	ND		56		ug/m3 Air			10/02/19 00:23	23.3
1,2-Dichloroethane	ND		75		ug/m3 Air			10/02/19 00:23	23.3
1,2-Dichloropropane	ND		43		ug/m3 Air			10/02/19 00:23	23.3
1,3,5-Trimethylbenzene	ND		46		ug/m3 Air			10/02/19 00:23	23.3
1,3-Dichlorobenzene	ND		56		ug/m3 Air			10/02/19 00:23	23.3
1,4-Dichlorobenzene	ND		56		ug/m3 Air			10/02/19 00:23	23.3
2-Butanone (MEK)	ND		55		ug/m3 Air			10/02/19 00:23	23.3
2-Hexanone	ND		38		ug/m3 Air			10/02/19 00:23	23.3
4-Ethyltoluene	ND		46		ug/m3 Air			10/02/19 00:23	23.3
4-Methyl-2-pentanone (MIBK)	ND		38		ug/m3 Air			10/02/19 00:23	23.3
Acetone	ND		280		ug/m3 Air			10/02/19 00:23	23.3
Benzene	ND		30		ug/m3 Air			10/02/19 00:23	23.3
Benzyl chloride	ND		97		ug/m3 Air			10/02/19 00:23	23.3
Bromodichloromethane	ND		47		ug/m3 Air			10/02/19 00:23	23.3
Bromoform	ND		96		ug/m3 Air			10/02/19 00:23	23.3
Bromomethane	ND		72		ug/m3 Air			10/02/19 00:23	23.3
Carbon disulfide	ND		58		ug/m3 Air			10/02/19 00:23	23.3
Carbon tetrachloride	ND		120		ug/m3 Air			10/02/19 00:23	23.3
Chlorobenzene	ND		32		ug/m3 Air			10/02/19 00:23	23.3
Chloroethane	ND		49		ug/m3 Air			10/02/19 00:23	23.3
Chloroform	ND		34		ug/m3 Air			10/02/19 00:23	23.3
Chloromethane	ND		38		ug/m3 Air			10/02/19 00:23	23.3
cis-1,2-Dichloroethene	**120**		37		ug/m3 Air			10/02/19 00:23	23.3
cis-1,3-Dichloropropene	ND		42		ug/m3 Air			10/02/19 00:23	23.3

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Client Sample ID: SVE_South_Pre Carbon-090919
Lab Sample ID: 320-54161-2
Date Collected: 09/09/19 08:16
Matrix: Air
Date Received: 09/11/19 12:46
Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibromochloromethane	ND		79		ug/m3 Air			10/02/19 00:23	23.3
Dichlorodifluoromethane	ND		46		ug/m3 Air			10/02/19 00:23	23.3
Ethylbenzene	ND		40		ug/m3 Air			10/02/19 00:23	23.3
Hexachlorobutadiene	ND	*	500		ug/m3 Air			10/02/19 00:23	23.3
m,p-Xylene	ND		81		ug/m3 Air			10/02/19 00:23	23.3
Methylene Chloride	ND		32		ug/m3 Air			10/02/19 00:23	23.3
o-Xylene	ND		40		ug/m3 Air			10/02/19 00:23	23.3
Styrene	ND		40		ug/m3 Air			10/02/19 00:23	23.3
Tetrachloroethene	**15000**		79		ug/m3 Air			10/03/19 08:54	29.1
Toluene	ND		35		ug/m3 Air			10/02/19 00:23	23.3
trans-1,2-Dichloroethene	ND		37		ug/m3 Air			10/02/19 00:23	23.3
trans-1,3-Dichloropropene	ND		42		ug/m3 Air			10/02/19 00:23	23.3
Trichloroethene	**590**		50		ug/m3 Air			10/02/19 00:23	23.3
Trichlorofluoromethane	ND		52		ug/m3 Air			10/02/19 00:23	23.3
Vinyl acetate	ND		66		ug/m3 Air			10/02/19 00:23	23.3
Vinyl chloride	ND		24		ug/m3 Air			10/02/19 00:23	23.3

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*		*10/02/19 00:23*	*23.3*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*		*10/03/19 08:54*	*29.1*
4-Bromofluorobenzene (Surr)	*76*		*70 - 130*		*10/02/19 00:23*	*23.3*
4-Bromofluorobenzene (Surr)	*70*		*70 - 130*		*10/03/19 08:54*	*29.1*
Toluene-d8 (Surr)	*98*		*70 - 130*		*10/02/19 00:23*	*23.3*
Toluene-d8 (Surr)	*97*		*70 - 130*		*10/03/19 08:54*	*29.1*

Surrogate Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Matrix: Air

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)		
		DCA	BFB	TOL
Lab Sample ID	Client Sample ID	(70-130)	(70-130)	(70-130)
320-54161-1	SVE_South_Post Carbon-09091	97	80	96
320-54161-2	SVE_South_Pre Carbon-090919	97	76	98
320-54161-2	SVE_South_Pre Carbon-090919	97	70	97
LCS 320-327435/4	Lab Control Sample	98	99	101
LCS 320-327767/4	Lab Control Sample	98	97	100
LCSD 320-327435/5	Lab Control Sample Dup	97	98	98
LCSD 320-327767/5	Lab Control Sample Dup	95	97	98
MB 320-327435/9	Method Blank	94	80	97
MB 320-327767/9	Method Blank	96	77	98

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
TOL = Toluene-d8 (Surr)

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 320-327435/9
Matrix: Air
Analysis Batch: 327435

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			10/01/19 18:53	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			10/01/19 18:53	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			10/01/19 18:53	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			10/01/19 18:53	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			10/01/19 18:53	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			10/01/19 18:53	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			10/01/19 18:53	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			10/01/19 18:53	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			10/01/19 18:53	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			10/01/19 18:53	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 18:53	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			10/01/19 18:53	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			10/01/19 18:53	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			10/01/19 18:53	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 18:53	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			10/01/19 18:53	1
2-Butanone (MEK)	ND		2.4		ug/m3 Air			10/01/19 18:53	1
2-Hexanone	ND		1.6		ug/m3 Air			10/01/19 18:53	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			10/01/19 18:53	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			10/01/19 18:53	1
Acetone	ND		12		ug/m3 Air			10/01/19 18:53	1
Benzene	ND		1.3		ug/m3 Air			10/01/19 18:53	1
Benzyl chloride	ND		4.1		ug/m3 Air			10/01/19 18:53	1
Bromodichloromethane	ND		2.0		ug/m3 Air			10/01/19 18:53	1
Bromoform	ND		4.1		ug/m3 Air			10/01/19 18:53	1
Bromomethane	ND		3.1		ug/m3 Air			10/01/19 18:53	1
Carbon disulfide	ND		2.5		ug/m3 Air			10/01/19 18:53	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			10/01/19 18:53	1
Chlorobenzene	ND		1.4		ug/m3 Air			10/01/19 18:53	1
Chloroethane	ND		2.1		ug/m3 Air			10/01/19 18:53	1
Chloroform	ND		1.5		ug/m3 Air			10/01/19 18:53	1
Chloromethane	ND		1.7		ug/m3 Air			10/01/19 18:53	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			10/01/19 18:53	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			10/01/19 18:53	1
Dibromochloromethane	ND		3.4		ug/m3 Air			10/01/19 18:53	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			10/01/19 18:53	1
Ethylbenzene	ND		1.7		ug/m3 Air			10/01/19 18:53	1
Hexachlorobutadiene	ND		21		ug/m3 Air			10/01/19 18:53	1
m,p-Xylene	ND		3.5		ug/m3 Air			10/01/19 18:53	1
Methylene Chloride	ND		1.4		ug/m3 Air			10/01/19 18:53	1
o-Xylene	ND		1.7		ug/m3 Air			10/01/19 18:53	1
Styrene	ND		1.7		ug/m3 Air			10/01/19 18:53	1
Tetrachloroethene	ND		2.7		ug/m3 Air			10/01/19 18:53	1
Toluene	ND		1.5		ug/m3 Air			10/01/19 18:53	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			10/01/19 18:53	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			10/01/19 18:53	1
Trichloroethene	ND		2.1		ug/m3 Air			10/01/19 18:53	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			10/01/19 18:53	1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-327435/9
Matrix: Air
Analysis Batch: 327435

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			10/01/19 18:53	1
Vinyl chloride	ND		1.0		ug/m3 Air			10/01/19 18:53	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*		*10/01/19 18:53*	*1*
4-Bromofluorobenzene (Surr)	*80*		*70 - 130*		*10/01/19 18:53*	*1*
Toluene-d8 (Surr)	*97*		*70 - 130*		*10/01/19 18:53*	*1*

Lab Sample ID: LCS 320-327435/4
Matrix: Air
Analysis Batch: 327435

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	112	119		ug/m3 Air		106	69 - 129
1,1,2,2-Tetrachloroethane	143	160		ug/m3 Air		112	64 - 124
1,1,2-Trichloro-1,2,2-trifluoroethane	166	176		ug/m3 Air		106	70 - 130
1,1,2-Trichloroethane	111	124		ug/m3 Air		111	64 - 124
1,1-Dichloroethane	84.2	88.4		ug/m3 Air		105	71 - 131
1,1-Dichloroethene	87.2	89.9		ug/m3 Air		103	72 - 132
1,2,4-Trichlorobenzene	159	120		ug/m3 Air		76	58 - 138
1,2,4-Trimethylbenzene	99.3	117		ug/m3 Air		118	60 - 132
1,2-Dibromoethane (EDB)	160	182		ug/m3 Air		114	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	148		ug/m3 Air		106	74 - 134
1,2-Dichlorobenzene	117	130		ug/m3 Air		111	62 - 126
1,2-Dichloroethane	85.0	90.2		ug/m3 Air		106	71 - 131
1,2-Dichloropropane	96.1	103		ug/m3 Air		107	72 - 132
1,3,5-Trimethylbenzene	101	119		ug/m3 Air		117	65 - 125
1,3-Dichlorobenzene	120	127		ug/m3 Air		106	59 - 130
1,4-Dichlorobenzene	123	123		ug/m3 Air		101	58 - 132
2-Butanone (MEK)	64.9	67.8		ug/m3 Air		104	73 - 133
2-Hexanone	91.8	80.8		ug/m3 Air		88	69 - 129
4-Ethyltoluene	104	121		ug/m3 Air		116	66 - 129
4-Methyl-2-pentanone (MIBK)	88.5	83.3		ug/m3 Air		94	74 - 134
Acetone	51.3	48.5		ug/m3 Air		94	65 - 125
Benzene	67.1	72.5		ug/m3 Air		108	68 - 128
Benzyl chloride	107	96.2		ug/m3 Air		90	67 - 127
Bromodichloromethane	139	157		ug/m3 Air		113	71 - 131
Bromoform	211	219		ug/m3 Air		104	66 - 126
Bromomethane	76.1	83.4		ug/m3 Air		110	73 - 134
Carbon disulfide	65.4	69.0		ug/m3 Air		105	71 - 131
Carbon tetrachloride	136	151		ug/m3 Air		111	63 - 126
Chlorobenzene	96.7	106		ug/m3 Air		110	63 - 123
Chloroethane	51.7	58.3		ug/m3 Air		113	73 - 133
Chloroform	104	110		ug/m3 Air		106	70 - 130
Chloromethane	41.3	36.6		ug/m3 Air		89	61 - 140
cis-1,2-Dichloroethene	84.1	92.8		ug/m3 Air		110	70 - 130
cis-1,3-Dichloropropene	91.7	105		ug/m3 Air		115	72 - 132

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-327435/4
Matrix: Air
Analysis Batch: 327435

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibromochloromethane	186	220		ug/m3 Air		119	66 - 126
Dichlorodifluoromethane	95.9	101		ug/m3 Air		105	69 - 129
Ethylbenzene	91.2	104		ug/m3 Air		114	64 - 124
Hexachlorobutadiene	218	288	*	ug/m3 Air		132	58 - 131
m,p-Xylene	177	203		ug/m3 Air		114	65 - 125
Methylene Chloride	73.6	75.0		ug/m3 Air		102	67 - 127
o-Xylene	90.3	103		ug/m3 Air		114	65 - 125
Styrene	88.6	90.3		ug/m3 Air		102	67 - 127
Tetrachloroethene	134	155		ug/m3 Air		115	63 - 123
Toluene	79.9	88.0		ug/m3 Air		110	68 - 128
trans-1,2-Dichloroethene	84.1	91.6		ug/m3 Air		109	72 - 132
trans-1,3-Dichloropropene	99.9	118		ug/m3 Air		118	66 - 126
Trichloroethene	112	124		ug/m3 Air		111	70 - 130
Trichlorofluoromethane	108	112		ug/m3 Air		104	71 - 131
Vinyl acetate	73.2	81.5		ug/m3 Air		111	65 - 134
Vinyl chloride	51.6	49.6		ug/m3 Air		96	59 - 152

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*98*		*70 - 130*
4-Bromofluorobenzene (Surr)	*99*		*70 - 130*
Toluene-d8 (Surr)	*101*		*70 - 130*

Lab Sample ID: LCSD 320-327435/5
Matrix: Air
Analysis Batch: 327435

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1-Trichloroethane	112	116		ug/m3 Air		103	69 - 129	3	25
1,1,2,2-Tetrachloroethane	143	167		ug/m3 Air		117	64 - 124	5	25
1,1,2-Trichloro-1,2,2-trifluoroethane	166	170		ug/m3 Air		103	70 - 130	3	25
1,1,2-Trichloroethane	111	122		ug/m3 Air		110	64 - 124	1	25
1,1-Dichloroethane	84.2	86.1		ug/m3 Air		102	71 - 131	3	25
1,1-Dichloroethene	87.2	87.9		ug/m3 Air		101	72 - 132	2	25
1,2,4-Trichlorobenzene	159	121		ug/m3 Air		76	58 - 138	0	25
1,2,4-Trimethylbenzene	99.3	124		ug/m3 Air		125	60 - 132	6	25
1,2-Dibromoethane (EDB)	160	181		ug/m3 Air		114	64 - 124	0	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	139		ug/m3 Air		99	74 - 134	6	25
1,2-Dichlorobenzene	117	137		ug/m3 Air		118	62 - 126	6	25
1,2-Dichloroethane	85.0	87.7		ug/m3 Air		103	71 - 131	3	25
1,2-Dichloropropane	96.1	100		ug/m3 Air		104	72 - 132	3	25
1,3,5-Trimethylbenzene	101	124		ug/m3 Air		123	65 - 125	4	25
1,3-Dichlorobenzene	120	136		ug/m3 Air		113	59 - 130	7	25
1,4-Dichlorobenzene	123	134		ug/m3 Air		109	58 - 132	8	25
2-Butanone (MEK)	64.9	67.9		ug/m3 Air		105	73 - 133	0	25
2-Hexanone	91.8	88.8		ug/m3 Air		97	69 - 129	9	25
4-Ethyltoluene	104	125		ug/m3 Air		120	66 - 129	3	25
4-Methyl-2-pentanone (MIBK)	88.5	87.8		ug/m3 Air		99	74 - 134	5	25

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-327435/5
Matrix: Air
Analysis Batch: 327435

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Acetone	51.3	48.0		ug/m3 Air		94	65 - 125	1	25
Benzene	67.1	70.3		ug/m3 Air		105	68 - 128	3	25
Benzyl chloride	107	106		ug/m3 Air		99	67 - 127	9	25
Bromodichloromethane	139	153		ug/m3 Air		110	71 - 131	3	25
Bromoform	211	220		ug/m3 Air		104	66 - 126	1	25
Bromomethane	76.1	81.8		ug/m3 Air		107	73 - 134	2	25
Carbon disulfide	65.4	66.7		ug/m3 Air		102	71 - 131	3	25
Carbon tetrachloride	136	146		ug/m3 Air		107	63 - 126	4	25
Chlorobenzene	96.7	104		ug/m3 Air		108	63 - 123	2	25
Chloroethane	51.7	56.7		ug/m3 Air		110	73 - 133	3	25
Chloroform	104	108		ug/m3 Air		104	70 - 130	2	25
Chloromethane	41.3	34.7		ug/m3 Air		84	61 - 140	5	25
cis-1,2-Dichloroethene	84.1	90.6		ug/m3 Air		108	70 - 130	2	25
cis-1,3-Dichloropropene	91.7	103		ug/m3 Air		113	72 - 132	2	25
Dibromochloromethane	186	217		ug/m3 Air		117	66 - 126	1	25
Dichlorodifluoromethane	95.9	97.3		ug/m3 Air		101	69 - 129	4	25
Ethylbenzene	91.2	102		ug/m3 Air		112	64 - 124	2	25
Hexachlorobutadiene	218	287	*	ug/m3 Air		132	58 - 131	0	25
m,p-Xylene	177	200		ug/m3 Air		113	65 - 125	2	25
Methylene Chloride	73.6	72.9		ug/m3 Air		99	67 - 127	3	25
o-Xylene	90.3	103		ug/m3 Air		114	65 - 125	1	25
Styrene	88.6	91.0		ug/m3 Air		103	67 - 127	1	25
Tetrachloroethene	134	150		ug/m3 Air		112	63 - 123	3	25
Toluene	79.9	85.5		ug/m3 Air		107	68 - 128	3	25
trans-1,2-Dichloroethene	84.1	89.3		ug/m3 Air		106	72 - 132	3	25
trans-1,3-Dichloropropene	99.9	117		ug/m3 Air		118	66 - 126	1	25
Trichloroethene	112	121		ug/m3 Air		108	70 - 130	2	25
Trichlorofluoromethane	108	109		ug/m3 Air		101	71 - 131	3	25
Vinyl acetate	73.2	80.4		ug/m3 Air		110	65 - 134	1	25
Vinyl chloride	51.6	46.6		ug/m3 Air		90	59 - 152	6	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*
4-Bromofluorobenzene (Surr)	*98*		*70 - 130*
Toluene-d8 (Surr)	*98*		*70 - 130*

Lab Sample ID: MB 320-327767/9
Matrix: Air
Analysis Batch: 327767

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tetrachloroethene	ND		2.7		ug/m3 Air			10/02/19 18:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*		*10/02/19 18:41*	*1*
4-Bromofluorobenzene (Surr)	*77*		*70 - 130*		*10/02/19 18:41*	*1*
Toluene-d8 (Surr)	*98*		*70 - 130*		*10/02/19 18:41*	*1*

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-327767/4
Matrix: Air
Analysis Batch: 327767

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Tetrachloroethene			134	150		ug/m3 Air		112	63 - 123		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*98*		*70 - 130*
4-Bromofluorobenzene (Surr)	*97*		*70 - 130*
Toluene-d8 (Surr)	*100*		*70 - 130*

Lab Sample ID: LCSD 320-327767/5
Matrix: Air
Analysis Batch: 327767

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tetrachloroethene			134	146		ug/m3 Air		108	63 - 123	3	25

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*70 - 130*
4-Bromofluorobenzene (Surr)	*97*		*70 - 130*
Toluene-d8 (Surr)	*98*		*70 - 130*

Air - GC/MS VOA

Analysis Batch: 327435

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-54161-1	SVE_South_Post Carbon-090919	Total/NA	Air	TO-15	
320-54161-2	SVE_South_Pre Carbon-090919	Total/NA	Air	TO-15	
MB 320-327435/9	Method Blank	Total/NA	Air	TO-15	
LCS 320-327435/4	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-327435/5	Lab Control Sample Dup	Total/NA	Air	TO-15	

Analysis Batch: 327767

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-54161-2	SVE_South_Pre Carbon-090919	Total/NA	Air	TO-15	
MB 320-327767/9	Method Blank	Total/NA	Air	TO-15	
LCS 320-327767/4	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-327767/5	Lab Control Sample Dup	Total/NA	Air	TO-15	

Lab Chronicle

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Client Sample ID: SVE_South_Post Carbon-090919

Lab Sample ID: 320-54161-1

Date Collected: 09/09/19 08:06

Matrix: Air

Date Received: 09/11/19 12:46

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		1	365 mL	250 mL	327435	10/01/19 23:29	AP1	TAL SAC

Client Sample ID: SVE_South_Pre Carbon-090919

Lab Sample ID: 320-54161-2

Date Collected: 09/09/19 08:16

Matrix: Air

Date Received: 09/11/19 12:46

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		23.3	15 mL	250 mL	327435	10/02/19 00:23	AP1	TAL SAC
Total/NA	Analysis	TO-15		29.1	12 mL	250 mL	327767	10/03/19 08:54	AP1	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Laboratory: Eurofins TestAmerica, Sacramento

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

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State Program	17-020	01-20-21
ANAB	Dept. of Defense ELAP	L2468	01-20-21
ANAB	Dept. of Energy	L2468.01	01-20-21
ANAB	ISO/IEC 17025	L2468	08-09-21
Arizona	State	AZ0708	08-11-20
Arkansas DEQ	State Program	88-0691	06-17-20
California	State	2897	01-31-20
Colorado	State	CA0004	08-31-20
Connecticut	State	PH-0691	06-30-21
Florida	NELAP	E87570	06-30-20
Hawaii	State	<cert No.>	01-29-20
Illinois	NELAP	200060	03-17-20
Kansas	NELAP	E-10375	10-31-19
Louisiana	NELAP	01944	06-30-20
Maine	State Program	CA0004	04-14-20
Michigan	State	9947	01-29-20
Michigan	State Program	9947	01-31-20
Nevada	State Program	CA00044	07-31-20
New Hampshire	NELAP	2997	04-20-20
New Jersey	NELAP	CA005	06-30-20
New York	NELAP	11666	04-01-20
Oregon	NELAP	4040	01-29-20
Pennsylvania	NELAP	68-01272	03-31-20
Texas	NELAP	T104704399-19-13	05-31-20
US Fish & Wildlife	US Federal Programs	58448	07-31-20
USDA	US Federal Programs	P330-18-00239	07-31-21
USEPA UCMR	Federal	CA00044	12-31-20
Utah	NELAP	CA00044	02-29-20
Vermont	State	VT-4040	04-16-20
Virginia	NELAP	460278	03-14-20
Washington	State	C581	05-05-20
West Virginia (DW)	State	9930C	12-31-19
Wyoming	State Program	8TMS-L	01-28-19 *

Laboratory: Eurofins TestAmerica, Seattle

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

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-024	01-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2901	11-05-19
Montana (UST)	State	NA	04-13-21
Oregon	NELAP	WA100007	11-05-19
US Fish & Wildlife	US Federal Programs	058448	07-31-20
USDA	US Federal Programs	P330-17-00039	02-10-20
Washington	State	C553	02-17-20

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-54161-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
320-54161-1	SVE_South_Post Carbon-090919	Air	09/09/19 08:06	09/11/19 12:46	Air Canister (6-Liter) #34001584
320-54161-2	SVE_South_Pre Carbon-090919	Air	09/09/19 08:16	09/11/19 12:46	Air Canister (6-Liter) #34002009

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	**Client Project Manager:** Stephanie Salisbury	**Samples Collected By:** Lindsey Wallis	COC No: 1 of 1 COCs
Company Name: Cascadia Associates	Phone: 503-906-6577		
Address: 5820 SW Kelly Ave, Unit B	Email: sbsalisbury@cascadiaassociates.com		
City/State/Zip: Portland, OR 97239			For Lab Use Only:
Phone: 503-906-6577	Site Contact:		Walk-in Client:
FAX:	Tel/Fax		Lab Sampling:
Project Name: NuStar Vancouver	Anaylsis Turnaround Time		
Site/Location: Vancouver, WA	Standard (Specific): ✓		Job / SDG No.:
P O #	Rush (Specifiy):		(See below for Add'l Items)

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Type	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE-South_Post Carbon-090919	~~9/5~~ 9/9/19 LW	0805	9/9/19	0806	-30	-1	—	34001584	X														
SVE-South-Pre Carbon-090919	9/9	0815	9/9	0816	-30	-1	—	34002009	X														

320-54161 Chain of Custody

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

Special Instructions/QC Requirements & Comments:
Email Results to sbsalisbury@cascadiaassociates.com

Samples Shipped by: Lindsey Wallis/Cascadia	**Date / Time:** 9/9/19 1430	**Samples Received by:** Cassie Pearson 0815 9-11-19	TA-PC
Samples Relinquished by:	**Date / Time:**	**Received by:**	
Relinquished by:	**Date / Time:**	**Received by:**	
Lab Use Only: **Shipper Name:**	**Opened by:**	**Condition:**	

Form No. CA-C-WI-003, Rev. 2.9, dated 9/5/2018

Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-54161-1

Login Number: 54161
List Number: 1
Creator: Branscum, Cassie

List Source: Eurofins TestAmerica, Sacramento

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

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sacramento
Canister QC Certification
Batch Certification

Date Cleaned/Batch ID: 08/16/19 SCAN

320-53364 Chain of Custody

Date of QC: 8/23/19

Data File Number: MS7G82313

(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	34001249
	34001584
	34002009
	7955
	34000548
	7904
	34001293
	8083
	34001128
	34001144
	34000438
	34002326

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "*Certification Type* " indicated above.

"*" INDICATES THE CAN OR CANS WHICH WERE SCREENED

dlv for AP
1st Level Reviewed By

8/26/19
Date

2nd Level Reviewed By

5/23/19
Date

Q:\DOCUMENT-MANAGEMENT\FORMS\QA-814 IND CAN QC 20180323.DOC
QA-814A RE 20180323

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-53364-1

SDG No.:

Client Sample ID: 34001249 Lab Sample ID: 320-53364-1

Matrix: Air Lab File ID: MS7082313.D

Analysis Method: TO-15 Date Collected: 08/16/2019 00:00

Sample wt/vol: 250(mL) Date Analyzed: 08/23/2019 23:11

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 317469 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	0.63	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	ND		0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	ND		0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	ND		0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	ND		0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-53364-1

SDG No.:

Client Sample ID: 34001249 Lab Sample ID: 320-53364-1

Matrix: Air Lab File ID: MS7082313.D

Analysis Method: TO-15 Date Collected: 08/16/2019 00:00

Sample wt/vol: 250(mL) Date Analyzed: 08/23/2019 23:11

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 317469 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	ND		0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	ND		0.40	0.072
98-83-9	alpha-Methylstyrene	ND		0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	ND		0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	ND		0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	ND		0.40	0.069
127-18-4	Tetrachloroethene	ND		0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	ND		0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-53364-1

SDG No.:

Client Sample ID: 34001249 Lab Sample ID: 320-53364-1

Matrix: Air Lab File ID: MS7082313.D

Analysis Method: TO-15 Date Collected: 08/16/2019 00:00

Sample wt/vol: 250(mL) Date Analyzed: 08/23/2019 23:11

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 317469 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	ND		0.80	0.10
95-47-6	o-Xylene	ND		0.40	0.054
1330-20-7	Xylenes, Total	ND		1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	100		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	98		70-130
2037-26-5	Toluene-d8 (Surr)	100		70-130

Eurofins TestAmerica, Sacramento
Target Compound Quantitation Report

Data File: \\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D
Lims ID: 320-53364-A-1
Client ID: 34001249
Sample Type: Client
Inject. Date: 23-Aug-2019 23:11:30 ALS Bottle#: 10 Worklist Smp#: 13
Purge Vol: 5.000 mL Dil. Factor: 1.0000
Sample Info: 320-53364-A-1
Misc. Info.: 500 mL
Operator ID: SRS Instrument ID: ATMS7

Method: \\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\TO15_ATMS7N.m
Limit Group: MSA - TO15 - ICAL
Last Update: 26-Aug-2019 11:16:56 Calib Date: 23-Aug-2019 13:48:30
Integrator: RTE ID Type: Deconvolution ID
Quant Method: Internal Standard Quant By: Initial Calibration
Last ICal File: \\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082304.D

Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
Process Host: CTX0339

First Level Reviewer: phanthasena Date: 26-Aug-2019 11:13:54

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	12.251	12.263	-0.012	85	77114	10.0	
* 2 1,4-Difluorobenzene	114	14.362	14.374	-0.012	96	327857	10.0	
* 3 Chlorobenzene-d5 (IS)	117	20.999	21.005	-0.006	91	277470	10.0	
$ 4 1,2-Dichloroethane-d4 (Sur	65	13.431	13.443	-0.012	96	172135	9.85	
$ 5 Toluene-d8 (Surr)	100	17.738	17.744	-0.006	98	227182	10.0	
$ 6 4-Bromofluorobenzene (Surr	95	23.548	23.554	-0.006	83	193109	10.0	
11 Propene	41	4.099	4.111	-0.012	66	575	0.0908	
13 Dichlorodifluoromethane	85	4.154	4.178	-0.024	95	1217	0.0346	
32 Acetone	43	7.469	7.481	-0.012	99	9616	0.6334	
87 m-Xylene & p-Xylene	91	21.443	21.437	0.000	93	2408	0.0619	
107 1,2,4-Trimethylbenzene	120	25.099	25.086	0.006	91	1081	0.0513	
S 150 Xylenes, Total	91				0		0.0619	

Reagents:

VAMSIS50_00017 Amount Added: 50.00 Units: mL Run Reagent

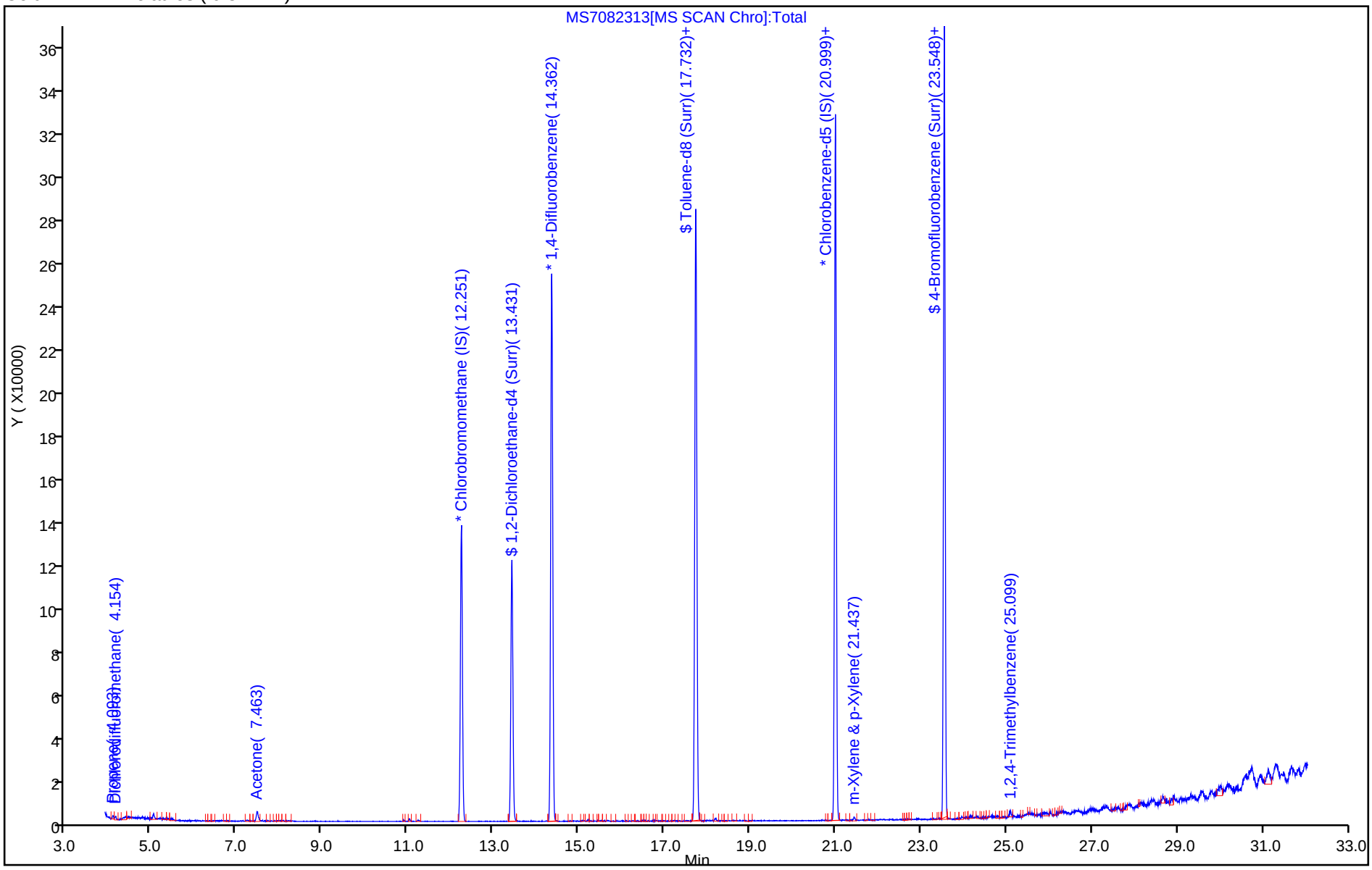
Report Date: 26-Aug-2019 11:17:37 Chrom Revision: 2.3 22-Aug-2019 12:55:36

Eurofins TestAmerica, Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D

Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7	Operator ID:	SRS
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1	Worklist Smp#:	13
Client ID:	34001249				
Purge Vol:	5.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	10
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		

Column: RTX Volatiles (0.32 mm)



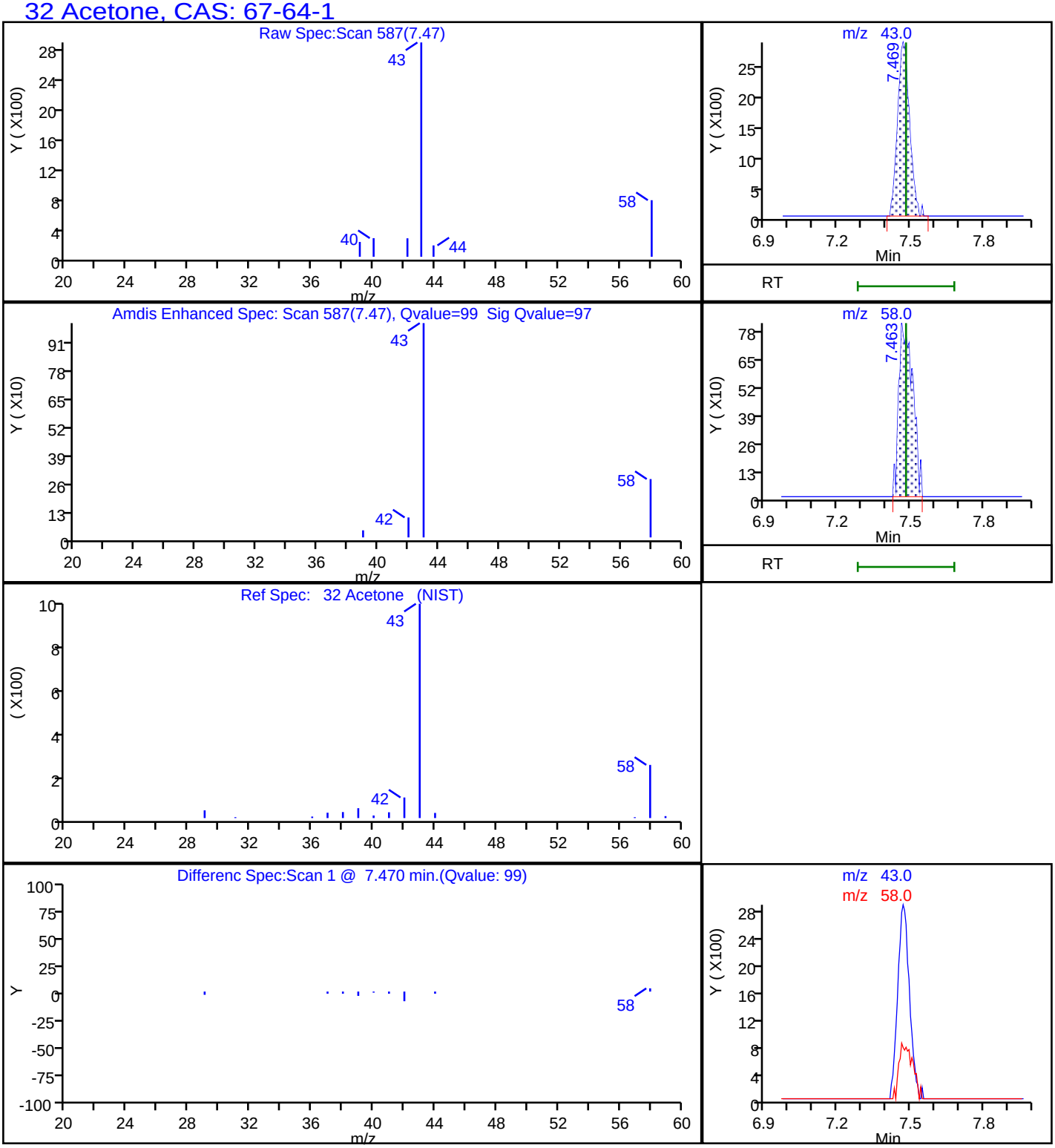
Report Date: 26-Aug-2019 11:17:37 Chrom Revision: 2.3 22-Aug-2019 12:55:36

Eurofins TestAmerica, Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D

Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

32 Acetone, CAS: 67-64-1



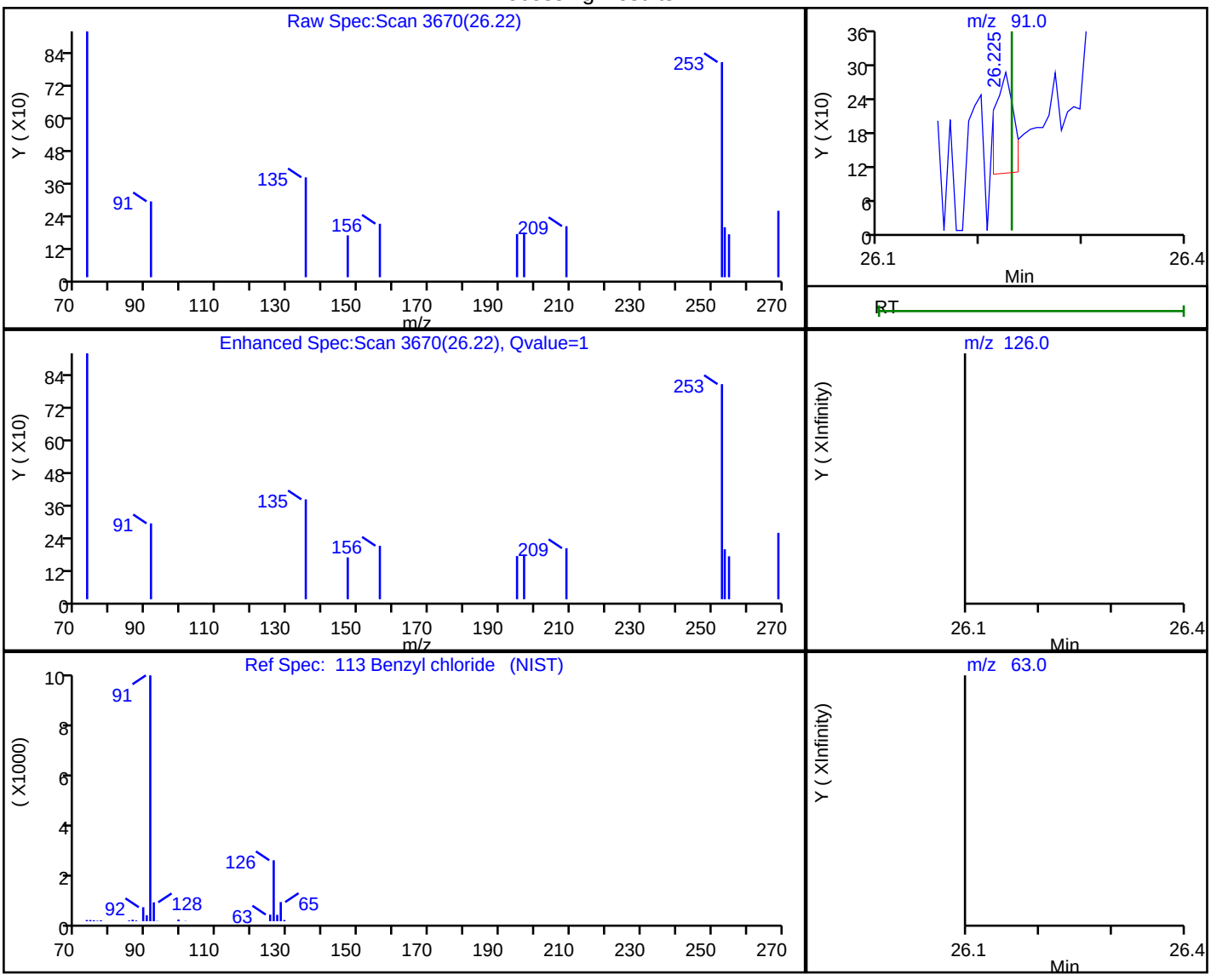
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

113 Benzyl chloride, CAS: 100-44-7

Processing Results



RT	Mass	Response	Amount
26.22	91.00	224	0.018100
26.23	126.00	0	
26.23	63.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:46

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

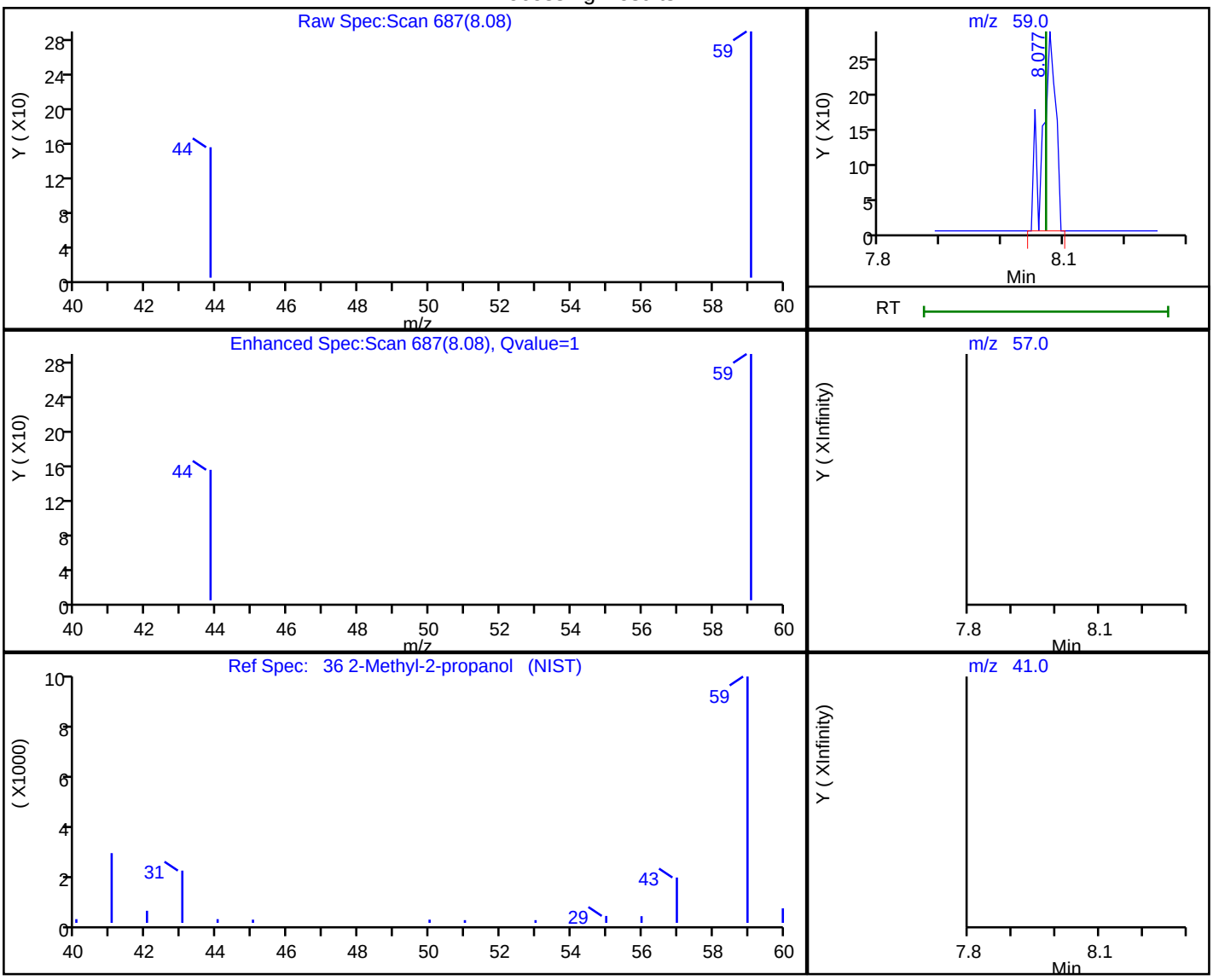
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

36 2-Methyl-2-propanol, CAS: 75-65-0

Processing Results



RT	Mass	Response	Amount
8.08	59.00	418	0.018572
8.05	57.00	0	
8.05	41.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:12:45

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

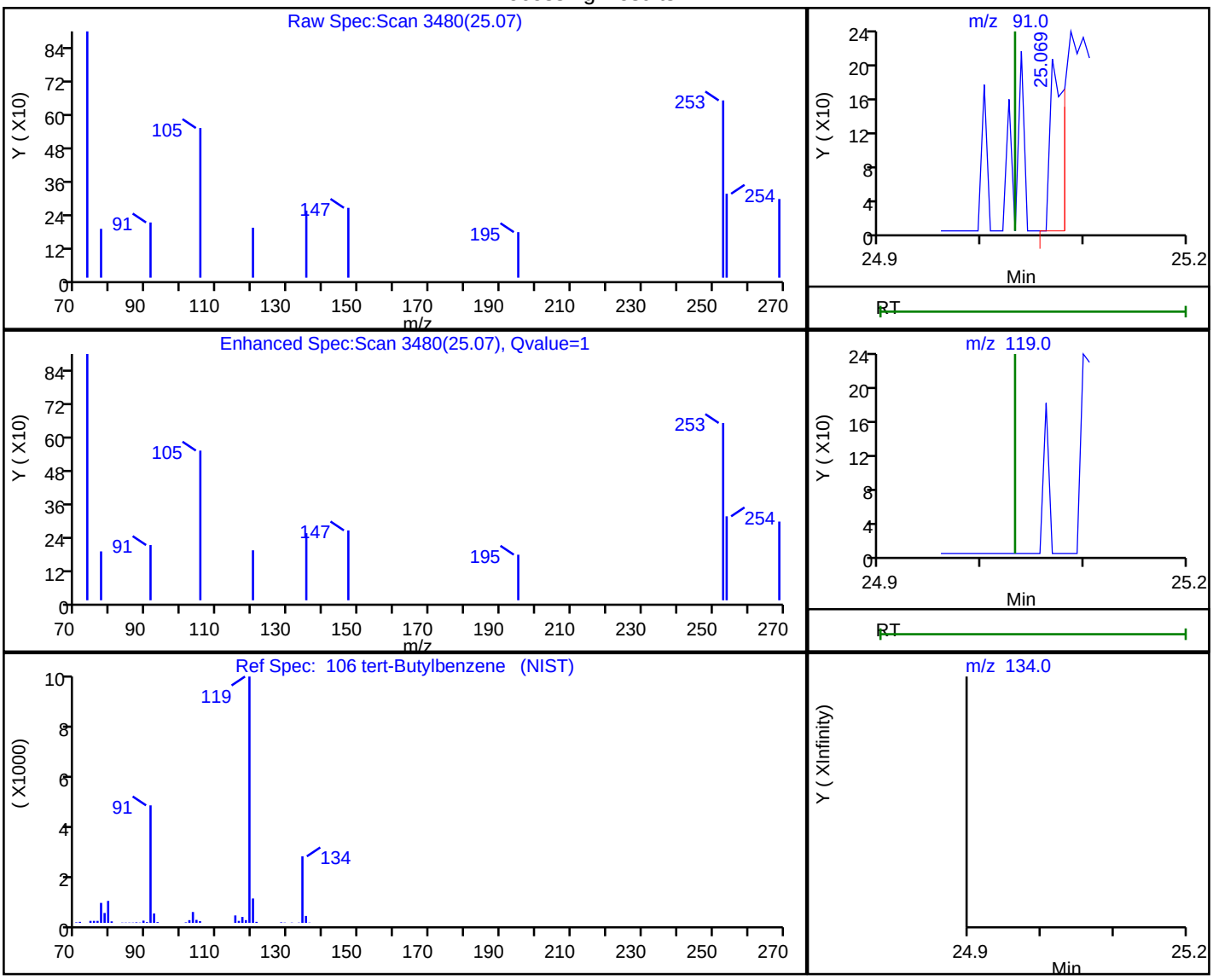
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

106 tert-Butylbenzene, CAS: 98-06-6

Processing Results



RT	Mass	Response	Amount
25.07	91.00	190	0.004569
25.03	119.00	0	
25.03	134.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:41

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

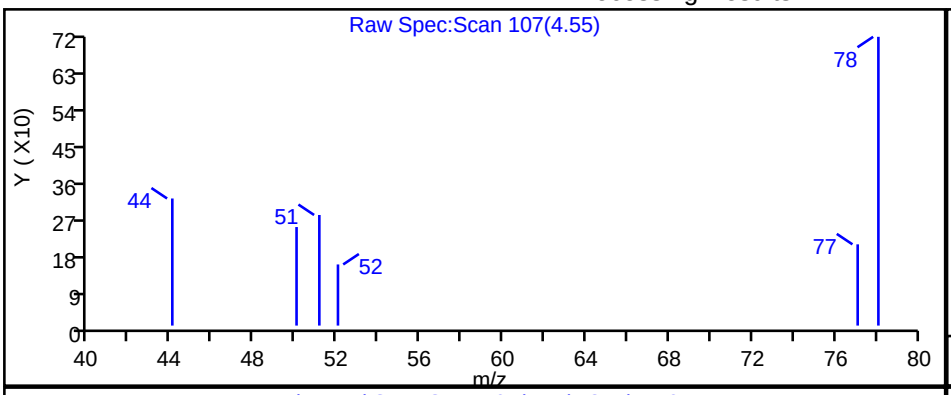
User Disabled Compound Report

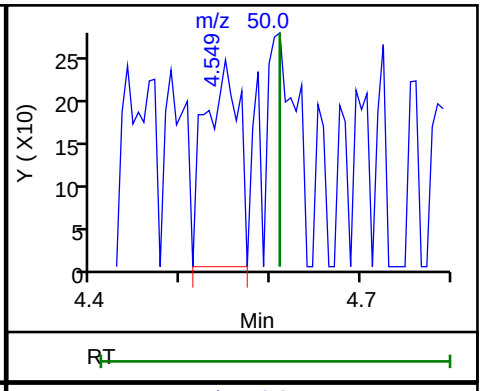
Eurofins TestAmerica, Sacramento

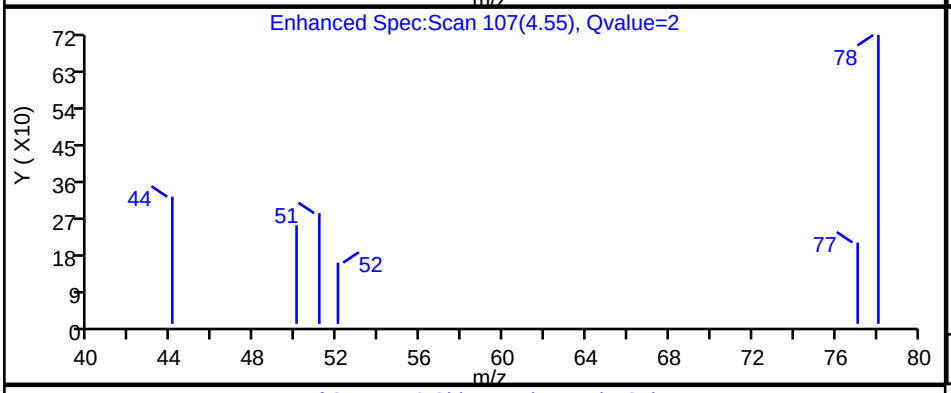
Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

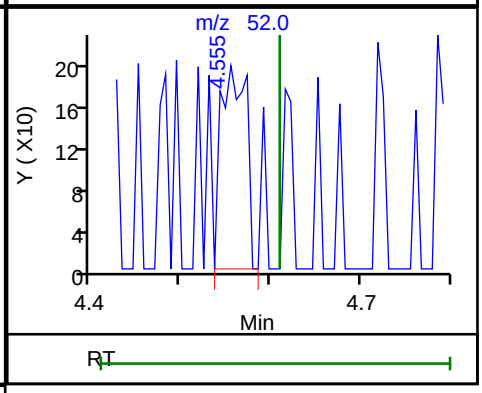
16 Chloromethane, CAS: 74-87-3

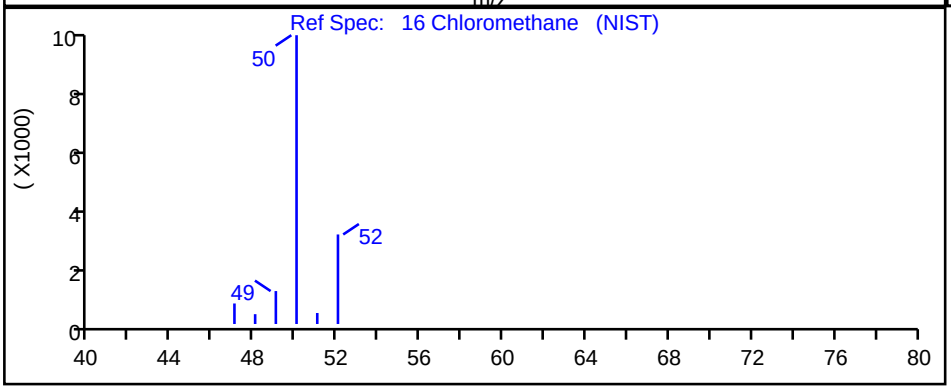
Processing Results











RT	Mass	Response	Amount
4.55	50.00	635	0.077270
4.56	52.00	373	

Reviewer: phanthasena, 26-Aug-2019 11:12:32

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

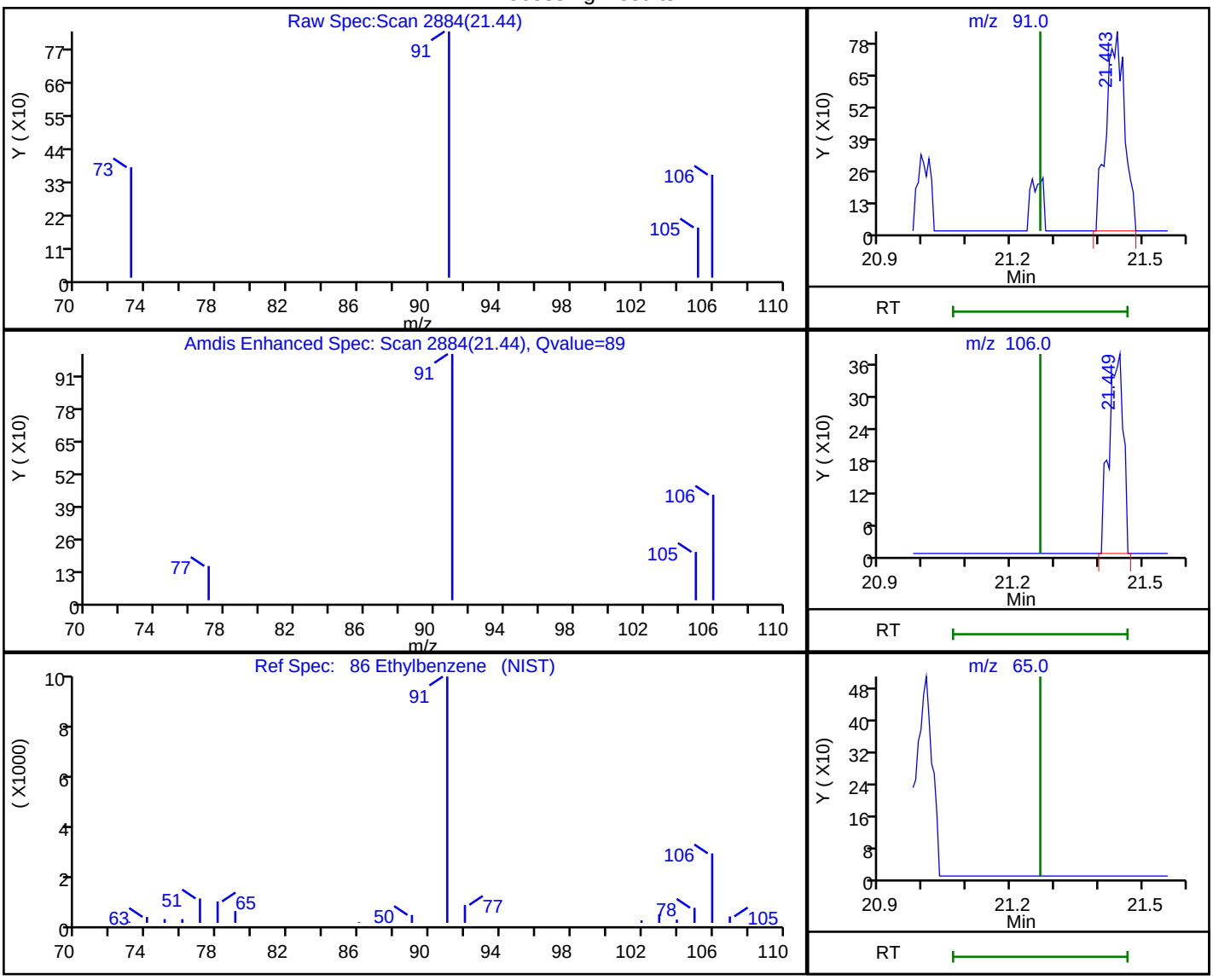
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

86 Ethylbenzene, CAS: 100-41-4

Processing Results



RT	Mass	Response	Amount
21.44	91.00	2408	0.052694
21.45	106.00	847	
21.26	65.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:21

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

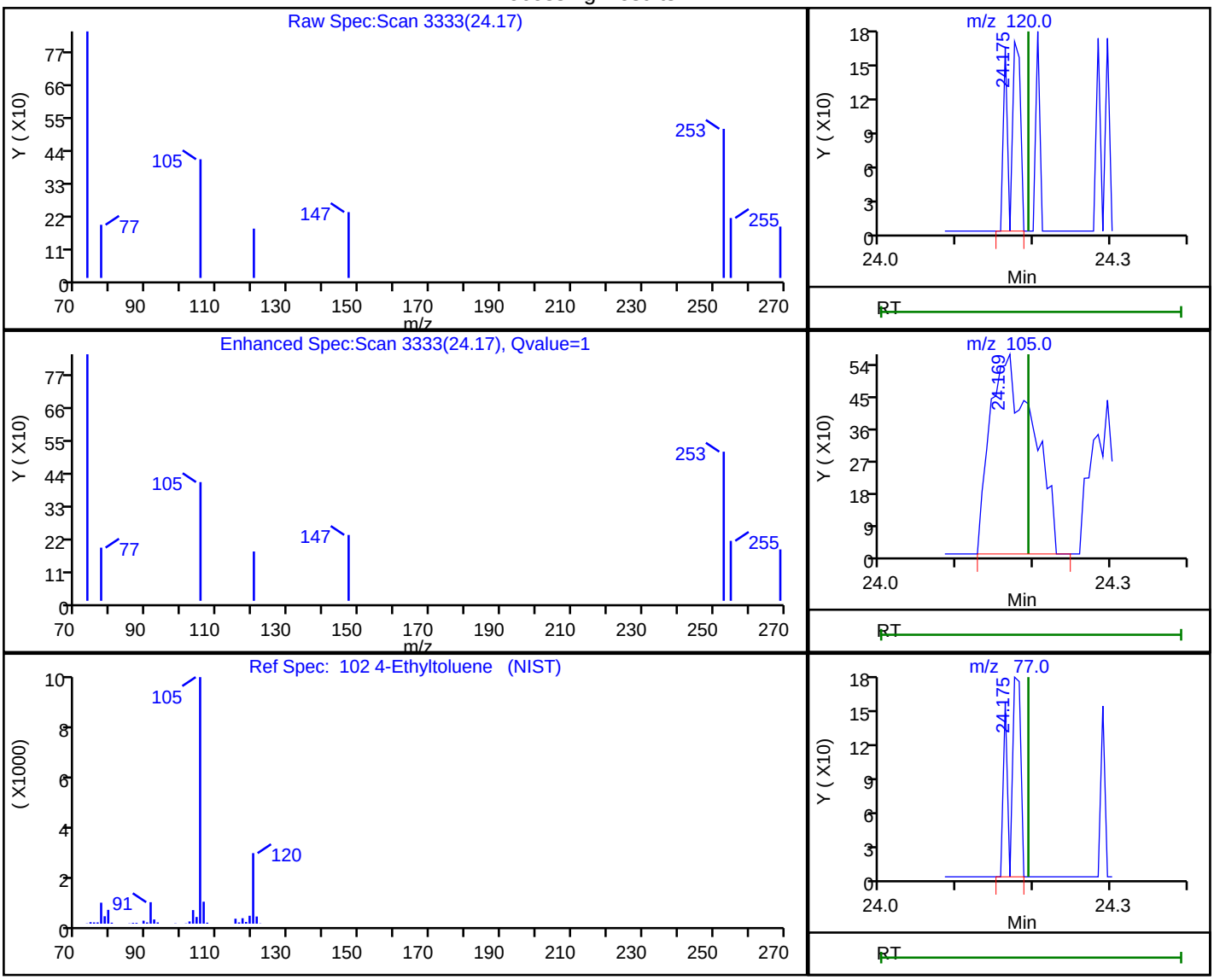
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

102 4-Ethyltoluene, CAS: 622-96-8

Processing Results



RT	Mass	Response	Amount
24.17	120.00	176	0.013783
24.17	105.00	2208	
24.17	77.00	187	

Reviewer: phanthasena, 26-Aug-2019 11:13:35

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

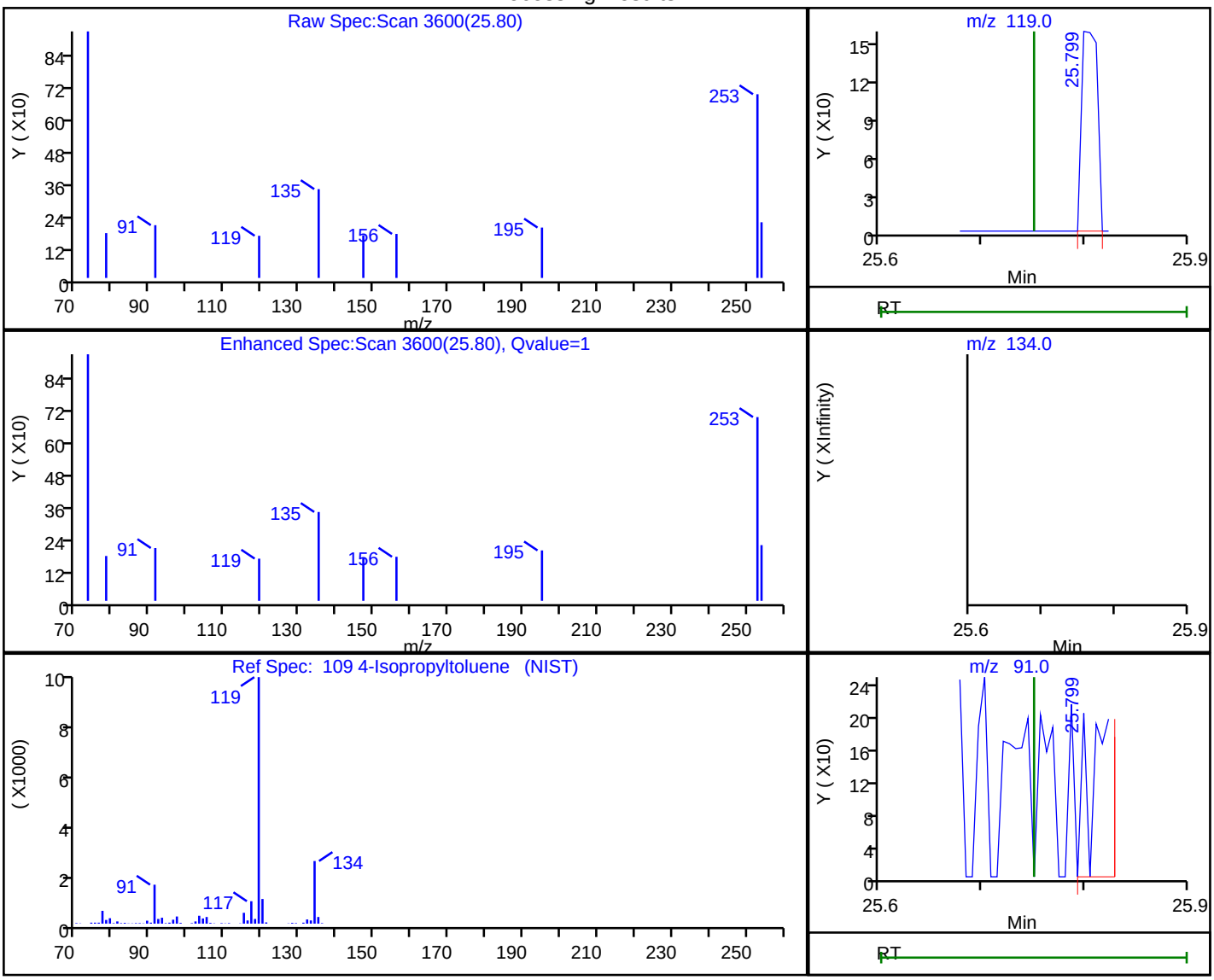
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

109 4-Isopropyltoluene, CAS: 99-87-6

Processing Results



RT	Mass	Response	Amount
25.80	119.00	170	0.002748
25.75	134.00	0	
25.80	91.00	332	

Reviewer: phanthasena, 26-Aug-2019 11:13:44

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

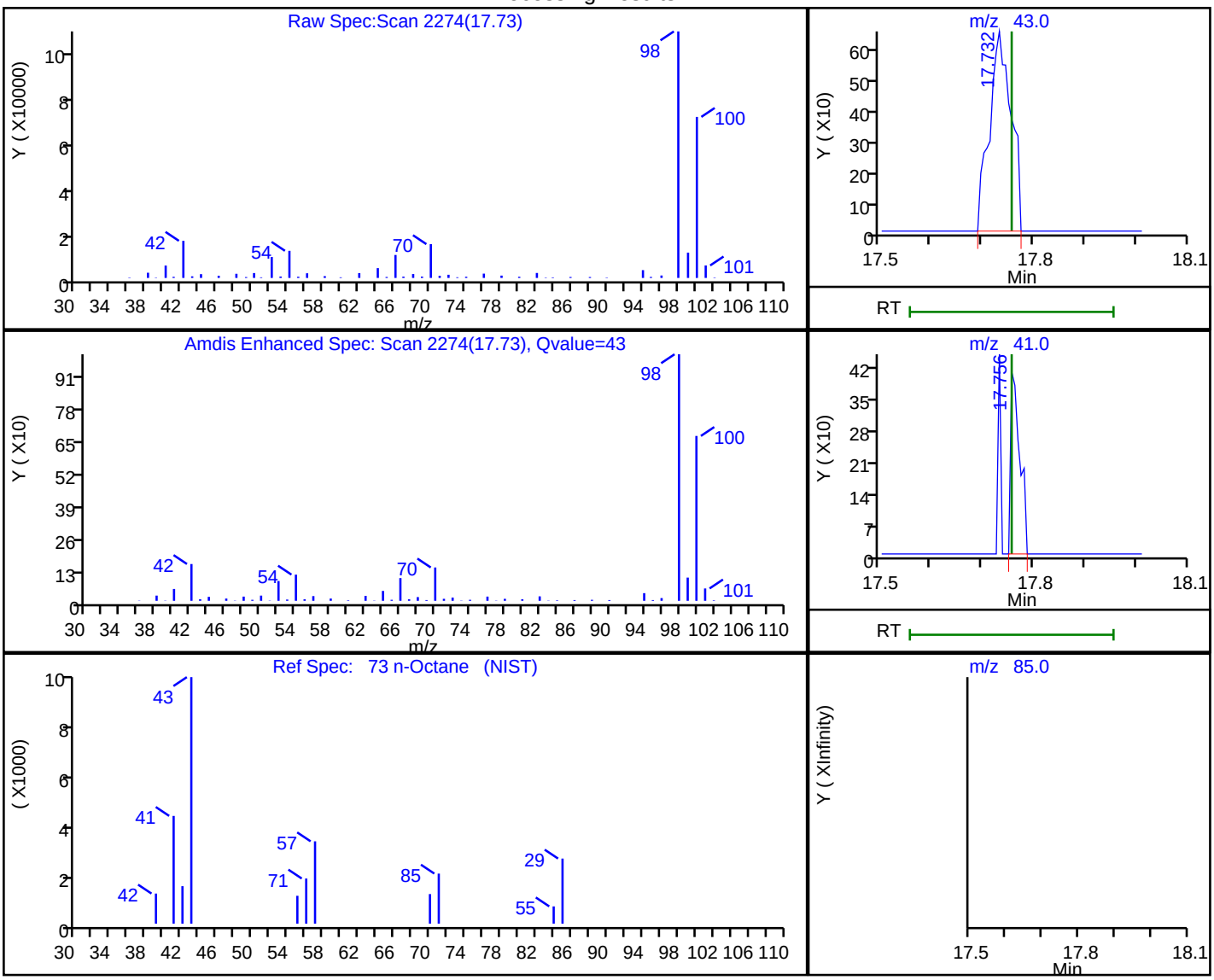
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

73 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
17.73	43.00	1935	0.082518
17.76	41.00	517	
17.76	85.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:18

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

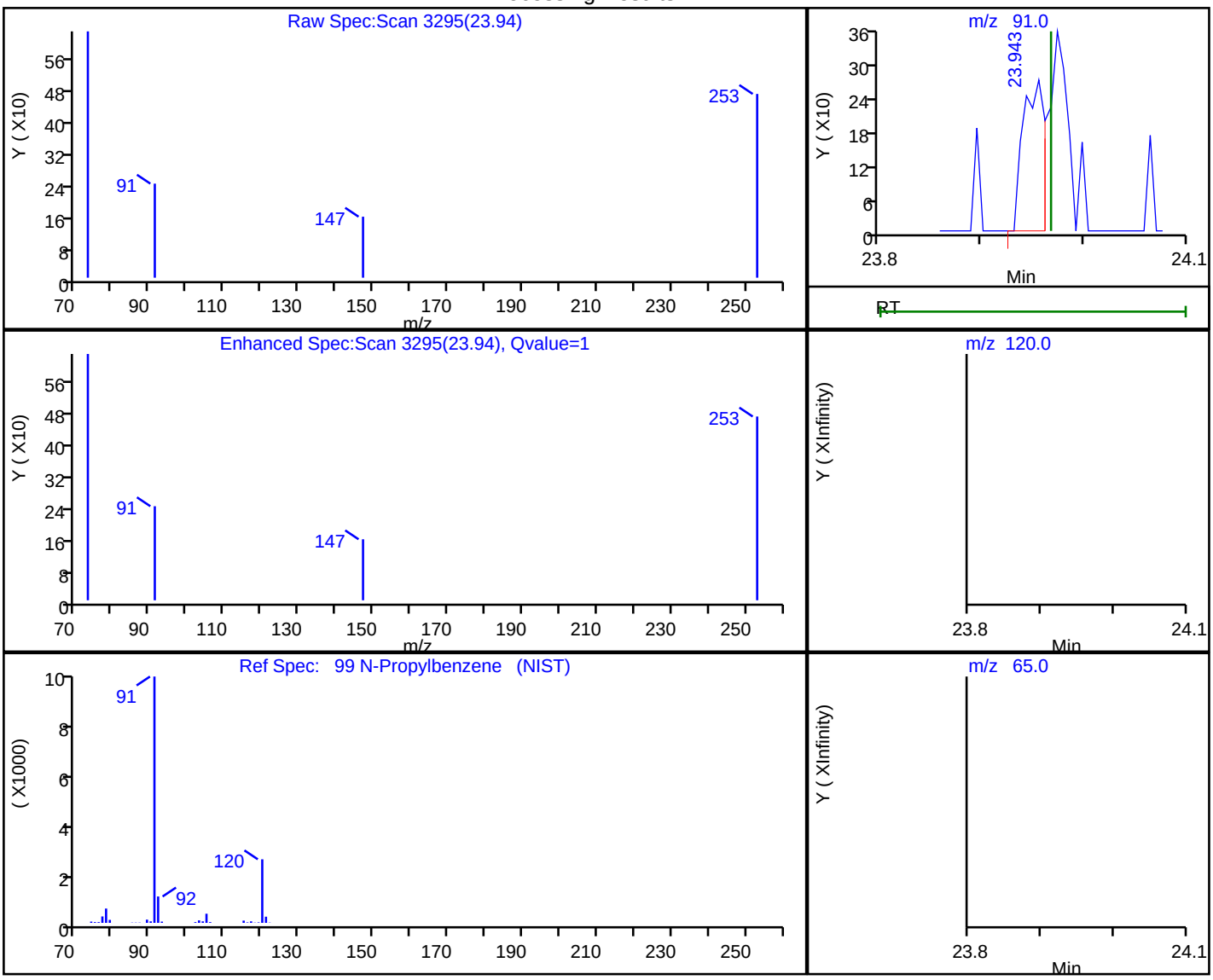
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

99 N-Propylbenzene, CAS: 103-65-1

Processing Results



RT	Mass	Response	Amount
23.94	91.00	393	0.006199
23.97	120.00	0	
23.97	65.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:33

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

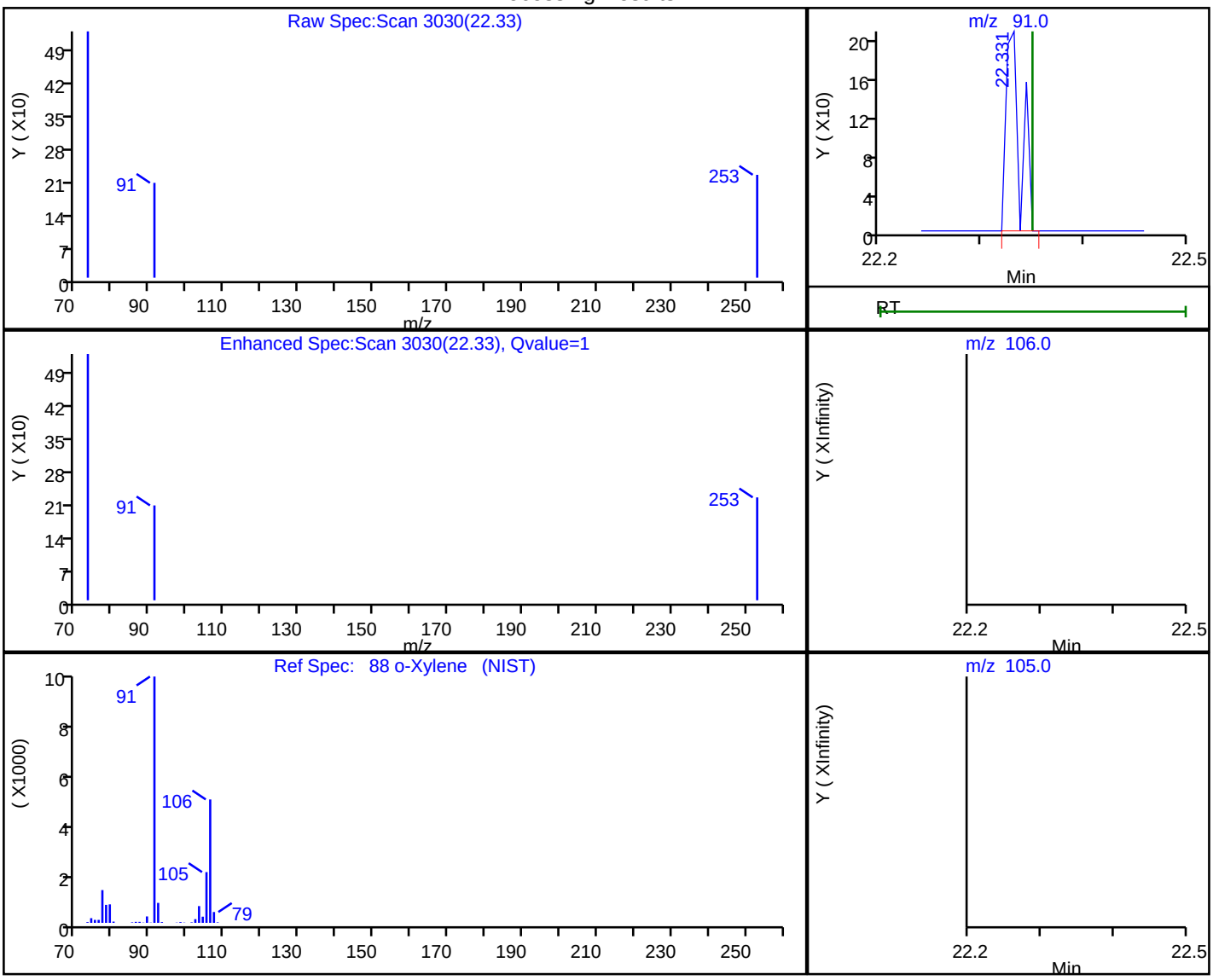
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS7\20190823-81717.b\MS7082313.D				
Injection Date:	23-Aug-2019 23:11:30	Instrument ID:	ATMS7		
Lims ID:	320-53364-A-1	Lab Sample ID:	320-53364-1		
Client ID:	34001249				
Operator ID:	SRS	ALS Bottle#:	10	Worklist Smp#:	13
Purge Vol:	5.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS7N	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

88 o-Xylene, CAS: 95-47-6

Processing Results



RT	Mass	Response	Amount
22.33	91.00	197	0.005079
22.35	106.00	0	
22.35	105.00	0	
22.35	78.00	0	

Reviewer: phanthasena, 26-Aug-2019 11:13:27

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

Summa Canister Dilution Worksheet

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job No.: 320-54161-1

Lab Sample ID	Canister Volume (L)	Preadjusted Pressure ("Hg)	Preadjusted Pressure (atm)	Preadjusted Volume (L)	Adjusted Pressure (psig)	Adjusted Pressure (atm)	Adjusted Volume (L)	Initial Volume (mL)	Dilution Factor	Final Dilution Factor	Pressure Gauge ID	Date	Analyst Initals
320-54161-2	6	29.41	1.00	6.00	29.41	3.00	18.00		3.00	3.00	AG14	09/30/19 17:45	SRV

Formulae:

Preadjusted Volume (L) = (Preadjusted Pressure ("Hg) + 29.92 "Hg * Vol L) / 29.92 "Hg
Adjusted Volume (L) = (Adjusted Pressure (psig) + 14.7 psig * Vol L) / 14.7 psig
Dilution Factor = Adjusted Volume (L) / Preadjusted Volume (L)

Where:

29.92 "Hg = Standard atmospheric pressure in inches of Mercury (“Hg)
14.7 psig = Standard atmospheric pressure in pounds per square inch gauge (psig)

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-56029-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
5820 SW Kelly Ave
Suite B
Portland, Oregon 97239

Attn: Stephanie Salisbury

Authorized for release by:
11/25/2019 1:47:34 PM

Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

Table of Contents

Glossary

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

Job ID: 320-56029-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative
320-56029-1

Comments
No additional comments.

Receipt
The samples were received on 11/6/2019 11:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice.

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

Subcontract Work
Method TO-15: This method was subcontracted to Eurofins Air Toxics. The subcontract laboratory certification is different from that of the facility issuing the final report.

Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Client Sample ID: SVE_South_PreCarbon_110419 — Lab Sample ID: 320-56029-1

No Detections.

Client Sample ID: SVE_South_PostCarbon_110419 — Lab Sample ID: 320-56029-2

No Detections.

This Detection Summary does not include radiochemical test results.

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Laboratory: Eurofins TestAmerica, Sacramento

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

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	01-20-21
ANAB	Dept. of Defense ELAP	L2468	01-20-21
ANAB	Dept. of Energy	L2468.01	01-20-21
ANAB	ISO/IEC 17025	L2468	01-20-21
Arizona	State	AZ0708	08-11-20
Arkansas DEQ	State	19-042-0	06-17-20
California	State	2897	01-31-20
Colorado	State	CA0004	08-31-20
Connecticut	State	PH-0691	06-30-21
Florida	NELAP	E87570	06-30-20
Georgia	State	4040	01-29-20
Hawaii	State	<cert No.>	01-29-20
Illinois	NELAP	200060	03-17-20
Kansas	NELAP	E-10375	10-31-20 *
Louisiana	NELAP	01944	06-30-20
Maine	State	2018009	04-14-20
Michigan	State	9947	01-29-20
Michigan	State Program	9947	01-31-20
Nevada	State	CA000442020-1	07-31-20
New Hampshire	NELAP	2997	04-18-20
New Jersey	NELAP	CA005	06-30-20
New York	NELAP	11666	04-01-20
Oregon	NELAP	4040	01-29-20
Pennsylvania	NELAP	68-01272	03-31-20
Texas	NELAP	T104704399-19-13	05-31-20
US Fish & Wildlife	US Federal Programs	58448	07-31-20
USDA	US Federal Programs	P330-18-00239	07-31-21
Utah	NELAP	CA000442019-01	02-29-20
Vermont	State	VT-4040	04-16-20
Virginia	NELAP	460278	03-14-20
Washington	State	C581	05-05-20
West Virginia (DW)	State	9930C	12-31-19
Wyoming	State Program	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Method	Method Description	Protocol	Laboratory
Subcontract	TO-15	None	Eurofins

Protocol References:

None = None

Laboratory References:

Eurofins = Eurofins Air Toxics, 180 Blue Ravine Road, Suite B, Folsom, CA 95630

Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
320-56029-1	SVE_South_PreCarbon_110419	Air	11/04/19 08:52	11/06/19 11:00	
320-56029-2	SVE_South_PostCarbon_110419	Air	11/04/19 08:59	11/06/19 11:00	

11/18/2019
Mr. Nate Lewis
Eurofins Test America
5755 8th Street East

Tacoma WA 98424

Project Name: NuStar Vancouver
Project #: 58012817
Workorder #: 1911204

Dear Mr. Nate Lewis

The following report includes the data for the above referenced project for sample(s) received on 11/11/2019 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1911204

Work Order Summary

CLIENT:	Mr. Nate Lewis Eurofins Test America 5755 8th Street East Tacoma, WA 98424	**BILL TO:**	Accounts Payable Eurofins Test America 4104 Shuffel St NW North Canton, OH 44720
PHONE:	253-922-2310	**P.O. #**	320-56029-1
FAX:	253-922-5047	**PROJECT #**	58012817 NuStar Vancouver
DATE RECEIVED:	11/11/2019	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/18/2019		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	SVE_South_PreCarbon_110419	TO-15	0.4 "Hg	5.1 psi
02A	SVE_South_PostCarbon_110419	TO-15	5.5 "Hg	5 psi
03A	Lab Blank	TO-15	NA	NA
04A	CCV	TO-15	NA	NA
05A	LCS	TO-15	NA	NA
05AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 11/18/19

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209218, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-18-13, UT NELAP – CA009332019-11, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-011, Effective date: 10/18/2019, Expiration date: 10/17/2020.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
EPA Method TO-15
Eurofins Test America
Workorder# 1911204

Two Client Canister samples were received on November 11, 2019. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Dilution was performed on sample SVE_South_PreCarbon_110419 due to the presence of high level target species.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

M - Reported value may be biased due to apparent matrix interferences.

CN - See Case Narrative.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	11	75	43	300
Trichloroethene	11	180	59	990
Tetrachloroethene	11	5600	74	38000

Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	0.66	1.2	1.7	3.2
trans-1,2-Dichloroethene	0.66	1.4	2.6	5.6
cis-1,2-Dichloroethene	0.66	41	2.6	160

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111327**	**Date of Collection:**	**11/4/19 8:52:00 AM**
Dil. Factor:	**27.3**	**Date of Analysis:**	**11/13/19 11:25 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	54	Not Detected
Freon 114	11	Not Detected	76	Not Detected
Chloromethane	140	Not Detected UJ	280	Not Detected UJ
Vinyl Chloride	11	Not Detected	28	Not Detected
Bromomethane	22	Not Detected	85	Not Detected
Chloroethane	22	Not Detected	58	Not Detected
Freon 11	11	Not Detected	61	Not Detected
Acetone	140	Not Detected	320	Not Detected
Carbon Disulfide	55	Not Detected	170	Not Detected
Methylene Chloride	11	Not Detected	38	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	43	Not Detected
2-Butanone (Methyl Ethyl Ketone)	22	Not Detected	64	Not Detected
cis-1,2-Dichloroethene	11	75	43	300
Chloroform	8.2	Not Detected	40	Not Detected
Carbon Tetrachloride	22	Not Detected	140	Not Detected
Benzene	11	Not Detected	35	Not Detected
1,2-Dichloroethane	11	Not Detected	44	Not Detected
Trichloroethene	11	180	59	990
1,2-Dichloropropane	11	Not Detected	50	Not Detected
Bromodichloromethane	8.2	Not Detected	55	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	50	Not Detected
4-Methyl-2-pentanone	11	Not Detected	45	Not Detected
Toluene	11	Not Detected	41	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	50	Not Detected
Tetrachloroethene	11	5600	74	38000
2-Hexanone	11	Not Detected	45	Not Detected
Dibromochloromethane	11	Not Detected	93	Not Detected
Chlorobenzene	8.2	Not Detected	38	Not Detected
Ethyl Benzene	11	Not Detected	47	Not Detected
m,p-Xylene	22	Not Detected	95	Not Detected
o-Xylene	11	Not Detected	47	Not Detected
Styrene	11	Not Detected	46	Not Detected
Bromoform	11	Not Detected	110	Not Detected
4-Ethyltoluene	11	Not Detected	54	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	54	Not Detected
1,3-Dichlorobenzene	11	Not Detected	66	Not Detected
1,4-Dichlorobenzene	11	Not Detected	66	Not Detected
alpha-Chlorotoluene	22	Not Detected	110	Not Detected
1,2-Dichlorobenzene	11	Not Detected	66	Not Detected
1,2,4-Trichlorobenzene	55	Not Detected	400	Not Detected
Hexachlorobutadiene	55	Not Detected	580	Not Detected
Vinyl Acetate	22	Not Detected	77	Not Detected

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111327**	**Date of Collection:**	**11/4/19 8:52:00 AM**
Dil. Factor:	**27.3**	**Date of Analysis:**	**11/13/19 11:25 PM**

UJ = Analyte associated with low bias in the CCV.

Container Type: Client Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	99	70-130

Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111326**	**Date of Collection:**	**11/4/19 8:59:00 AM**
Dil. Factor:	**1.64**	**Date of Analysis:**	**11/13/19 11:01 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.66	Not Detected	3.2	Not Detected
Freon 114	0.66	Not Detected	4.6	Not Detected
Chloromethane	8.2	Not Detected UJ	17	Not Detected UJ
Vinyl Chloride	0.66	1.2	1.7	3.2
Bromomethane	1.3	Not Detected	5.1	Not Detected
Chloroethane	1.3	Not Detected	3.5	Not Detected
Freon 11	0.66	Not Detected	3.7	Not Detected
Acetone	8.2	Not Detected	19	Not Detected
Carbon Disulfide	3.3	Not Detected	10	Not Detected
Methylene Chloride	0.66	Not Detected	2.3	Not Detected
trans-1,2-Dichloroethene	0.66	1.4	2.6	5.6
2-Butanone (Methyl Ethyl Ketone)	1.3	Not Detected	3.9	Not Detected
cis-1,2-Dichloroethene	0.66	41	2.6	160
Chloroform	0.49	Not Detected	2.4	Not Detected
Carbon Tetrachloride	1.3	Not Detected	8.2	Not Detected
Benzene	0.66	Not Detected	2.1	Not Detected
1,2-Dichloroethane	0.66	Not Detected	2.6	Not Detected
Trichloroethene	0.66	Not Detected	3.5	Not Detected
1,2-Dichloropropane	0.66	Not Detected	3.0	Not Detected
Bromodichloromethane	0.49	Not Detected	3.3	Not Detected
cis-1,3-Dichloropropene	0.66	Not Detected	3.0	Not Detected
4-Methyl-2-pentanone	0.66	Not Detected	2.7	Not Detected
Toluene	0.66	Not Detected	2.5	Not Detected
trans-1,3-Dichloropropene	0.66	Not Detected	3.0	Not Detected
Tetrachloroethene	0.66	Not Detected	4.4	Not Detected
2-Hexanone	0.66	Not Detected	2.7	Not Detected
Dibromochloromethane	0.66	Not Detected	5.6	Not Detected
Chlorobenzene	0.49	Not Detected	2.3	Not Detected
Ethyl Benzene	0.66	Not Detected	2.8	Not Detected
m,p-Xylene	1.3	Not Detected	5.7	Not Detected
o-Xylene	0.66	Not Detected	2.8	Not Detected
Styrene	0.66	Not Detected	2.8	Not Detected
Bromoform	0.66	Not Detected	6.8	Not Detected
4-Ethyltoluene	0.66	Not Detected	3.2	Not Detected
1,3,5-Trimethylbenzene	0.66	Not Detected	3.2	Not Detected
1,3-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
1,4-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
alpha-Chlorotoluene	1.3	Not Detected	6.8	Not Detected
1,2-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
1,2,4-Trichlorobenzene	3.3	Not Detected	24	Not Detected
Hexachlorobutadiene	3.3	Not Detected	35	Not Detected
Vinyl Acetate	1.3	Not Detected	4.6	Not Detected

Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111326**	**Date of Collection:**	**11/4/19 8:59:00 AM**
Dil. Factor:	**1.64**	**Date of Analysis:**	**11/13/19 11:01 PM**

UJ = Analyte associated with low bias in the CCV.

Container Type: Client Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	100	70-130

Client Sample ID: Lab Blank

Lab ID#: 1911204-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111307a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 11:28 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.40	Not Detected	2.0	Not Detected
Freon 114	0.40	Not Detected	2.8	Not Detected
Chloromethane	5.0	Not Detected UJ	10	Not Detected UJ
Vinyl Chloride	0.40	Not Detected	1.0	Not Detected
Bromomethane	0.80	Not Detected	3.1	Not Detected
Chloroethane	0.80	Not Detected	2.1	Not Detected
Freon 11	0.40	Not Detected	2.2	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
Methylene Chloride	0.40	Not Detected	1.4	Not Detected
trans-1,2-Dichloroethene	0.40	Not Detected	1.6	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.80	Not Detected	2.4	Not Detected
cis-1,2-Dichloroethene	0.40	Not Detected	1.6	Not Detected
Chloroform	0.30	Not Detected	1.5	Not Detected
Carbon Tetrachloride	0.80	Not Detected	5.0	Not Detected
Benzene	0.40	Not Detected	1.3	Not Detected
1,2-Dichloroethane	0.40	Not Detected	1.6	Not Detected
Trichloroethene	0.40	Not Detected	2.1	Not Detected
1,2-Dichloropropane	0.40	Not Detected	1.8	Not Detected
Bromodichloromethane	0.30	Not Detected	2.0	Not Detected
cis-1,3-Dichloropropene	0.40	Not Detected	1.8	Not Detected
4-Methyl-2-pentanone	0.40	Not Detected	1.6	Not Detected
Toluene	0.40	Not Detected	1.5	Not Detected
trans-1,3-Dichloropropene	0.40	Not Detected	1.8	Not Detected
Tetrachloroethene	0.40	Not Detected	2.7	Not Detected
2-Hexanone	0.40	Not Detected	1.6	Not Detected
Dibromochloromethane	0.40	Not Detected	3.4	Not Detected
Chlorobenzene	0.30	Not Detected	1.4	Not Detected
Ethyl Benzene	0.40	Not Detected	1.7	Not Detected
m,p-Xylene	0.80	Not Detected	3.5	Not Detected
o-Xylene	0.40	Not Detected	1.7	Not Detected
Styrene	0.40	Not Detected	1.7	Not Detected
Bromoform	0.40	Not Detected	4.1	Not Detected
4-Ethyltoluene	0.40	Not Detected	2.0	Not Detected
1,3,5-Trimethylbenzene	0.40	Not Detected	2.0	Not Detected
1,3-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
1,4-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
alpha-Chlorotoluene	0.80	Not Detected	4.1	Not Detected
1,2-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected
Vinyl Acetate	0.80	Not Detected	2.8	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1911204-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111307a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 11:28 AM**	

UJ = Analyte associated with low bias in the CCV.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	97	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: CCV

Lab ID#: 1911204-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:23 AM**

Compound	%Recovery
Freon 12	92
Freon 114	93
Chloromethane	67 Q
Vinyl Chloride	87
Bromomethane	90
Chloroethane	90
Freon 11	96
Acetone	87
Carbon Disulfide	96
Methylene Chloride	77
trans-1,2-Dichloroethene	97
2-Butanone (Methyl Ethyl Ketone)	94
cis-1,2-Dichloroethene	95
Chloroform	95
Carbon Tetrachloride	99
Benzene	99
1,2-Dichloroethane	98
Trichloroethene	100
1,2-Dichloropropane	97
Bromodichloromethane	100
cis-1,3-Dichloropropene	106
4-Methyl-2-pentanone	93
Toluene	103
trans-1,3-Dichloropropene	101
Tetrachloroethene	104
2-Hexanone	91
Dibromochloromethane	102
Chlorobenzene	97
Ethyl Benzene	103
m,p-Xylene	102
o-Xylene	98
Styrene	103
Bromoform	106
4-Ethyltoluene	99
1,3,5-Trimethylbenzene	100
1,3-Dichlorobenzene	98
1,4-Dichlorobenzene	99
alpha-Chlorotoluene	94
1,2-Dichlorobenzene	99
1,2,4-Trichlorobenzene	105
Hexachlorobutadiene	112
Vinyl Acetate	101

Client Sample ID: CCV

Lab ID#: 1911204-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:23 AM**	

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	106	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCS

Lab ID#: 1911204-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:48 AM**	

Compound	%Recovery	Method Limits
Freon 12	86	70-130
Freon 114	87	70-130
Chloromethane	86	70-130
Vinyl Chloride	80	70-130
Bromomethane	88	70-130
Chloroethane	83	70-130
Freon 11	85	70-130
Acetone	85	70-130
Carbon Disulfide	86	70-130
Methylene Chloride	73	70-130
trans-1,2-Dichloroethene	78	70-130
2-Butanone (Methyl Ethyl Ketone)	84	70-130
cis-1,2-Dichloroethene	96	70-130
Chloroform	90	70-130
Carbon Tetrachloride	91	70-130
Benzene	88	70-130
1,2-Dichloroethane	85	70-130
Trichloroethene	88	70-130
1,2-Dichloropropane	81	70-130
Bromodichloromethane	85	70-130
cis-1,3-Dichloropropene	90	70-130
4-Methyl-2-pentanone	80	70-130
Toluene	89	70-130
trans-1,3-Dichloropropene	97	70-130
Tetrachloroethene	96	70-130
2-Hexanone	83	70-130
Dibromochloromethane	94	70-130
Chlorobenzene	87	70-130
Ethyl Benzene	91	70-130
m,p-Xylene	92	70-130
o-Xylene	92	70-130
Styrene	90	70-130
Bromoform	95	70-130
4-Ethyltoluene	88	70-130
1,3,5-Trimethylbenzene	90	70-130
1,3-Dichlorobenzene	87	70-130
1,4-Dichlorobenzene	86	70-130
alpha-Chlorotoluene	86	70-130
1,2-Dichlorobenzene	87	70-130
1,2,4-Trichlorobenzene	73	70-130
Hexachlorobutadiene	78	70-130
Vinyl Acetate	97	70-130

Client Sample ID: LCS

Lab ID#: 1911204-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:48 AM**	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	101	70-130

Client Sample ID: LCSD

Lab ID#: 1911204-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 10:12 AM**	

Compound	%Recovery	Method Limits
Freon 12	85	70-130
Freon 114	89	70-130
Chloromethane	84	70-130
Vinyl Chloride	80	70-130
Bromomethane	91	70-130
Chloroethane	86	70-130
Freon 11	88	70-130
Acetone	85	70-130
Carbon Disulfide	89	70-130
Methylene Chloride	72	70-130
trans-1,2-Dichloroethene	81	70-130
2-Butanone (Methyl Ethyl Ketone)	89	70-130
cis-1,2-Dichloroethene	100	70-130
Chloroform	92	70-130
Carbon Tetrachloride	93	70-130
Benzene	89	70-130
1,2-Dichloroethane	85	70-130
Trichloroethene	88	70-130
1,2-Dichloropropane	82	70-130
Bromodichloromethane	86	70-130
cis-1,3-Dichloropropene	91	70-130
4-Methyl-2-pentanone	81	70-130
Toluene	91	70-130
trans-1,3-Dichloropropene	97	70-130
Tetrachloroethene	98	70-130
2-Hexanone	86	70-130
Dibromochloromethane	95	70-130
Chlorobenzene	88	70-130
Ethyl Benzene	92	70-130
m,p-Xylene	95	70-130
o-Xylene	94	70-130
Styrene	92	70-130
Bromoform	96	70-130
4-Ethyltoluene	90	70-130
1,3,5-Trimethylbenzene	92	70-130
1,3-Dichlorobenzene	89	70-130
1,4-Dichlorobenzene	89	70-130
alpha-Chlorotoluene	87	70-130
1,2-Dichlorobenzene	90	70-130
1,2,4-Trichlorobenzene	80	70-130
Hexachlorobutadiene	87	70-130
Vinyl Acetate	98	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1911204-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 10:12 AM**	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	103	70-130

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	Client Project Manager: Stephanie Salisbury	Samples Collected By: Lindsay Wallis	COC No:
Company Name: Cascadia Associates	Phone: 503-906-6577		1 of 1 COCs
Address: 5820 SW Kelly Ave Suite B	Email: ssalisbury@cascadiaassociates.com		
City/State/Zip: Portland OR 97239			For Lab Use Only:
Phone: 503-906-6577	Site Contact: Lindsay Wallis		Walk-in Client:
FAX:	Tel/Fax 503-319-5064		Lab Sampling:
Project Name: Nustar Vancouver	Anaylsis Turnaround Time		
Site/Location: Vancouver, WA	Standard (Specific): X		Job / SDG No.:
P O #	Rush (Specify):		(See below for Add'l Items)

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Type	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE-South-Pre Carbon-110419	11/4	851	11/4	852	-30	-2	—	34001403	X														
SVE-South-Post Carbon-110419	11/4	858	11/4	859	-30	-5	—	34001257	X														

320-56029 Chain of Custody

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

Special Instructions/QC Requirements & Comments:
Results emailed to ssalisbury@cascadiaassociates.com

Samples Shipped by: Lindsay Wallis, Cascadia	Date / Time: 11/4/19 1535	Samples Received by: [signature] 11:00 11-6-19	TASAC
Samples Relinquished by:	Date / Time:	Received by:	
Relinquished by:	Date / Time:	Received by:	
Lab Use Only: Shipper Name:	Opened by:	Condition:	

Form No. CA-C-WI-003, Rev. 2.9, dated 9/5/2018

11/25/2019

Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-56029-1

Login Number: 56029
List Number: 1
Creator: Branscum, Cassie

List Source: Eurofins TestAmerica, Sacramento

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

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Sacramento
Canister QC Certification
Batch Certification

320-54181 Chain of Custody

Date Cleaned/Batch ID: C09/11/19

Date of QC: 10/1/19

Data File Number: MS6100120
(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	8362
	34000059
	8276
	34000135
	34001403
	34000504
	34001257
	7969
	34000029
	8387
	8047
	8133

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "*Certification Type*" indicated above.

"*" INDICATES THE CAN OR CANS WHICH WERE SCREENED

[signature] 1st Level Reviewed By — Date: 10/2/19

[signature] 2nd Level Reviewed By — Date: 10/28/19

Q:\DOCUMENT-MANAGEMENT\FORMS\QA-814 IND CAN QC 20180323.DOC
QA-814A RE 20180323

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-54181-1

SDG No.:

Client Sample ID: 8362 Lab Sample ID: 320-54181-1

Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

Sample wt/vol: 574(mL) Date Analyzed: 10/02/2019 09:05

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	0.38	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	0.25	J B	0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	0.079	J B	0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	0.069	J B	0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	0.16	J B	0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-54181-1

SDG No.:

Client Sample ID: 8362 Lab Sample ID: 320-54181-1

Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

Sample wt/vol: 574(mL) Date Analyzed: 10/02/2019 09:05

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	0.14	J B	0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	ND		0.40	0.072
98-83-9	alpha-Methylstyrene	0.22	J B	0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	0.18	J B	0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	0.20	J B	0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	0.15	J B	0.40	0.069
127-18-4	Tetrachloroethene	0.071	J B	0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	0.13	J B	0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-54181-1

SDG No.:

Client Sample ID: 8362 Lab Sample ID: 320-54181-1

Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

Sample wt/vol: 574(mL) Date Analyzed: 10/02/2019 09:05

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	0.36	J B	0.80	0.10
95-47-6	o-Xylene	0.15	J B	0.40	0.054
1330-20-7	Xylenes, Total	0.51	J B	1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	75		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	96		70-130
2037-26-5	Toluene-d8 (Surr)	97		70-130

Eurofins TestAmerica, Sacramento
Target Compound Quantitation Report

Data File: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D
Lims ID: 320-54181-A-1
Client ID: 8362
Sample Type: Client
Inject. Date: 02-Oct-2019 09:05:30 ALS Bottle#: 14 Worklist Smp#: 21
Purge Vol: 25.000 mL Dil. Factor: 1.0000
Sample Info: 320-54181-A-1
Misc. Info.: 500mL
Operator ID: SRS Instrument ID: ATMS6

Method: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\TO15_ATMS6.m
Limit Group: MSA - TO15 - ICAL
Last Update: 02-Oct-2019 10:19:55 Calib Date: 28-Sep-2019 10:10:30
Integrator: RTE ID Type: Deconvolution ID
Quant Method: Internal Standard Quant By: Initial Calibration
Last ICal File: \\chromna\Sacramento\ChromData\ATMS6\20190927-83863.b\MS6092811.D

Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
Process Host: CTX0316

First Level Reviewer: vanommens Date: 02-Oct-2019 10:19:55

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	11.076	11.082	-0.006	92	102921	10.0	
* 2 1,4-Difluorobenzene	114	13.266	13.266	0.000	94	380834	10.0	
* 3 Chlorobenzene-d5 (IS)	117	20.031	20.030	0.001	86	278651	10.0	
$ 4 1,2-Dichloroethane-d4 (Sur	65	12.298	12.298	0.000	42	133008	9.59	
$ 5 Toluene-d8 (Surr)	100	16.672	16.672	0.000	99	248014	9.74	
$ 6 4-Bromofluorobenzene (Surr	95	22.640	22.640	0.000	0	126348	7.55	
11 Propene	41	3.094	3.092	0.000	96	1452	0.1751	
32 Acetone	43	6.203	6.175	0.025	94	6574	0.3797	
75 Toluene	91	16.855	16.849	0.006	94	5676	0.1332	
80 Tetrachloroethene	166	18.394	18.394	0.000	89	1288	0.0713	
81 Chlorodibromomethane	129	18.631	18.631	0.000	89	875	0.0453	
82 Ethylene Dibromide	107	19.094	19.094	0.000	39	591	0.0310	
83 Chlorobenzene	112	20.116	20.116	0.000	86	1918	0.0694	
84 n-Nonane	43	20.213	20.213	0.000	83	718	0.0273	
86 Ethylbenzene	91	20.298	20.304	-0.006	96	6619	0.1428	
87 m-Xylene & p-Xylene	91	20.493	20.493	0.000	98	12932	0.3580	
88 o-Xylene	91	21.412	21.405	0.007	94	5221	0.1465	
89 Styrene	104	21.442	21.442	0.000	76	1429	0.1991	
90 Bromoform	173	22.002	22.002	0.000	92	1903	0.2455	
92 Isopropylbenzene	120	22.215	22.209	0.007	93	1034	0.0753	
93 1,1,2,2-Tetrachloroethane	83	22.421	22.421	0.000	94	4019	0.1534	
97 1,2,3-Trichloropropane	110	22.720	22.726	-0.005	88	966	0.1306	
99 N-Propylbenzene	91	23.060	23.060	0.000	95	3654	0.0565	
102 4-Ethyltoluene	120	23.304	23.304	0.001	96	1048	0.0686	
104 1,3,5-Trimethylbenzene	120	23.407	23.401	0.006	92	1632	0.0770	
105 Alpha Methyl Styrene	118	23.985	23.991	-0.006	80	684	0.2186	
106 tert-Butylbenzene	91	24.131	24.137	-0.006	90	2409	0.0790	
107 1,2,4-Trimethylbenzene	120	24.198	24.204	-0.006	99	1325	0.0658	
108 sec-Butylbenzene	105	24.587	24.587	0.000	96	4324	0.0671	
109 4-Isopropyltoluene	119	24.879	24.873	0.006	94	3244	0.0620	
110 1,3-Dichlorobenzene	146	24.964	24.964	0.000	87	941	0.1610	

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
111 1,4-Dichlorobenzene	146	25.171	25.165	0.006	89	1366	0.1056	
116 1,2-Dichlorobenzene	146	25.895	25.895	0.000	92	1128	0.1049	
120 Hexachlorobutadiene	225	29.588	29.588	0.000	79	727	0.0405	
S 150 Xylenes, Total	91				0		0.5045	

Reagents:

VAMSIS50_00032 Amount Added: 50.00 Units: mL Run Reagent

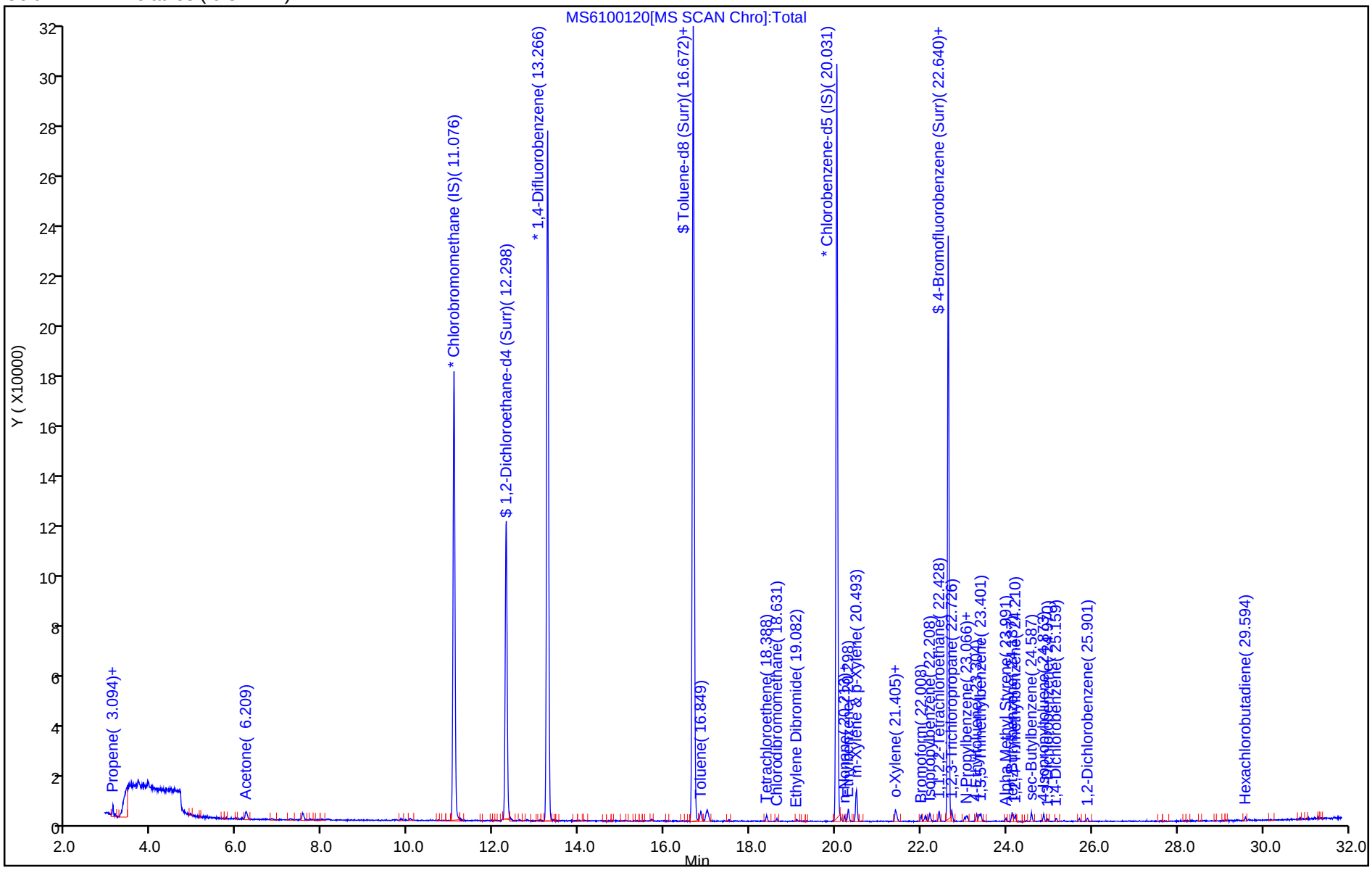
Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D

Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6	Operator ID:	SRS
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1	Worklist Smp#:	21
Client ID:	8362				
Purge Vol:	25.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	14
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		

Column: RTX Volatiles (0.32 mm)



11/25/2019

Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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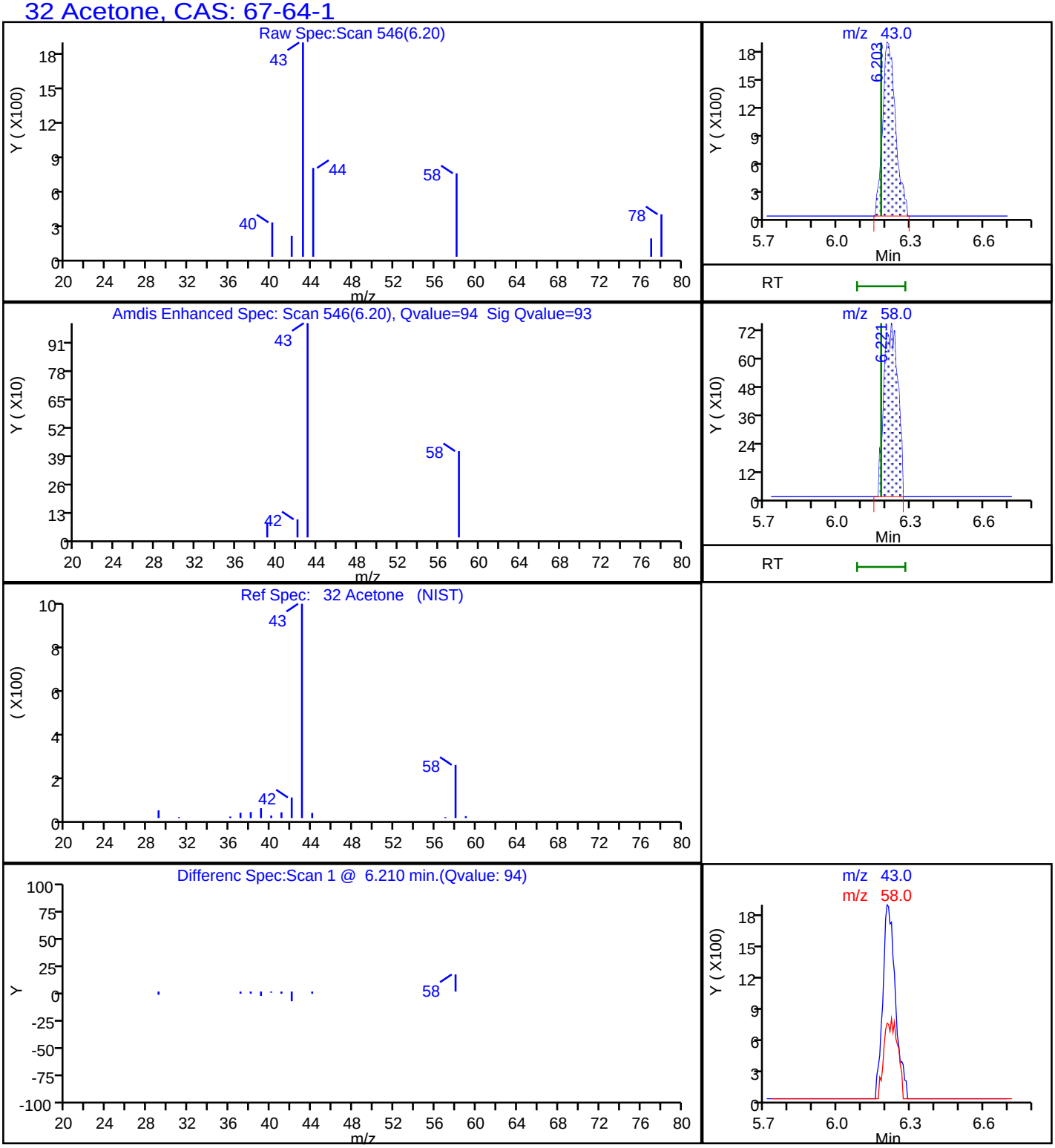
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

32 Acetone, CAS: 67-64-1



Eurofins TestAmerica, Sacramento

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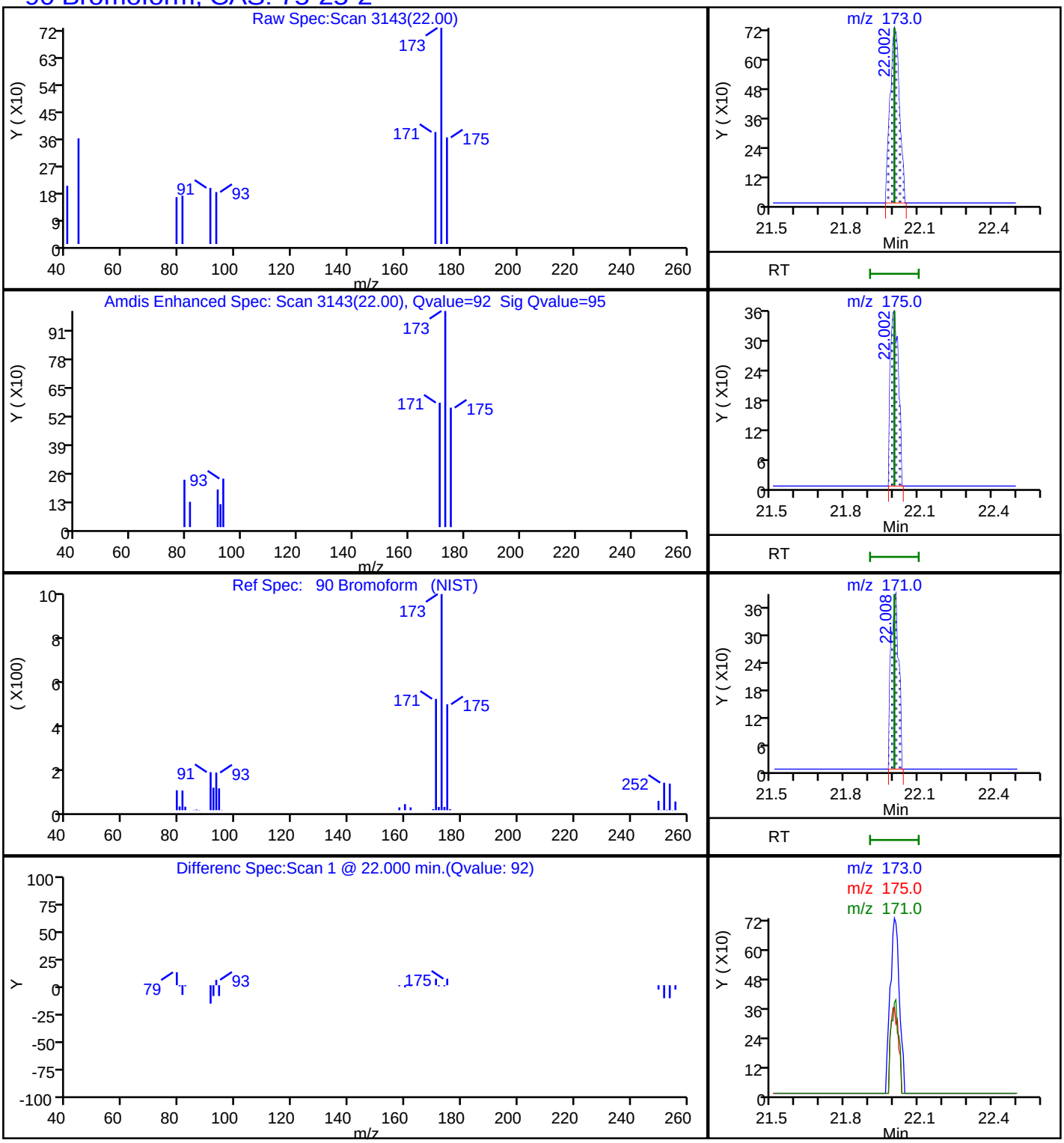
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

90 Bromoform, CAS: 75-25-2



Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

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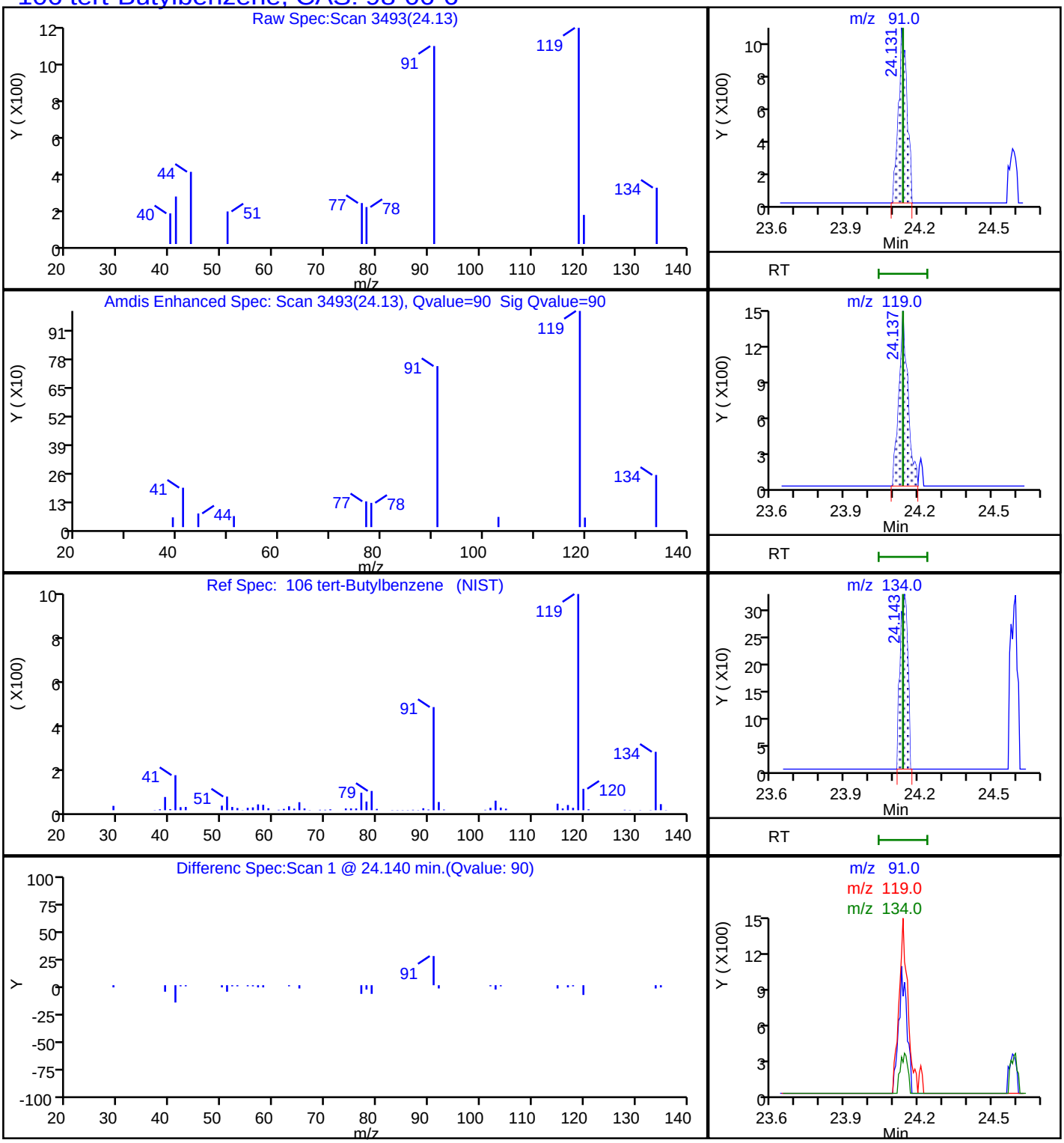
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

106 tert-Butylbenzene, CAS: 98-06-6



Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

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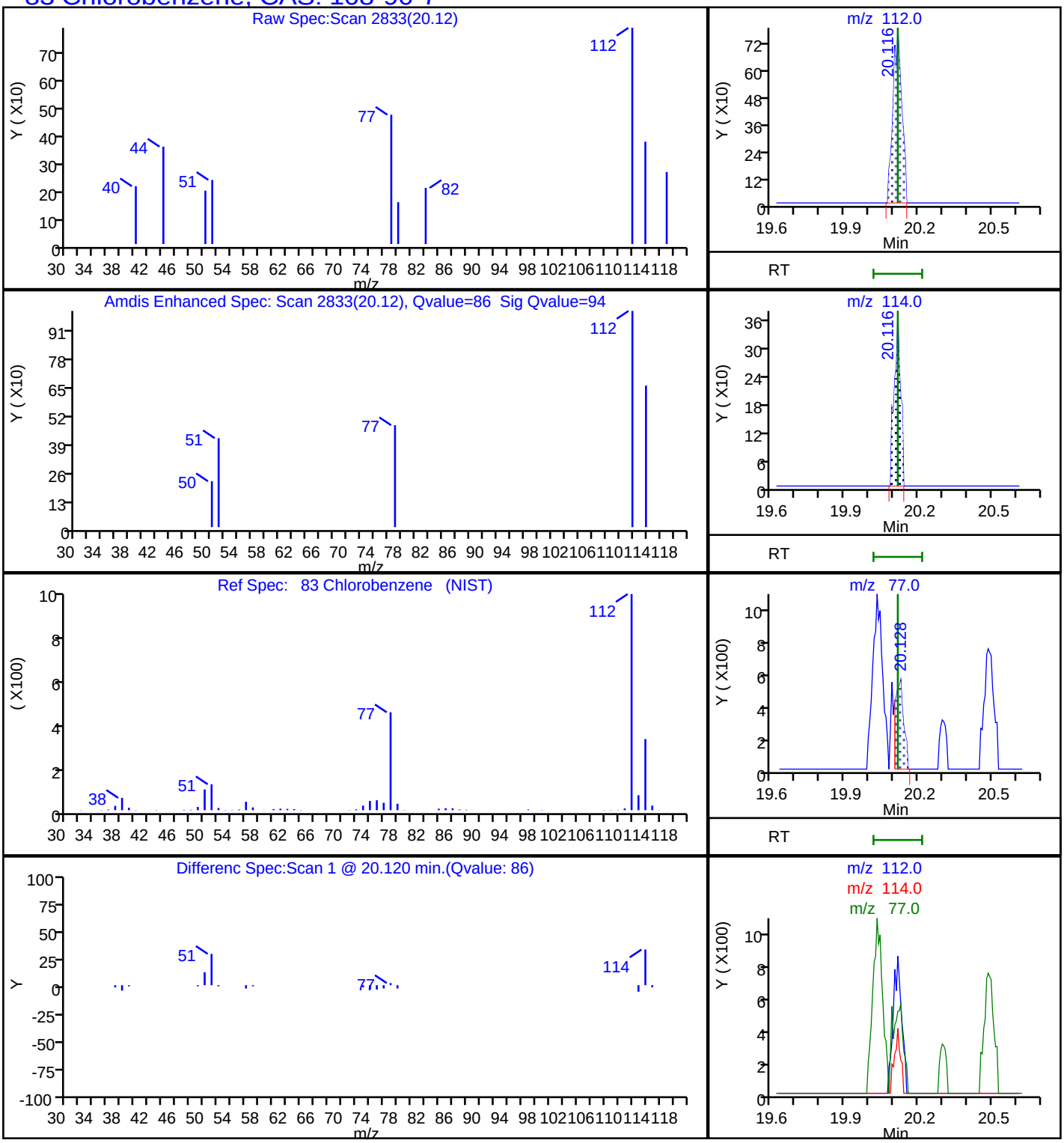
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

83 Chlorobenzene, CAS: 108-90-7



Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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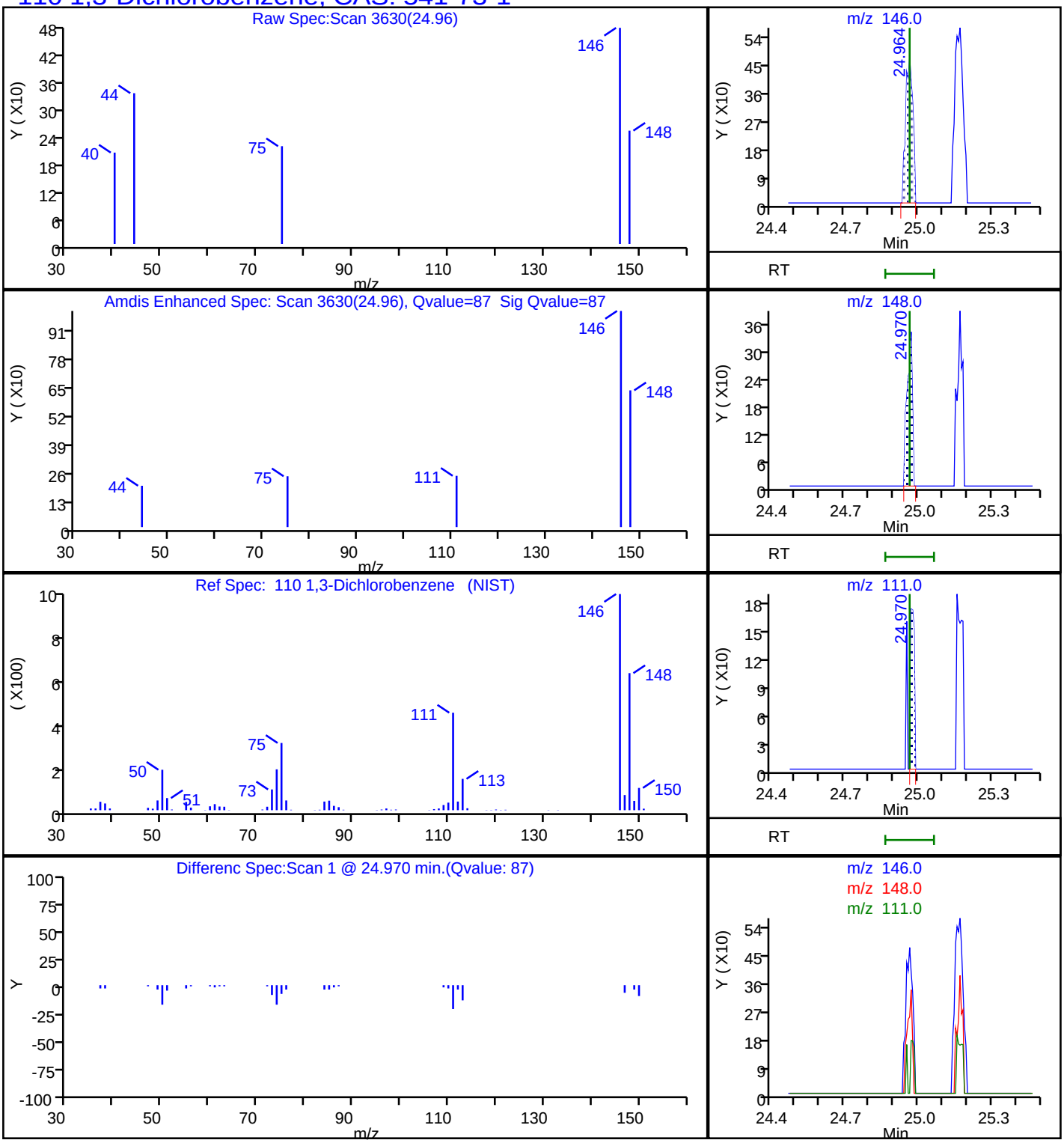
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

110 1,3-Dichlorobenzene, CAS: 541-73-1



Eurofins TestAmerica, Sacramento

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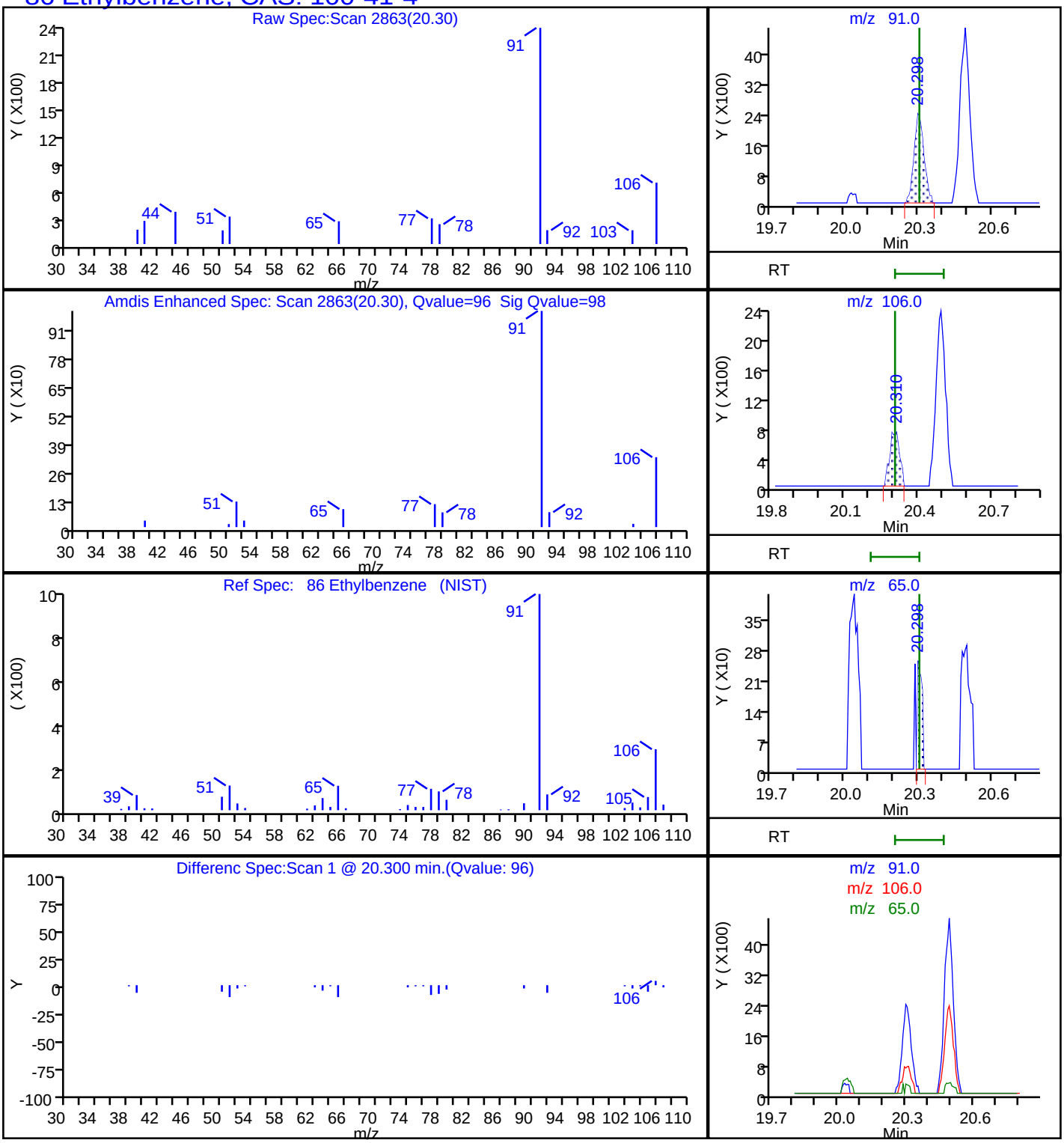
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

86 Ethylbenzene, CAS: 100-41-4



Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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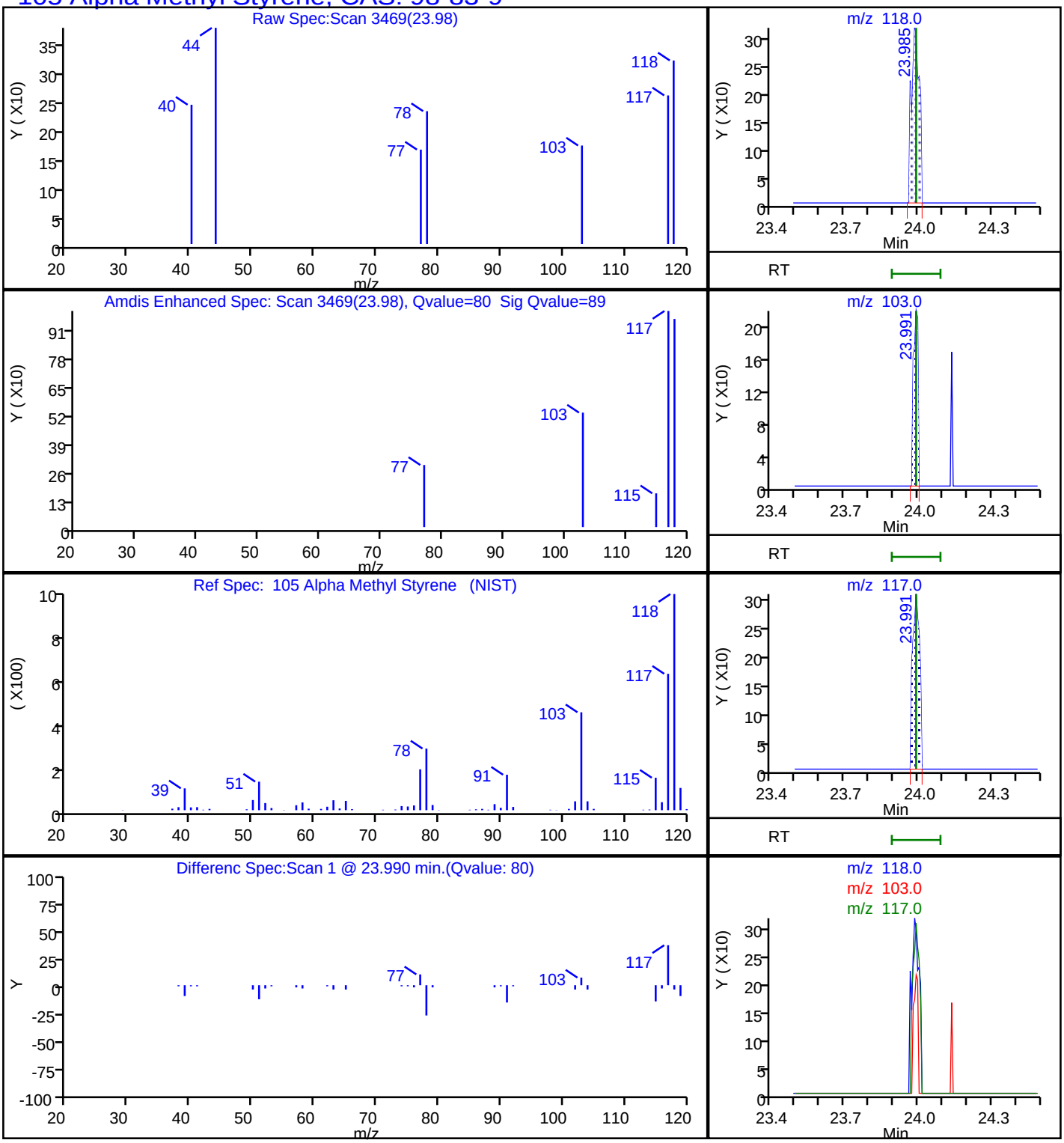
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

105 Alpha Methyl Styrene, CAS: 98-83-9



Eurofins TestAmerica, Sacramento

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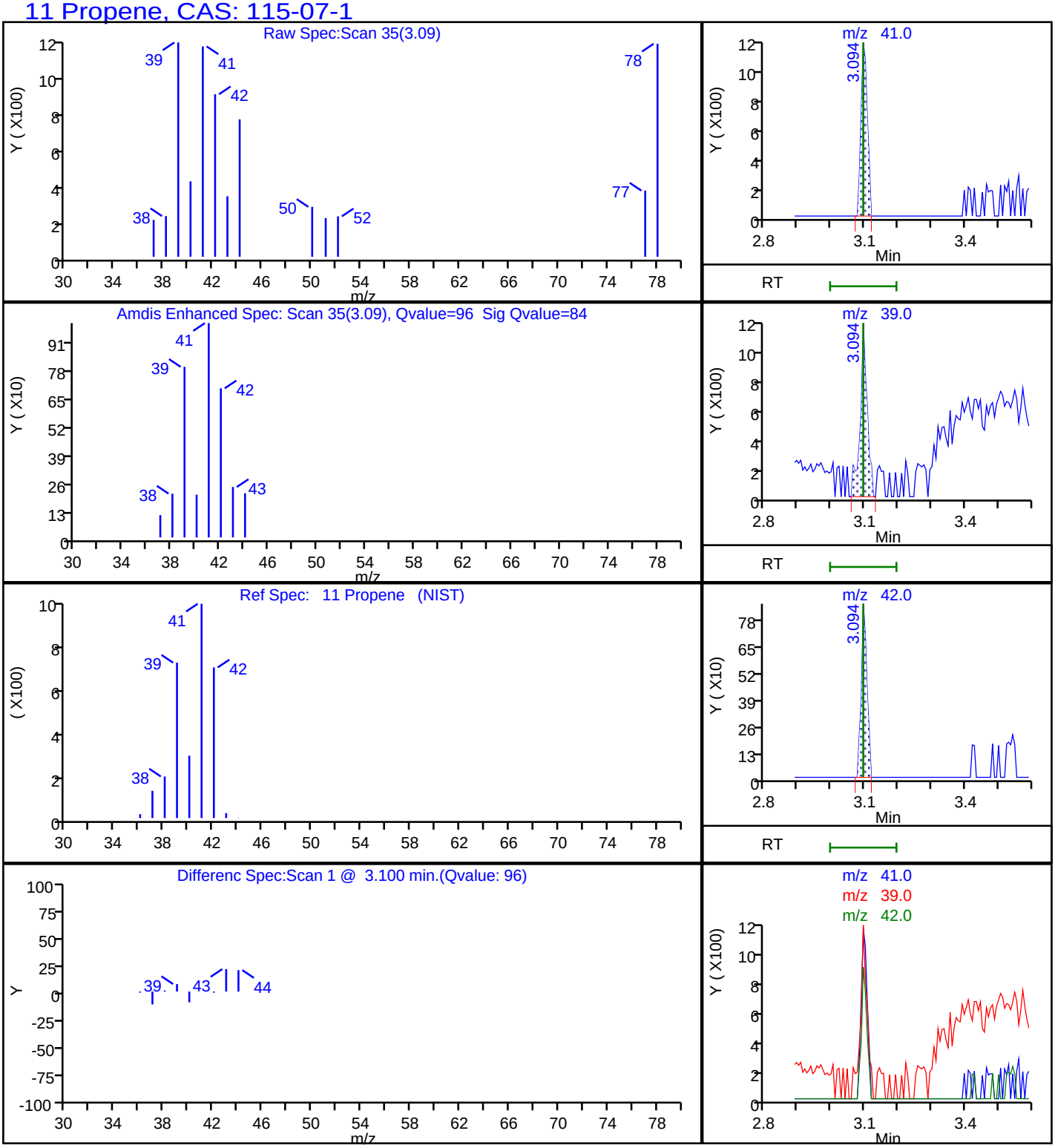
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

11 Propene, CAS: 115-07-1



Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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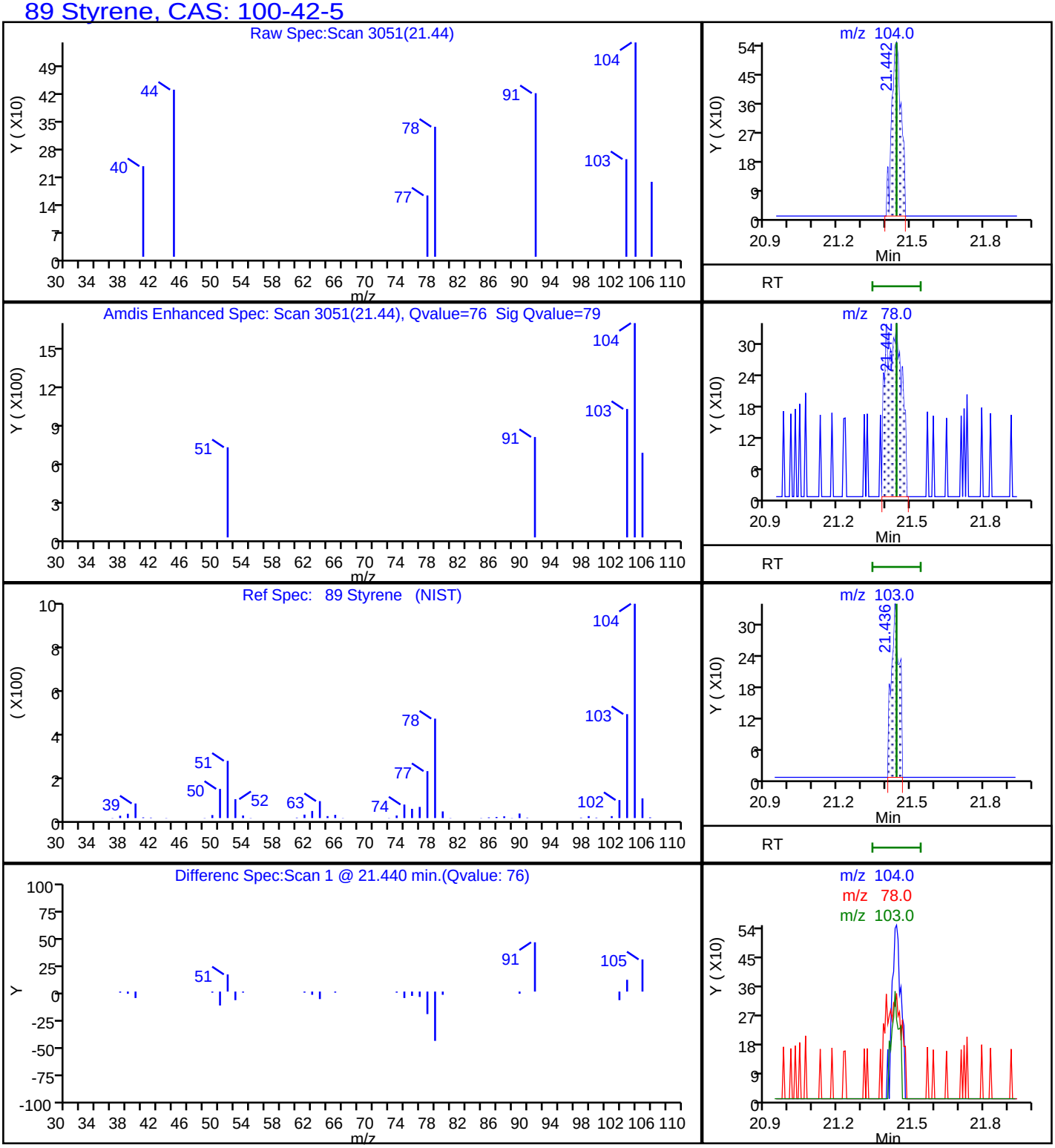
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

89 Styrene, CAS: 100-42-5



Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
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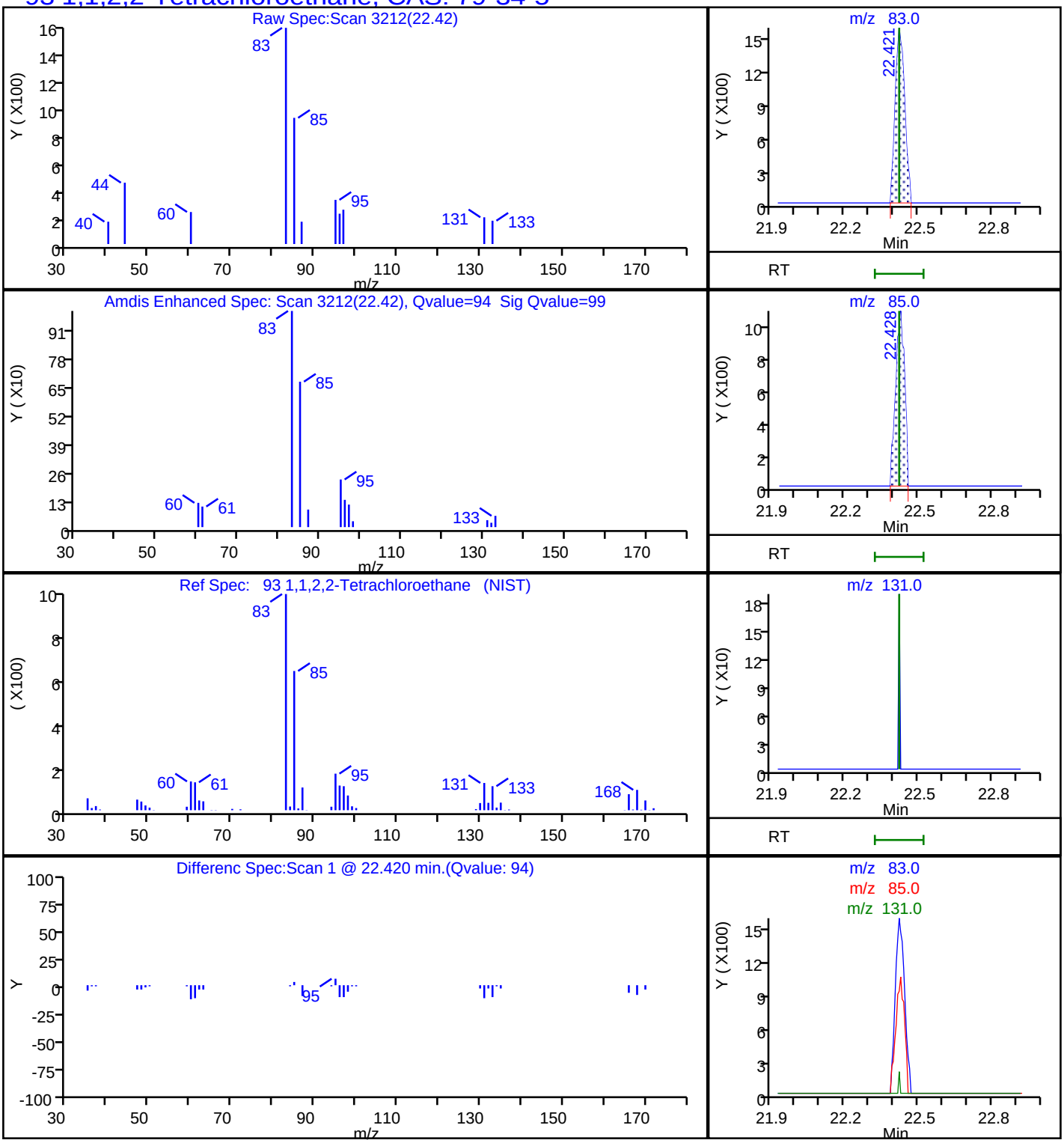
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

93 1,1,2,2-Tetrachloroethane, CAS: 79-34-5



Eurofins TestAmerica, Sacramento

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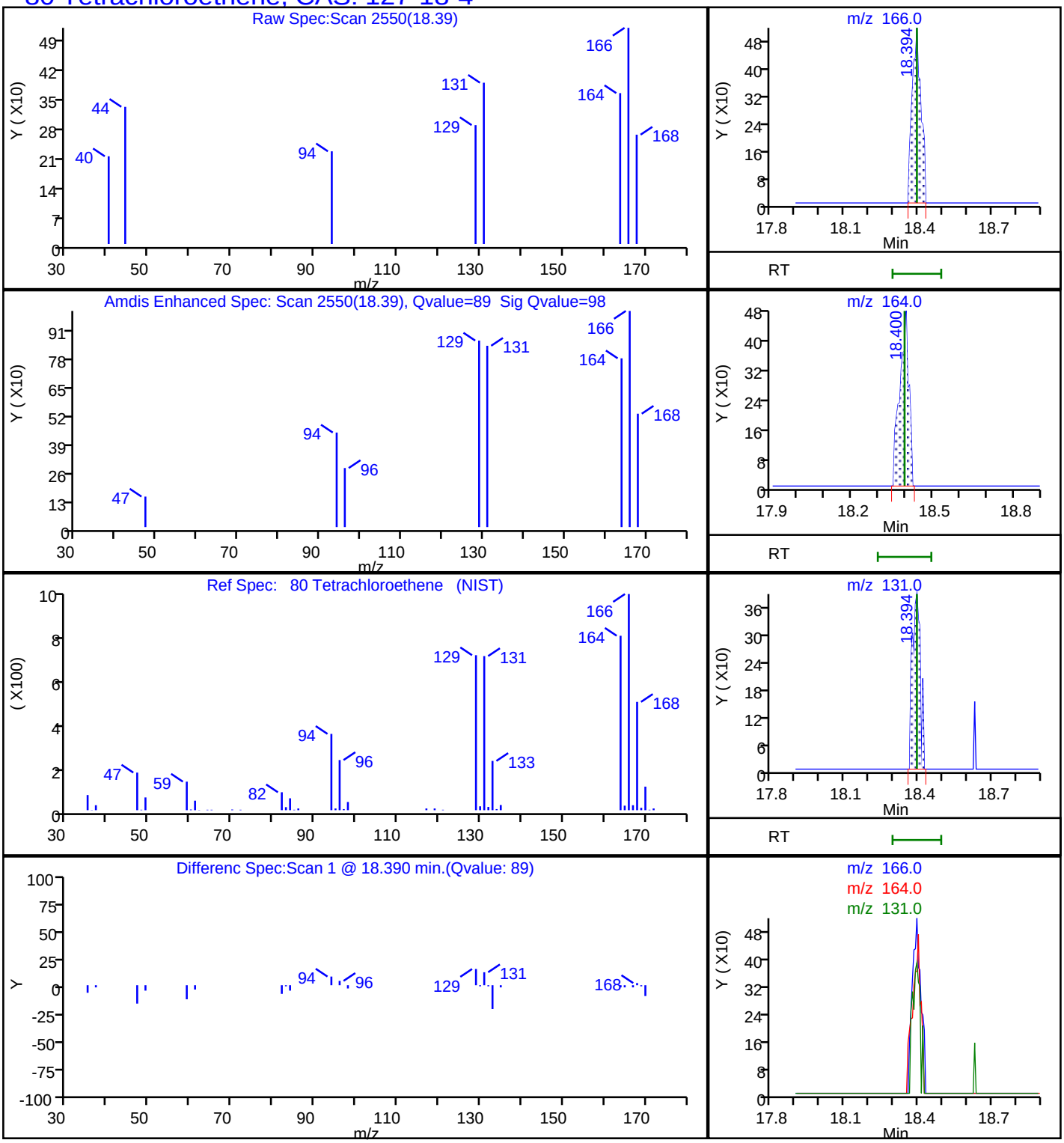
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

80 Tetrachloroethene, CAS: 127-18-4



Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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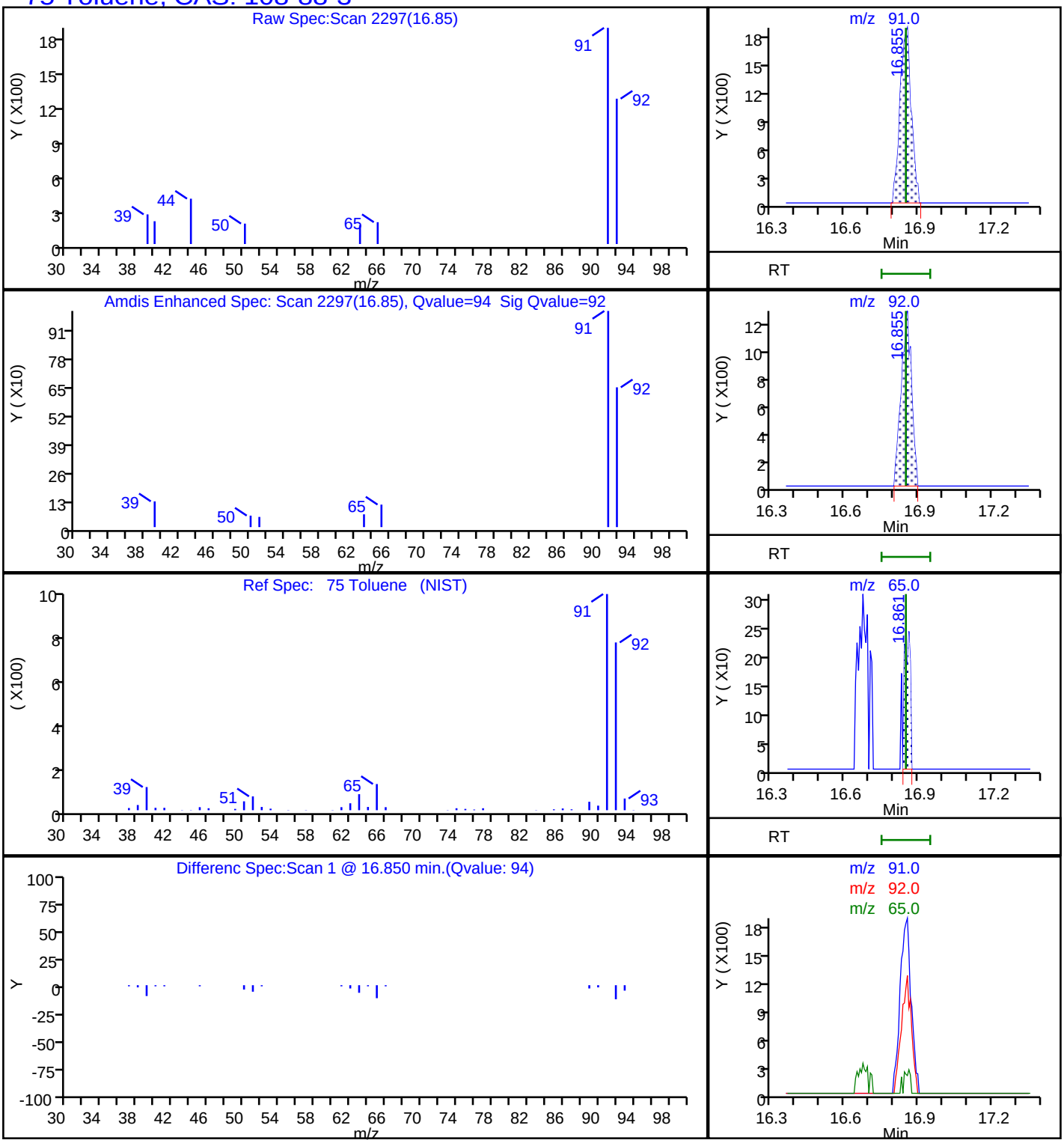
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

75 Toluene, CAS: 108-88-3



Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

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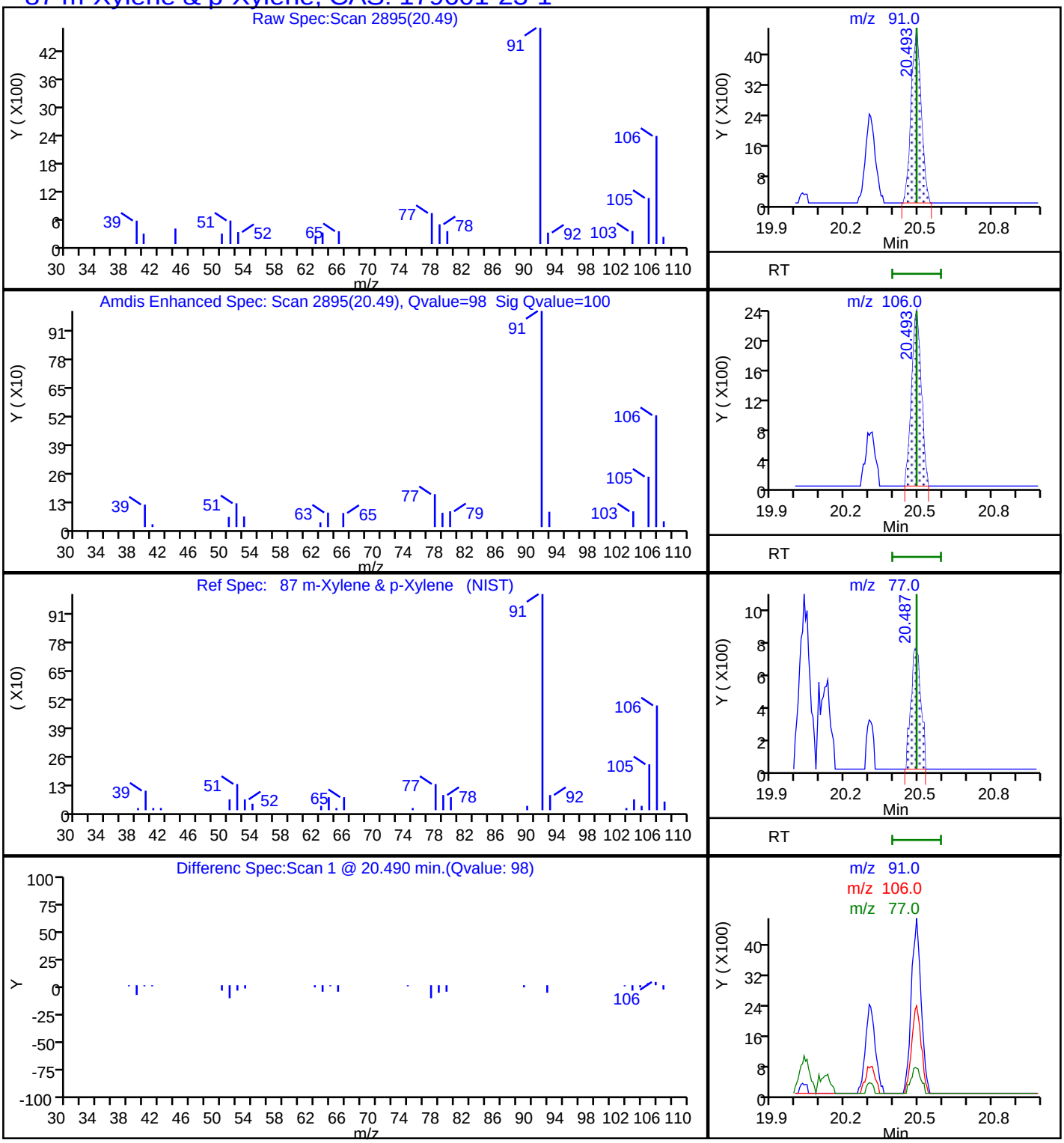
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

87 m-Xylene & p-Xylene, CAS: 179601-23-1

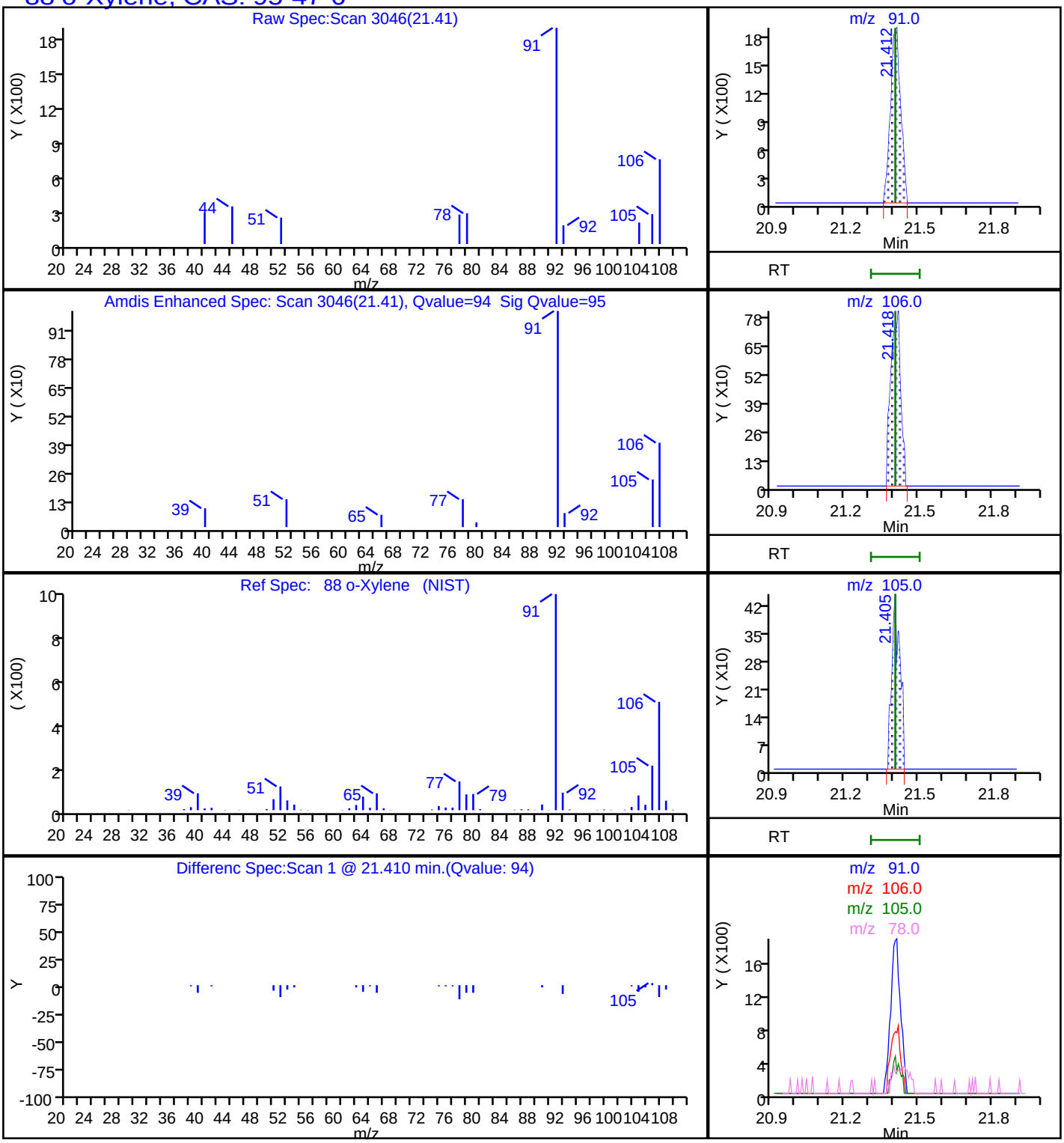


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

88 o-Xylene, CAS: 95-47-6



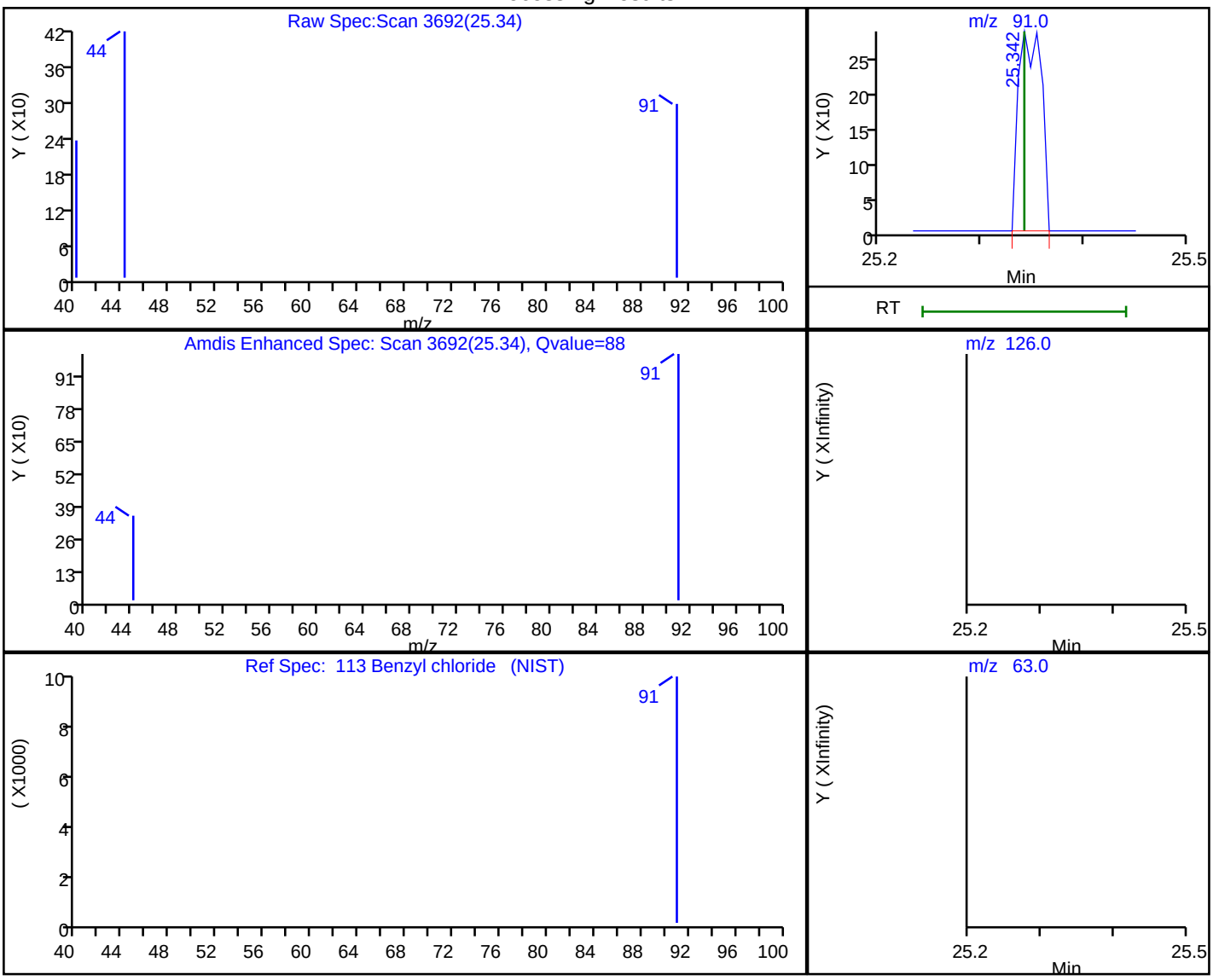
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

113 Benzyl chloride, CAS: 100-44-7

Processing Results



RT	Mass	Response	Amount
25.34	91.00	457	0.416242
25.34	126.00	0	
25.34	63.00	0	

Reviewer: vanommens, 02-Oct-2019 10:19:23

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

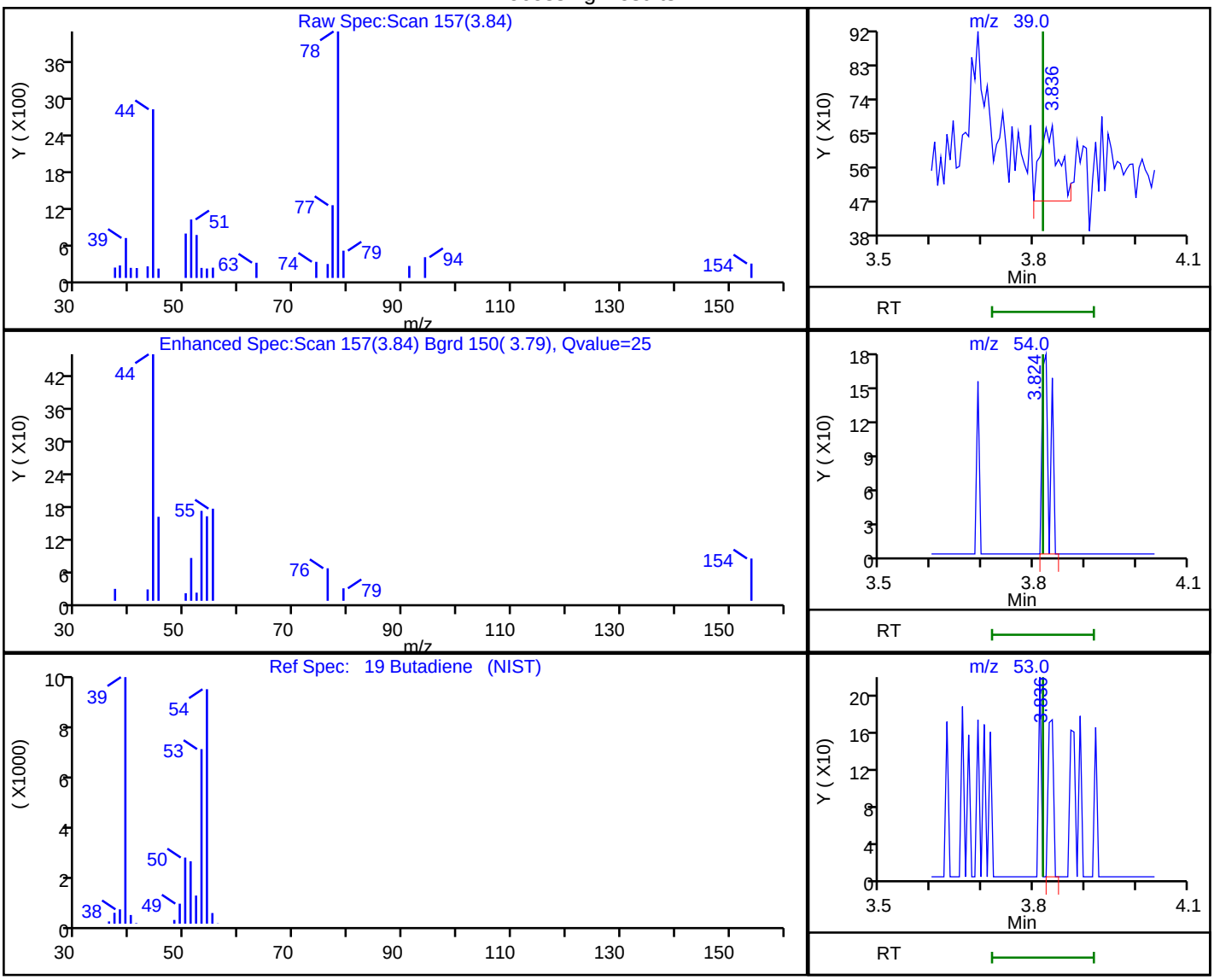
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

19 Butadiene, CAS: 106-99-0

Processing Results



RT	Mass	Response	Amount
3.84	39.00	511	0.062037
3.82	54.00	182	
3.84	53.00	120	

Reviewer: vanommens, 02-Oct-2019 10:17:47

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

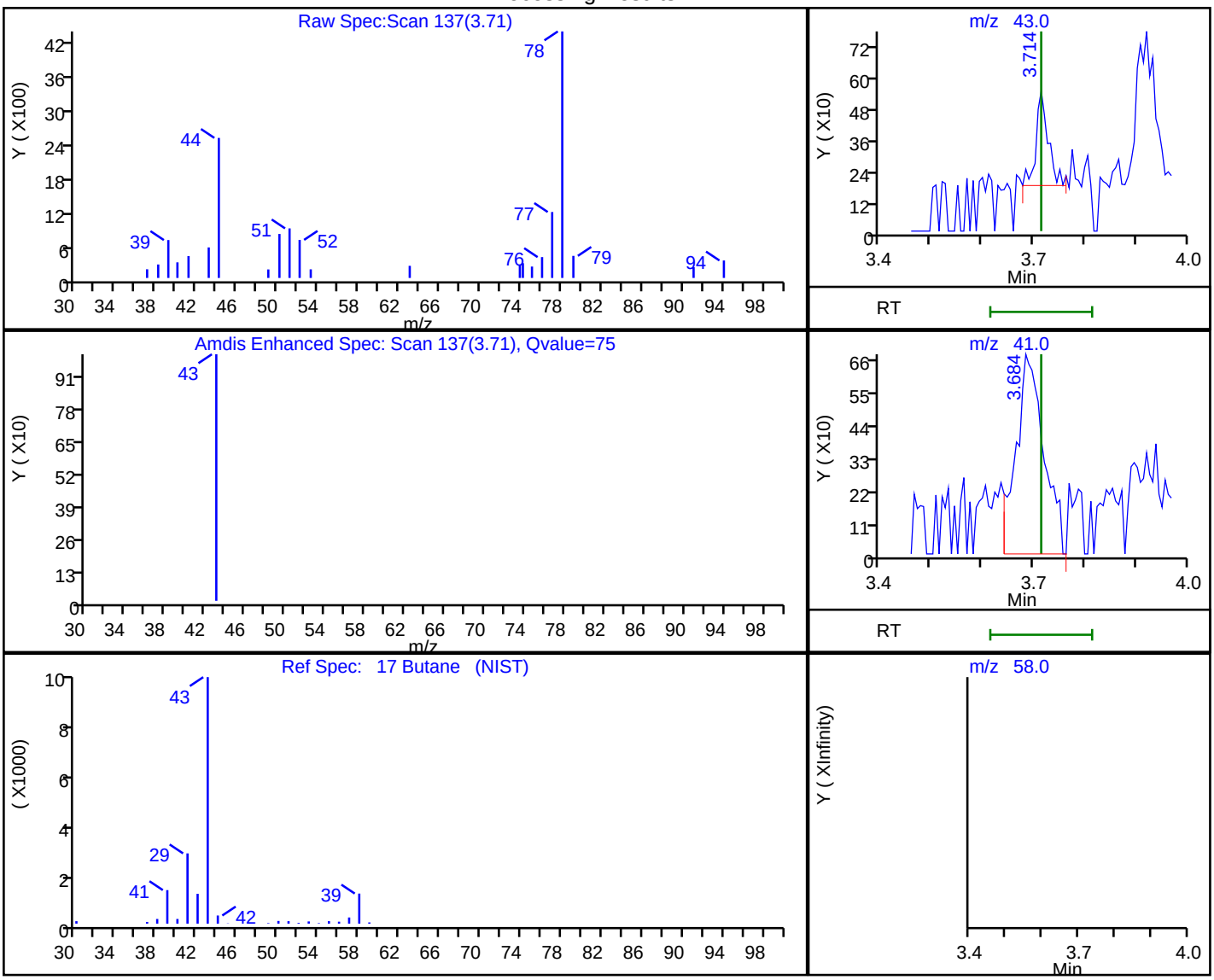
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

17 Butane, CAS: 106-97-8

Processing Results



RT	Mass	Response	Amount
3.71	43.00	609	0.038232
3.68	41.00	2563	
3.71	58.00	0	

Reviewer: vanommens, 02-Oct-2019 10:17:44

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

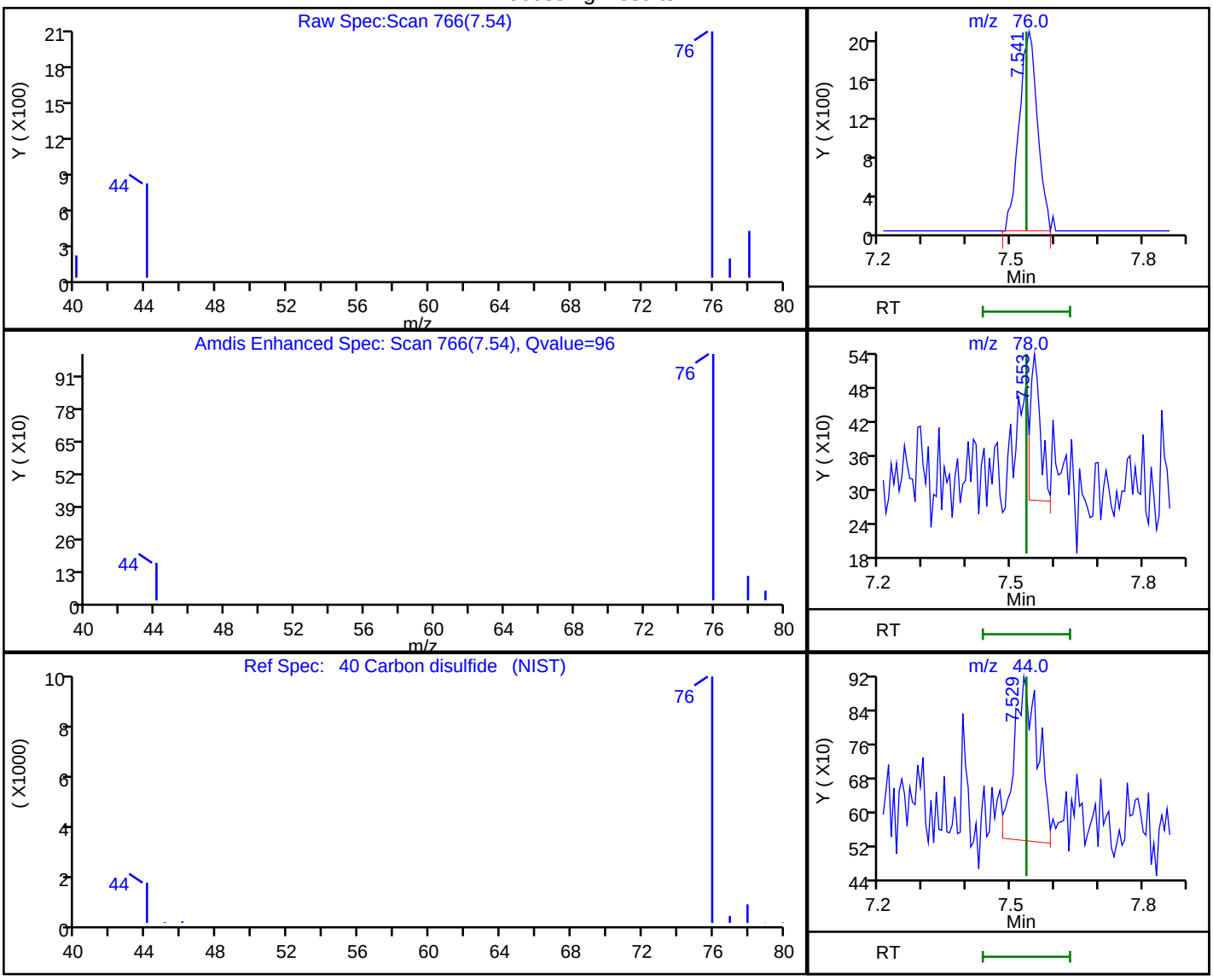
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

40 Carbon disulfide, CAS: 75-15-0

Processing Results



RT	Mass	Response	Amount
7.54	76.00	6009	0.169151
7.55	78.00	410	
7.53	44.00	1469	

Reviewer: vanommens, 02-Oct-2019 10:17:56

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

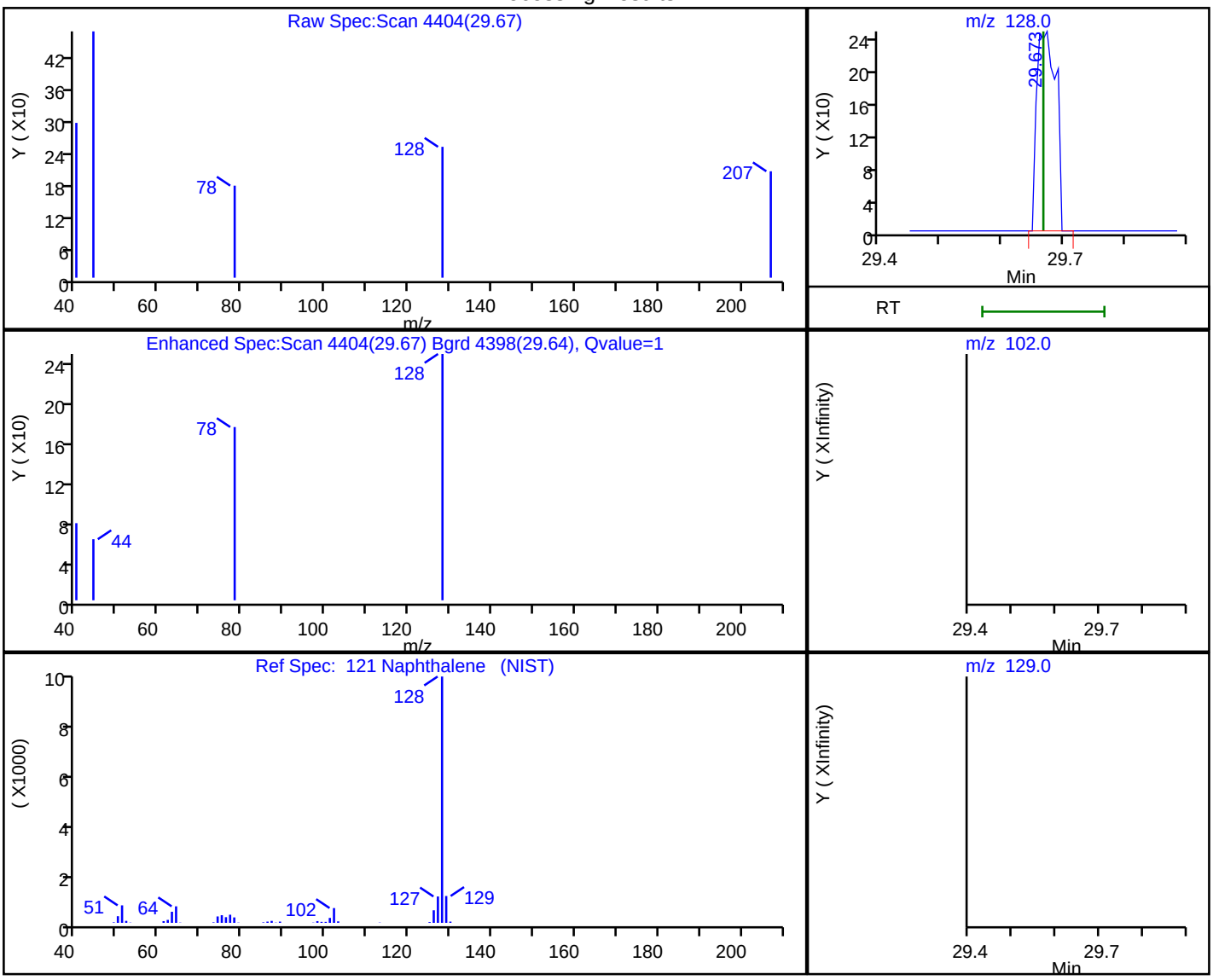
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

121 Naphthalene, CAS: 91-20-3

Processing Results



RT	Mass	Response	Amount
29.67	128.00	538	0.317773
29.67	102.00	0	
29.67	129.00	0	

Reviewer: vanommens, 02-Oct-2019 10:19:37

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

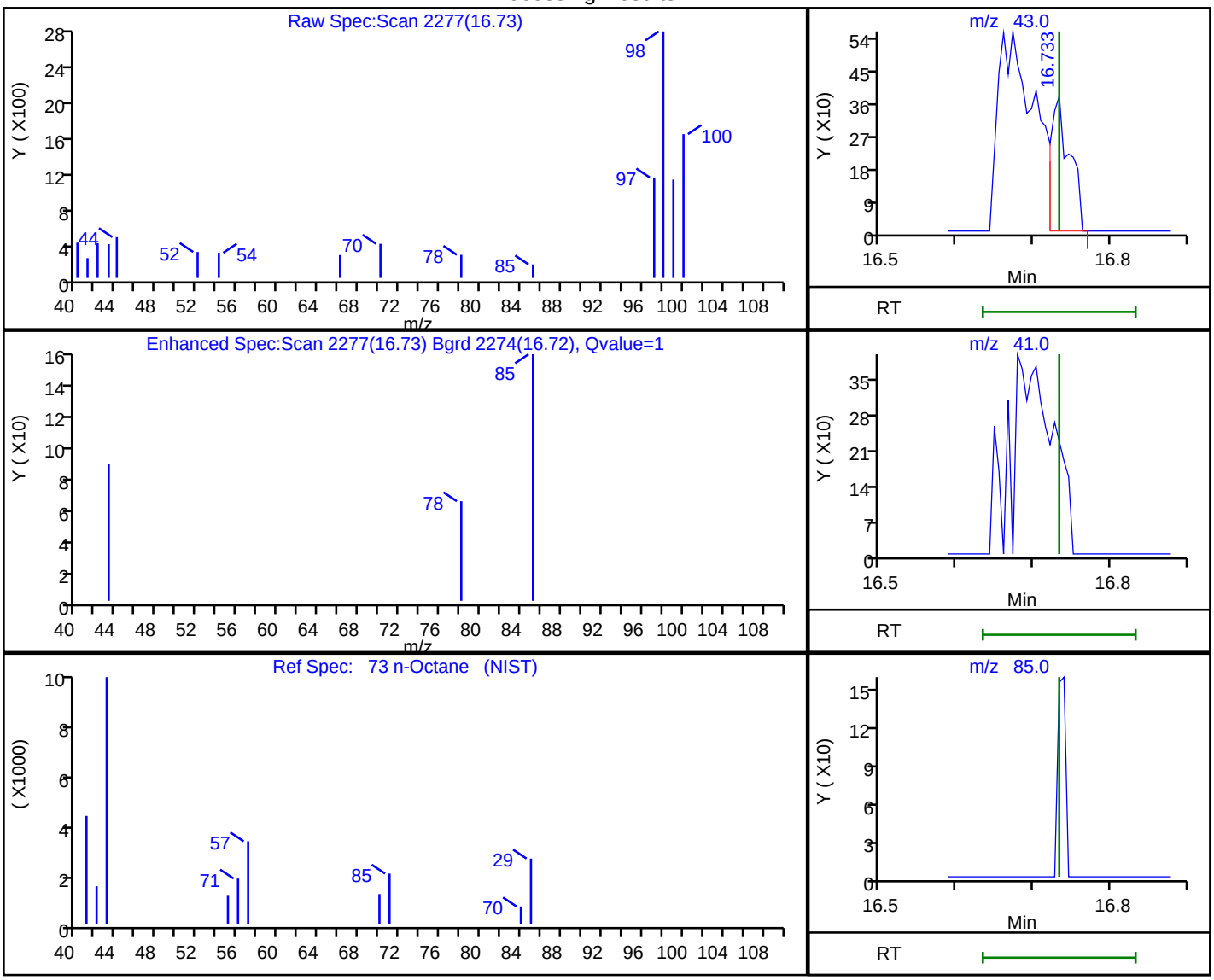
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

73 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
16.73	43.00	640	0.023468
16.73	41.00	0	
16.73	85.00	0	

Reviewer: vanommens, 02-Oct-2019 10:18:21

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

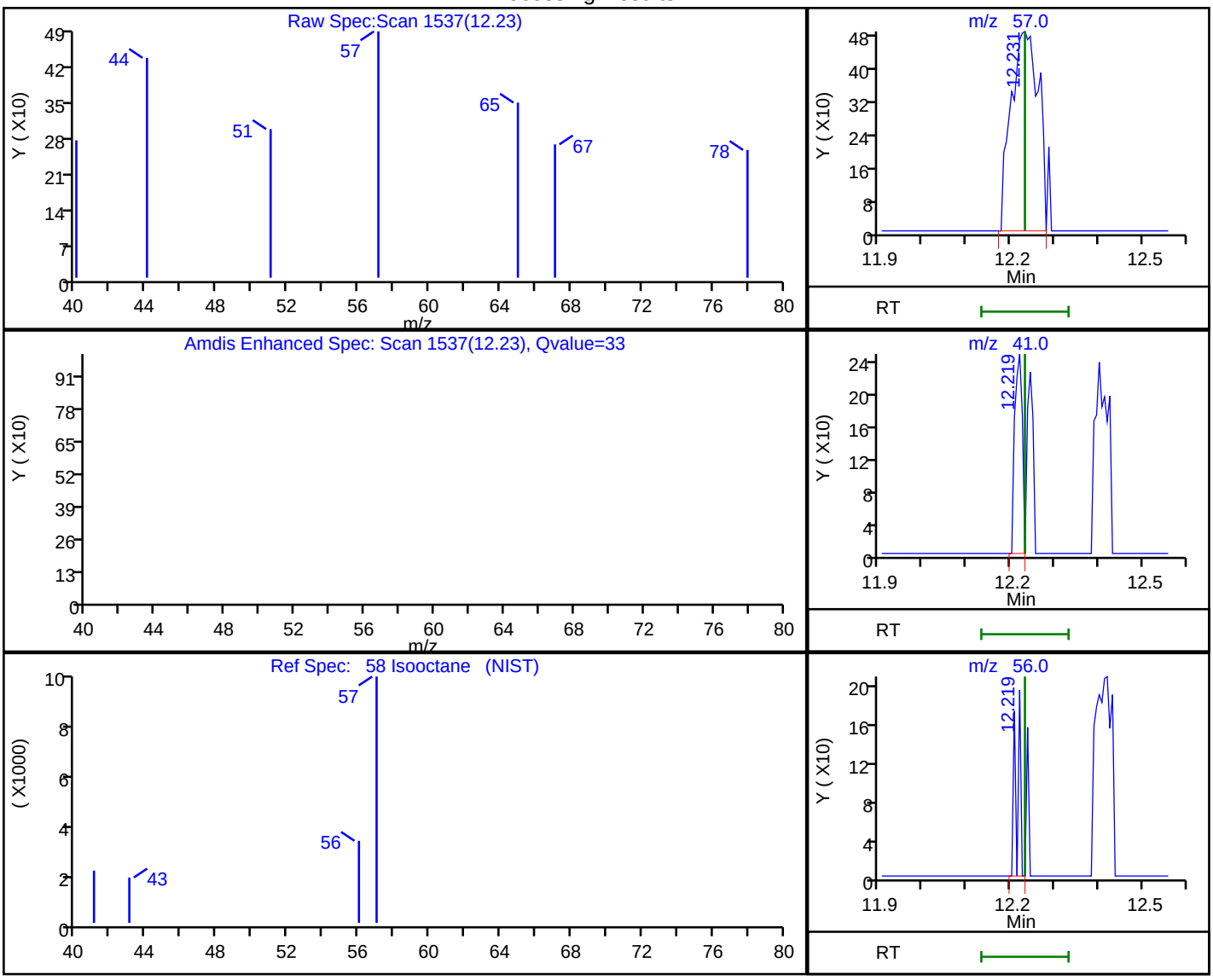
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

58 Isooctane, CAS: 540-84-1

Processing Results



RT	Mass	Response	Amount
12.23	57.00	2112	0.035976
12.22	41.00	288	
12.22	56.00	134	

Reviewer: vanommens, 02-Oct-2019 10:18:06

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

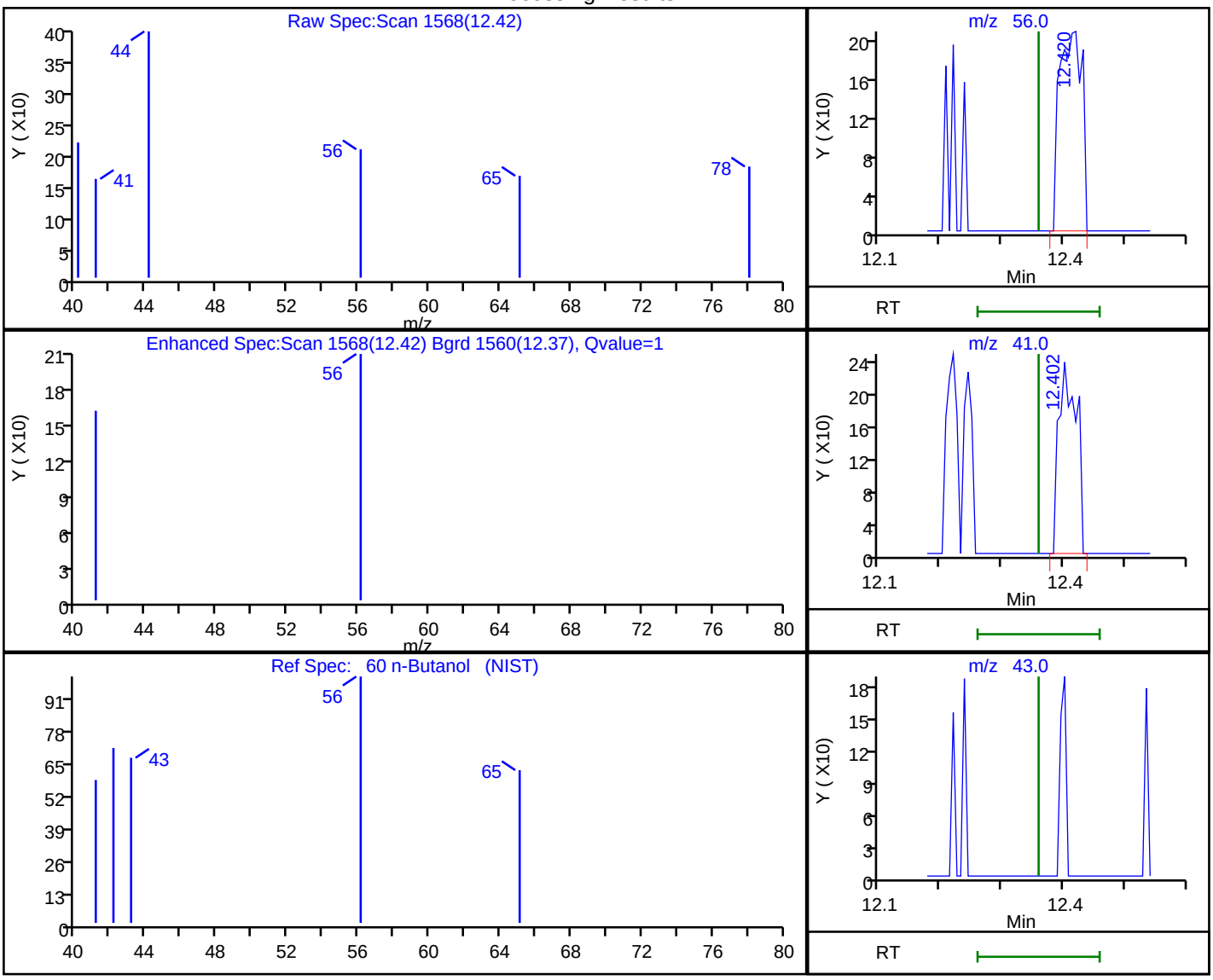
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

60 n-Butanol, CAS: 71-36-3

Processing Results



RT	Mass	Response	Amount
12.42	56.00	533	0.064080
12.40	41.00	467	
12.36	43.00	0	

Reviewer: vanommens, 02-Oct-2019 10:18:18

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

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ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-56029-1
Client Project/Site: NuStar Vancouver
Revision: 1

For:
Cascadia Associates LLC
5820 SW Kelly Ave
Suite B
Portland, Oregon 97239

Attn: Stephanie Salisbury

Authorized for release by:
1/6/2020 2:34:43 PM

Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

Table of Contents

Glossary

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

Case Narrative

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Job ID: 320-56029-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

Job Narrative
320-56029-1

Comments
This report has been revised to include a revised report from Eurofins Air Toxics.

Receipt
The samples were received on 11/6/2019 11:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice.

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

Subcontract Work
Method TO-15: This method was subcontracted to Eurofins Air Toxics. The subcontract laboratory certification is different from that of the facility issuing the final report.

Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Client Sample ID: SVE_South_PreCarbon_110419 — Lab Sample ID: 320-56029-1

No Detections.

Client Sample ID: SVE_South_PostCarbon_110419 — Lab Sample ID: 320-56029-2

No Detections.

This Detection Summary does not include radiochemical test results.

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Laboratory: Eurofins TestAmerica, Sacramento

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

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	01-20-21
ANAB	Dept. of Defense ELAP	L2468	12-22-19
ANAB	Dept. of Energy	L2468.01	01-20-21
ANAB	ISO/IEC 17025	L2468	01-20-21
Arizona	State	AZ0708	08-11-20
Arkansas DEQ	State	19-042-0	06-17-20
California	State	2897	01-31-20
Colorado	State	CA0004	08-31-20
Connecticut	State	PH-0691	06-30-21
Florida	NELAP	E87570	06-30-20
Georgia	State	4040	01-29-20
Hawaii	State	<cert No.>	01-29-20
Illinois	NELAP	200060	03-17-20
Kansas	NELAP	E-10375	10-31-20 *
Louisiana	NELAP	01944	06-30-20
Maine	State	2018009	04-14-20
Michigan	State	9947	01-29-20
Michigan	State Program	9947	01-31-20
Nevada	State	CA000442020-1	07-31-20
New Hampshire	NELAP	2997	04-18-20
New Jersey	NELAP	CA005	06-30-20
New York	NELAP	11666	04-01-20
Oregon	NELAP	4040	01-29-20
Pennsylvania	NELAP	68-01272	03-31-20
Texas	NELAP	T104704399-19-13	05-31-20
US Fish & Wildlife	US Federal Programs	58448	07-31-20
USDA	US Federal Programs	P330-18-00239	07-31-21
Utah	NELAP	CA000442019-01	02-29-20
Vermont	State	VT-4040	04-16-20
Virginia	NELAP	460278	03-14-20
Washington	State	C581	05-05-20
West Virginia (DW)	State	9930C	12-31-19
Wyoming	State Program	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Method	Method Description	Protocol	Laboratory
Subcontract	TO-15	None	Eurofins

Protocol References:

None = None

Laboratory References:

Eurofins = Eurofins Air Toxics, 180 Blue Ravine Road, Suite B, Folsom, CA 95630

Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

Job ID: 320-56029-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
320-56029-1	SVE_South_PreCarbon_110419	Air	11/04/19 08:52	11/06/19 11:00	
320-56029-2	SVE_South_PostCarbon_110419	Air	11/04/19 08:59	11/06/19 11:00	

1/3/2020
Mr. Nate Lewis
Eurofins Test America
5755 8th Street East

Tacoma WA 98424

Project Name: NuStar Vancouver
Project #: 58012817
Workorder #: 1911204R1

Dear Mr. Nate Lewis

The following report includes the data for the above referenced project for sample(s) received on 11/11/2019 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1911204R1

Work Order Summary

CLIENT:	Mr. Nate Lewis Eurofins Test America 5755 8th Street East Tacoma, WA 98424	**BILL TO:**	Accounts Payable Eurofins Test America 4104 Shuffel St NW North Canton, OH 44720
PHONE:	253-922-2310	**P.O. #**	320-56029-1
FAX:	253-922-5047	**PROJECT #**	58012817 NuStar Vancouver
DATE RECEIVED:	11/11/2019	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/18/2019		
DATE REISSUED:	01/03/2020		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	SVE_South_PreCarbon_110419	TO-15	0.4 "Hg	5.1 psi
02A	SVE_South_PostCarbon_110419	TO-15	5.5 "Hg	5 psi
03A	Lab Blank	TO-15	NA	NA
04A	CCV	TO-15	NA	NA
05A	LCS	TO-15	NA	NA
05AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 01/03/20

Technical Director

Certification numbers: AZ Licensure AZ0775, FL NELAP – E87680, LA NELAP – 02089, NH NELAP - 209218, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-18-13, UT NELAP – CA009332019-11, VA NELAP - 460197, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005-011, Effective date: 10/18/2019, Expiration date: 10/17/2020.
Eurofins Air Toxics, LLC certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 351-8279

LABORATORY NARRATIVE
EPA Method TO-15
Eurofins Test America
Workorder# 1911204R1

Two Client Canister samples were received on November 11, 2019. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Dilution was performed on sample SVE_South_PreCarbon_110419 due to the presence of high level target species.

Due to laboratory error, the workorder was reissued on 01/03/20 to report additional compounds.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

M - Reported value may be biased due to apparent matrix interferences.

CN - See Case Narrative.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204R1-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	11	75	43	300
1,1,1-Trichloroethane	8.2	16	45	87
Trichloroethene	11	180	59	990
Tetrachloroethene	11	5600	74	38000

Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204R1-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Vinyl Chloride	0.66	1.2	1.7	3.2
trans-1,2-Dichloroethene	0.66	1.4	2.6	5.6
1,1-Dichloroethane	0.49	0.54	2.0	2.2
cis-1,2-Dichloroethene	0.66	41	2.6	160

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204R1-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111327r1**	**Date of Collection:**	**11/4/19 8:52:00 AM**
Dil. Factor:	**27.3**	**Date of Analysis:**	**11/13/19 11:25 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	54	Not Detected
Freon 114	11	Not Detected	76	Not Detected
Chloromethane	140	Not Detected UJ	280	Not Detected UJ
Vinyl Chloride	11	Not Detected	28	Not Detected
Bromomethane	22	Not Detected	85	Not Detected
Chloroethane	22	Not Detected	58	Not Detected
Freon 11	11	Not Detected	61	Not Detected
Freon 113	11	Not Detected	84	Not Detected
1,1-Dichloroethene	22	Not Detected	87	Not Detected
Acetone	140	Not Detected	320	Not Detected
Carbon Disulfide	55	Not Detected	170	Not Detected
Methylene Chloride	11	Not Detected	38	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	43	Not Detected
1,1-Dichloroethane	8.2	Not Detected	33	Not Detected
2-Butanone (Methyl Ethyl Ketone)	22	Not Detected	64	Not Detected
cis-1,2-Dichloroethene	11	75	43	300
Chloroform	8.2	Not Detected	40	Not Detected
1,1,1-Trichloroethane	8.2	16	45	87
Carbon Tetrachloride	22	Not Detected	140	Not Detected
Benzene	11	Not Detected	35	Not Detected
1,2-Dichloroethane	11	Not Detected	44	Not Detected
Trichloroethene	11	180	59	990
1,2-Dichloropropane	11	Not Detected	50	Not Detected
Bromodichloromethane	8.2	Not Detected	55	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	50	Not Detected
4-Methyl-2-pentanone	11	Not Detected	45	Not Detected
Toluene	11	Not Detected	41	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	50	Not Detected
1,1,2-Trichloroethane	11	Not Detected	60	Not Detected
Tetrachloroethene	11	5600	74	38000
2-Hexanone	11	Not Detected	45	Not Detected
Dibromochloromethane	11	Not Detected	93	Not Detected
1,2-Dibromoethane (EDB)	22	Not Detected	170	Not Detected
Chlorobenzene	8.2	Not Detected	38	Not Detected
Ethyl Benzene	11	Not Detected	47	Not Detected
m,p-Xylene	22	Not Detected	95	Not Detected
o-Xylene	11	Not Detected	47	Not Detected
Styrene	11	Not Detected	46	Not Detected
Bromoform	11	Not Detected	110	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	75	Not Detected
4-Ethyltoluene	11	Not Detected	54	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	54	Not Detected

Client Sample ID: SVE_South_PreCarbon_110419

Lab ID#: 1911204R1-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111327r1**	**Date of Collection:**	**11/4/19 8:52:00 AM**
Dil. Factor:	**27.3**	**Date of Analysis:**	**11/13/19 11:25 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,2,4-Trimethylbenzene	22	Not Detected	110	Not Detected
1,3-Dichlorobenzene	11	Not Detected	66	Not Detected
1,4-Dichlorobenzene	11	Not Detected	66	Not Detected
alpha-Chlorotoluene	22	Not Detected	110	Not Detected
1,2-Dichlorobenzene	11	Not Detected	66	Not Detected
1,2,4-Trichlorobenzene	55	Not Detected	400	Not Detected
Hexachlorobutadiene	55	Not Detected	580	Not Detected
Vinyl Acetate	22	Not Detected	77	Not Detected

UJ = Analyte associated with low bias in the CCV.

Container Type: Client Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204R1-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111326r1**	**Date of Collection:**	**11/4/19 8:59:00 AM**
Dil. Factor:	**1.64**	**Date of Analysis:**	**11/13/19 11:01 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.66	Not Detected	3.2	Not Detected
Freon 114	0.66	Not Detected	4.6	Not Detected
Chloromethane	8.2	Not Detected UJ	17	Not Detected UJ
Vinyl Chloride	0.66	1.2	1.7	3.2
Bromomethane	1.3	Not Detected	5.1	Not Detected
Chloroethane	1.3	Not Detected	3.5	Not Detected
Freon 11	0.66	Not Detected	3.7	Not Detected
Freon 113	0.66	Not Detected	5.0	Not Detected
1,1-Dichloroethene	1.3	Not Detected	5.2	Not Detected
Acetone	8.2	Not Detected	19	Not Detected
Carbon Disulfide	3.3	Not Detected	10	Not Detected
Methylene Chloride	0.66	Not Detected	2.3	Not Detected
trans-1,2-Dichloroethene	0.66	1.4	2.6	5.6
1,1-Dichloroethane	0.49	0.54	2.0	2.2
2-Butanone (Methyl Ethyl Ketone)	1.3	Not Detected	3.9	Not Detected
cis-1,2-Dichloroethene	0.66	41	2.6	160
Chloroform	0.49	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.49	Not Detected	2.7	Not Detected
Carbon Tetrachloride	1.3	Not Detected	8.2	Not Detected
Benzene	0.66	Not Detected	2.1	Not Detected
1,2-Dichloroethane	0.66	Not Detected	2.6	Not Detected
Trichloroethene	0.66	Not Detected	3.5	Not Detected
1,2-Dichloropropane	0.66	Not Detected	3.0	Not Detected
Bromodichloromethane	0.49	Not Detected	3.3	Not Detected
cis-1,3-Dichloropropene	0.66	Not Detected	3.0	Not Detected
4-Methyl-2-pentanone	0.66	Not Detected	2.7	Not Detected
Toluene	0.66	Not Detected	2.5	Not Detected
trans-1,3-Dichloropropene	0.66	Not Detected	3.0	Not Detected
1,1,2-Trichloroethane	0.66	Not Detected	3.6	Not Detected
Tetrachloroethene	0.66	Not Detected	4.4	Not Detected
2-Hexanone	0.66	Not Detected	2.7	Not Detected
Dibromochloromethane	0.66	Not Detected	5.6	Not Detected
1,2-Dibromoethane (EDB)	1.3	Not Detected	10	Not Detected
Chlorobenzene	0.49	Not Detected	2.3	Not Detected
Ethyl Benzene	0.66	Not Detected	2.8	Not Detected
m,p-Xylene	1.3	Not Detected	5.7	Not Detected
o-Xylene	0.66	Not Detected	2.8	Not Detected
Styrene	0.66	Not Detected	2.8	Not Detected
Bromoform	0.66	Not Detected	6.8	Not Detected
1,1,2,2-Tetrachloroethane	0.66	Not Detected	4.5	Not Detected
4-Ethyltoluene	0.66	Not Detected	3.2	Not Detected
1,3,5-Trimethylbenzene	0.66	Not Detected	3.2	Not Detected

Client Sample ID: SVE_South_PostCarbon_110419

Lab ID#: 1911204R1-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111326r1**	**Date of Collection:**	**11/4/19 8:59:00 AM**
Dil. Factor:	**1.64**	**Date of Analysis:**	**11/13/19 11:01 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,2,4-Trimethylbenzene	1.3	Not Detected	6.4	Not Detected
1,3-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
1,4-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
alpha-Chlorotoluene	1.3	Not Detected	6.8	Not Detected
1,2-Dichlorobenzene	0.66	Not Detected	3.9	Not Detected
1,2,4-Trichlorobenzene	3.3	Not Detected	24	Not Detected
Hexachlorobutadiene	3.3	Not Detected	35	Not Detected
Vinyl Acetate	1.3	Not Detected	4.6	Not Detected

UJ = Analyte associated with low bias in the CCV.

Container Type: Client Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	100	70-130

Client Sample ID: Lab Blank

Lab ID#: 1911204R1-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111307ar1**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 11:28 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.40	Not Detected	2.0	Not Detected
Freon 114	0.40	Not Detected	2.8	Not Detected
Chloromethane	5.0	Not Detected UJ	10	Not Detected UJ
Vinyl Chloride	0.40	Not Detected	1.0	Not Detected
Bromomethane	0.80	Not Detected	3.1	Not Detected
Chloroethane	0.80	Not Detected	2.1	Not Detected
Freon 11	0.40	Not Detected	2.2	Not Detected
Freon 113	0.40	Not Detected	3.1	Not Detected
1,1-Dichloroethene	0.80	Not Detected	3.2	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
Methylene Chloride	0.40	Not Detected	1.4	Not Detected
trans-1,2-Dichloroethene	0.40	Not Detected	1.6	Not Detected
1,1-Dichloroethane	0.30	Not Detected	1.2	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.80	Not Detected	2.4	Not Detected
cis-1,2-Dichloroethene	0.40	Not Detected	1.6	Not Detected
Chloroform	0.30	Not Detected	1.5	Not Detected
1,1,1-Trichloroethane	0.30	Not Detected	1.6	Not Detected
Carbon Tetrachloride	0.80	Not Detected	5.0	Not Detected
Benzene	0.40	Not Detected	1.3	Not Detected
1,2-Dichloroethane	0.40	Not Detected	1.6	Not Detected
Trichloroethene	0.40	Not Detected	2.1	Not Detected
1,2-Dichloropropane	0.40	Not Detected	1.8	Not Detected
Bromodichloromethane	0.30	Not Detected	2.0	Not Detected
cis-1,3-Dichloropropene	0.40	Not Detected	1.8	Not Detected
4-Methyl-2-pentanone	0.40	Not Detected	1.6	Not Detected
Toluene	0.40	Not Detected	1.5	Not Detected
trans-1,3-Dichloropropene	0.40	Not Detected	1.8	Not Detected
1,1,2-Trichloroethane	0.40	Not Detected	2.2	Not Detected
Tetrachloroethene	0.40	Not Detected	2.7	Not Detected
2-Hexanone	0.40	Not Detected	1.6	Not Detected
Dibromochloromethane	0.40	Not Detected	3.4	Not Detected
1,2-Dibromoethane (EDB)	0.80	Not Detected	6.1	Not Detected
Chlorobenzene	0.30	Not Detected	1.4	Not Detected
Ethyl Benzene	0.40	Not Detected	1.7	Not Detected
m,p-Xylene	0.80	Not Detected	3.5	Not Detected
o-Xylene	0.40	Not Detected	1.7	Not Detected
Styrene	0.40	Not Detected	1.7	Not Detected
Bromoform	0.40	Not Detected	4.1	Not Detected
1,1,2,2-Tetrachloroethane	0.40	Not Detected	2.7	Not Detected
4-Ethyltoluene	0.40	Not Detected	2.0	Not Detected
1,3,5-Trimethylbenzene	0.40	Not Detected	2.0	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1911204R1-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111307ar1**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 11:28 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,2,4-Trimethylbenzene	0.80	Not Detected	3.9	Not Detected
1,3-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
1,4-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
alpha-Chlorotoluene	0.80	Not Detected	4.1	Not Detected
1,2-Dichlorobenzene	0.40	Not Detected	2.4	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected
Vinyl Acetate	0.80	Not Detected	2.8	Not Detected

UJ = Analyte associated with low bias in the CCV.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	97	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: CCV
Lab ID#: 1911204R1-04A
EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:23 AM**	

Compound	%Recovery
Freon 12	92
Freon 114	93
Chloromethane	67 Q
Vinyl Chloride	87
Bromomethane	90
Chloroethane	90
Freon 11	96
Freon 113	96
1,1-Dichloroethene	95
Acetone	87
Carbon Disulfide	96
Methylene Chloride	77
trans-1,2-Dichloroethene	97
1,1-Dichloroethane	90
2-Butanone (Methyl Ethyl Ketone)	94
cis-1,2-Dichloroethene	95
Chloroform	95
1,1,1-Trichloroethane	95
Carbon Tetrachloride	99
Benzene	99
1,2-Dichloroethane	98
Trichloroethene	100
1,2-Dichloropropane	97
Bromodichloromethane	100
cis-1,3-Dichloropropene	106
4-Methyl-2-pentanone	93
Toluene	103
trans-1,3-Dichloropropene	101
1,1,2-Trichloroethane	101
Tetrachloroethene	104
2-Hexanone	91
Dibromochloromethane	102
1,2-Dibromoethane (EDB)	103
Chlorobenzene	97
Ethyl Benzene	103
m,p-Xylene	102
o-Xylene	98
Styrene	103
Bromoform	106
1,1,2,2-Tetrachloroethane	94
4-Ethyltoluene	99
1,3,5-Trimethylbenzene	100

Client Sample ID: CCV

Lab ID#: 1911204R1-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:23 AM**

Compound	%Recovery
1,2,4-Trimethylbenzene	102
1,3-Dichlorobenzene	98
1,4-Dichlorobenzene	99
alpha-Chlorotoluene	94
1,2-Dichlorobenzene	99
1,2,4-Trichlorobenzene	105
Hexachlorobutadiene	112
Vinyl Acetate	101

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	106	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCS

Lab ID#: 1911204R1-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:48 AM**	

Compound	%Recovery	Method Limits
Freon 12	86	70-130
Freon 114	87	70-130
Chloromethane	86	70-130
Vinyl Chloride	80	70-130
Bromomethane	88	70-130
Chloroethane	83	70-130
Freon 11	85	70-130
Freon 113	89	70-130
1,1-Dichloroethene	87	70-130
Acetone	85	70-130
Carbon Disulfide	86	70-130
Methylene Chloride	73	70-130
trans-1,2-Dichloroethene	78	70-130
1,1-Dichloroethane	85	70-130
2-Butanone (Methyl Ethyl Ketone)	84	70-130
cis-1,2-Dichloroethene	96	70-130
Chloroform	90	70-130
1,1,1-Trichloroethane	86	70-130
Carbon Tetrachloride	91	70-130
Benzene	88	70-130
1,2-Dichloroethane	85	70-130
Trichloroethene	88	70-130
1,2-Dichloropropane	81	70-130
Bromodichloromethane	85	70-130
cis-1,3-Dichloropropene	90	70-130
4-Methyl-2-pentanone	80	70-130
Toluene	89	70-130
trans-1,3-Dichloropropene	97	70-130
1,1,2-Trichloroethane	90	70-130
Tetrachloroethene	96	70-130
2-Hexanone	83	70-130
Dibromochloromethane	94	70-130
1,2-Dibromoethane (EDB)	93	70-130
Chlorobenzene	87	70-130
Ethyl Benzene	91	70-130
m,p-Xylene	92	70-130
o-Xylene	92	70-130
Styrene	90	70-130
Bromoform	95	70-130
1,1,2,2-Tetrachloroethane	87	70-130
4-Ethyltoluene	88	70-130
1,3,5-Trimethylbenzene	90	70-130

Client Sample ID: LCS

Lab ID#: 1911204R1-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 09:48 AM**	

Compound	%Recovery	Method Limits
1,2,4-Trimethylbenzene	90	70-130
1,3-Dichlorobenzene	87	70-130
1,4-Dichlorobenzene	86	70-130
alpha-Chlorotoluene	86	70-130
1,2-Dichlorobenzene	87	70-130
1,2,4-Trichlorobenzene	73	70-130
Hexachlorobutadiene	78	70-130
Vinyl Acetate	97	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	101	70-130

Client Sample ID: LCSD

Lab ID#: 1911204R1-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 10:12 AM**	

Compound	%Recovery	Method Limits
Freon 12	85	70-130
Freon 114	89	70-130
Chloromethane	84	70-130
Vinyl Chloride	80	70-130
Bromomethane	91	70-130
Chloroethane	86	70-130
Freon 11	88	70-130
Freon 113	91	70-130
1,1-Dichloroethene	90	70-130
Acetone	85	70-130
Carbon Disulfide	89	70-130
Methylene Chloride	72	70-130
trans-1,2-Dichloroethene	81	70-130
1,1-Dichloroethane	88	70-130
2-Butanone (Methyl Ethyl Ketone)	89	70-130
cis-1,2-Dichloroethene	100	70-130
Chloroform	92	70-130
1,1,1-Trichloroethane	86	70-130
Carbon Tetrachloride	93	70-130
Benzene	89	70-130
1,2-Dichloroethane	85	70-130
Trichloroethene	88	70-130
1,2-Dichloropropane	82	70-130
Bromodichloromethane	86	70-130
cis-1,3-Dichloropropene	91	70-130
4-Methyl-2-pentanone	81	70-130
Toluene	91	70-130
trans-1,3-Dichloropropene	97	70-130
1,1,2-Trichloroethane	93	70-130
Tetrachloroethene	98	70-130
2-Hexanone	86	70-130
Dibromochloromethane	95	70-130
1,2-Dibromoethane (EDB)	96	70-130
Chlorobenzene	88	70-130
Ethyl Benzene	92	70-130
m,p-Xylene	95	70-130
o-Xylene	94	70-130
Styrene	92	70-130
Bromoform	96	70-130
1,1,2,2-Tetrachloroethane	89	70-130
4-Ethyltoluene	90	70-130
1,3,5-Trimethylbenzene	92	70-130

Client Sample ID: LCSD

Lab ID#: 1911204R1-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3111304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 11/13/19 10:12 AM**	

Compound	%Recovery	Method Limits
1,2,4-Trimethylbenzene	92	70-130
1,3-Dichlorobenzene	89	70-130
1,4-Dichlorobenzene	89	70-130
alpha-Chlorotoluene	87	70-130
1,2-Dichlorobenzene	90	70-130
1,2,4-Trichlorobenzene	80	70-130
Hexachlorobutadiene	87	70-130
Vinyl Acetate	98	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	103	70-130

TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

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TestAmerica Laboratories, Inc.

Client Contact Information	**Client Project Manager:** Stephanie Salisbury	**Samples Collected By:** Lindsay Wallis
Company Name: Cascadia Associates	**Phone:** 503-906-6577	
Address: 5820 SW Kelly Ave Suite B	**Email:** ssalisbury@cascadiaassociates.com	
City/State/Zip Portland OR 97239		
Phone: 503-906-6577	**Site Contact:** Lindsay Wallis	
FAX:	**Tel/Fax** 503-319-5064	
Project Name: Nustar Vancouver	**Anaylsis Turnaround Time**	
Site/Location: Vancouver, WA	**Standard (Specific):** X	
P O #	**Rush (Specify):**	

COC No: 1 of 1 COCs

For Lab Use Only:
Walk-in Client:
Lab Sampling:

Job / SDG No.:

(See below for Add'l Items)

Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	TO-15 SIM	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Type	Indoor Air/Ambient Air	Sub-Slab	Soil Gas	Soil Vapor Extraction (SVE)	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
SVE-South-Pre Carbon-110419	11/4	851	11/4	852	-30	-2	—	34001403	X														
SVE-South-Post Carbon-110419	11/4	858	11/4	859	-30	-5	—	34001257	X														

320-56029 Chain of Custody

Temperature (Fahrenheit)			
Start	Interior	Ambient	
Stop			

Pressure (inches of Hg)			
Start	Interior	Ambient	
Stop			

Special Instructions/QC Requirements & Comments:
Results emailed to ssalisbury@cascadiaassociates.com

Samples Shipped by: Lindsay Wallis, Cascadia	**Date / Time:** 11/4/19 1535	**Samples Received by:** [signature]	11:00 11-6-19
Samples Relinquished by:	**Date / Time:**	**Received by:**	
Relinquished by:	**Date / Time:**	**Received by:**	
Lab Use Only: **Shipper Name:**	**Opened by:**	**Condition:**	

TASAC

Form No. CA-C-WI-003, Rev. 2.9, dated 9/5/2018

Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-56029-1

Login Number: 56029
List Number: 1
Creator: Branscum, Cassie

List Source: Eurofins TestAmerica, Sacramento

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

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Sacramento
Canister QC Certification
Batch Certification

Date Cleaned/Batch ID: C09/11/19

Date of QC: 10/1/19

320-54181 Chain of Custody

Data File Number: MS6100120

(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	
	8362
	34000059
	8276
	34000135
	34001403
	34000504
	34001257
	7969
	34000029
	8387
	8047
	8133

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "*Certification Type*" indicated above.

"*" INDICATES THE CAN OR CANS WHICH WERE SCREENED

Shane Van O — 1st Level Reviewed By

10/2/19 — Date

2nd Level Reviewed By

10/28/19 — Date

Q:\DOCUMENT-MANAGEMENT\FORMS\QA-814 IND CAN QC 20180323.DOC
QA-814A RE 20180323

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-54181-1

SDG No.:

Client Sample ID: 8362 Lab Sample ID: 320-54181-1

Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

Sample wt/vol: 574(mL) Date Analyzed: 10/02/2019 09:05

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	0.38	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	0.25	J B	0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	0.079	J B	0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	0.069	J B	0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	0.16	J B	0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

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Lab Name: Eurofins TestAmerica, Sacramento Job No.: 320-54181-1

SDG No.:

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Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

Sample wt/vol: 574(mL) Date Analyzed: 10/02/2019 09:05

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	0.14	J B	0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	ND		0.40	0.072
98-83-9	alpha-Methylstyrene	0.22	J B	0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	0.18	J B	0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	0.20	J B	0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	0.15	J B	0.40	0.069
127-18-4	Tetrachloroethene	0.071	J B	0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	0.13	J B	0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

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SDG No.:

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Matrix: Air Lab File ID: MS6100120.D

Analysis Method: TO-15 Date Collected: 09/11/2019 00:00

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Soil Extract Vol.: GC Column: RTX-Volatiles ID: 0.32(mm)

% Moisture: Level: (low/med) Low

Analysis Batch No.: 327435 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	0.36	J B	0.80	0.10
95-47-6	o-Xylene	0.15	J B	0.40	0.054
1330-20-7	Xylenes, Total	0.51	J B	1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	75		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	96		70-130
2037-26-5	Toluene-d8 (Surr)	97		70-130

Eurofins TestAmerica, Sacramento
Target Compound Quantitation Report

Data File: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D
Lims ID: 320-54181-A-1
Client ID: 8362
Sample Type: Client
Inject. Date: 02-Oct-2019 09:05:30 ALS Bottle#: 14 Worklist Smp#: 21
Purge Vol: 25.000 mL Dil. Factor: 1.0000
Sample Info: 320-54181-A-1
Misc. Info.: 500mL
Operator ID: SRS Instrument ID: ATMS6

Method: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\TO15_ATMS6.m
Limit Group: MSA - TO15 - ICAL
Last Update: 02-Oct-2019 10:19:55 Calib Date: 28-Sep-2019 10:10:30
Integrator: RTE ID Type: Deconvolution ID
Quant Method: Internal Standard Quant By: Initial Calibration
Last ICal File: \\chromna\Sacramento\ChromData\ATMS6\20190927-83863.b\MS6092811.D

Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
Process Host: CTX0316

First Level Reviewer: vanommens Date: 02-Oct-2019 10:19:55

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	11.076	11.082	-0.006	92	102921	10.0	
* 2 1,4-Difluorobenzene	114	13.266	13.266	0.000	94	380834	10.0	
* 3 Chlorobenzene-d5 (IS)	117	20.031	20.030	0.001	86	278651	10.0	
$ 4 1,2-Dichloroethane-d4 (Sur	65	12.298	12.298	0.000	42	133008	9.59	
$ 5 Toluene-d8 (Surr)	100	16.672	16.672	0.000	99	248014	9.74	
$ 6 4-Bromofluorobenzene (Surr	95	22.640	22.640	0.000	0	126348	7.55	
11 Propene	41	3.094	3.092	0.000	96	1452	0.1751	
32 Acetone	43	6.203	6.175	0.025	94	6574	0.3797	
75 Toluene	91	16.855	16.849	0.006	94	5676	0.1332	
80 Tetrachloroethene	166	18.394	18.394	0.000	89	1288	0.0713	
81 Chlorodibromomethane	129	18.631	18.631	0.000	89	875	0.0453	
82 Ethylene Dibromide	107	19.094	19.094	0.000	39	591	0.0310	
83 Chlorobenzene	112	20.116	20.116	0.000	86	1918	0.0694	
84 n-Nonane	43	20.213	20.213	0.000	83	718	0.0273	
86 Ethylbenzene	91	20.298	20.304	-0.006	96	6619	0.1428	
87 m-Xylene & p-Xylene	91	20.493	20.493	0.000	98	12932	0.3580	
88 o-Xylene	91	21.412	21.405	0.007	94	5221	0.1465	
89 Styrene	104	21.442	21.442	0.000	76	1429	0.1991	
90 Bromoform	173	22.002	22.002	0.000	92	1903	0.2455	
92 Isopropylbenzene	120	22.215	22.209	0.007	93	1034	0.0753	
93 1,1,2,2-Tetrachloroethane	83	22.421	22.421	0.000	94	4019	0.1534	
97 1,2,3-Trichloropropane	110	22.720	22.726	-0.005	88	966	0.1306	
99 N-Propylbenzene	91	23.060	23.060	0.000	95	3654	0.0565	
102 4-Ethyltoluene	120	23.304	23.304	0.001	96	1048	0.0686	
104 1,3,5-Trimethylbenzene	120	23.407	23.401	0.006	92	1632	0.0770	
105 Alpha Methyl Styrene	118	23.985	23.991	-0.006	80	684	0.2186	
106 tert-Butylbenzene	91	24.131	24.137	-0.006	90	2409	0.0790	
107 1,2,4-Trimethylbenzene	120	24.198	24.204	-0.006	99	1325	0.0658	
108 sec-Butylbenzene	105	24.587	24.587	0.000	96	4324	0.0671	
109 4-Isopropyltoluene	119	24.879	24.873	0.006	94	3244	0.0620	
110 1,3-Dichlorobenzene	146	24.964	24.964	0.000	87	941	0.1610	

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
111 1,4-Dichlorobenzene	146	25.171	25.165	0.006	89	1366	0.1056	
116 1,2-Dichlorobenzene	146	25.895	25.895	0.000	92	1128	0.1049	
120 Hexachlorobutadiene	225	29.588	29.588	0.000	79	727	0.0405	
S 150 Xylenes, Total	91				0		0.5045	

Reagents:

VAMSIS50_00032 Amount Added: 50.00 Units: mL Run Reagent

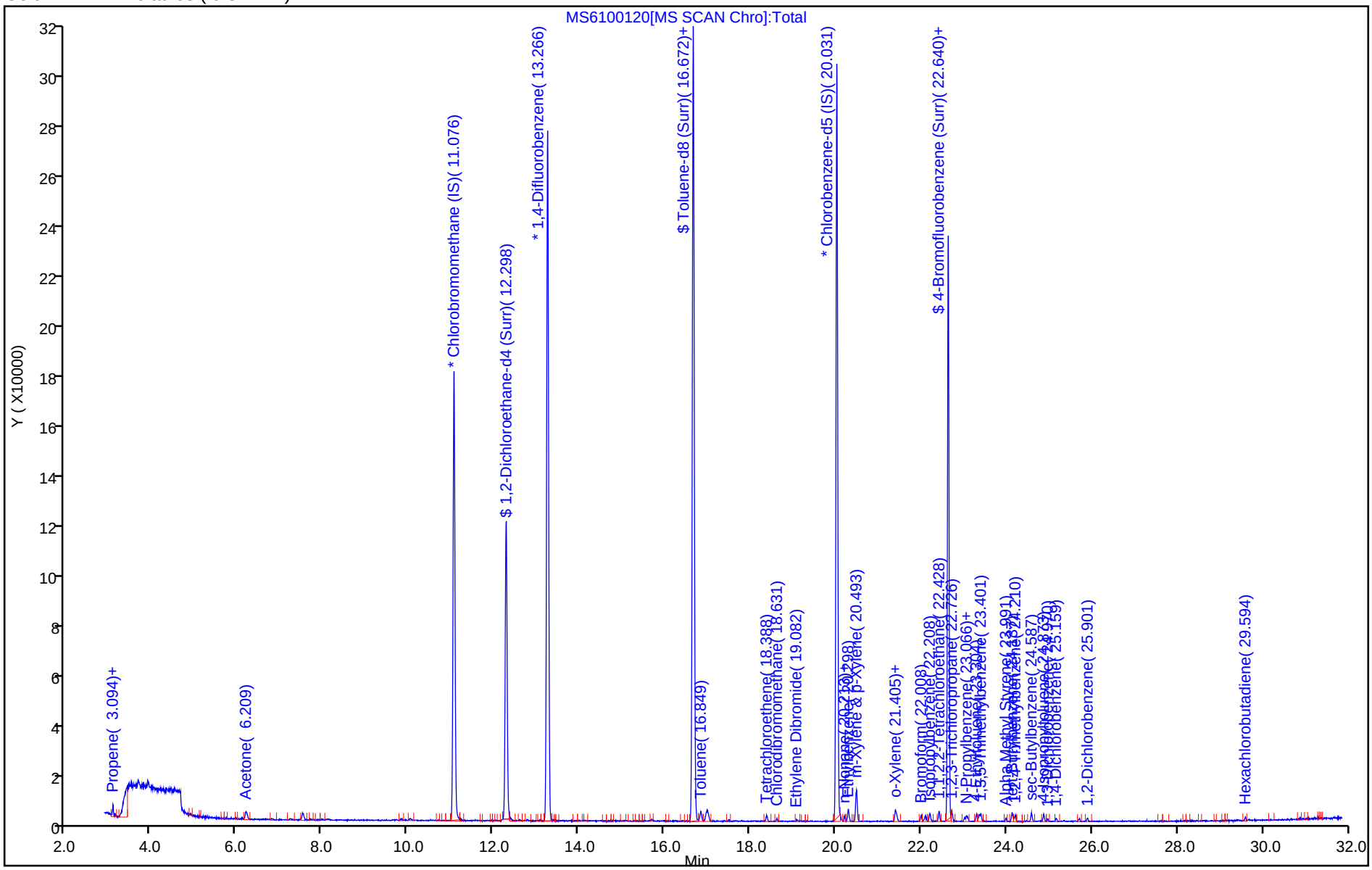
Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D

Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6	Operator ID:	SRS
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1	Worklist Smp#:	21
Client ID:	8362				
Purge Vol:	25.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	14
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		

Column: RTX Volatiles (0.32 mm)

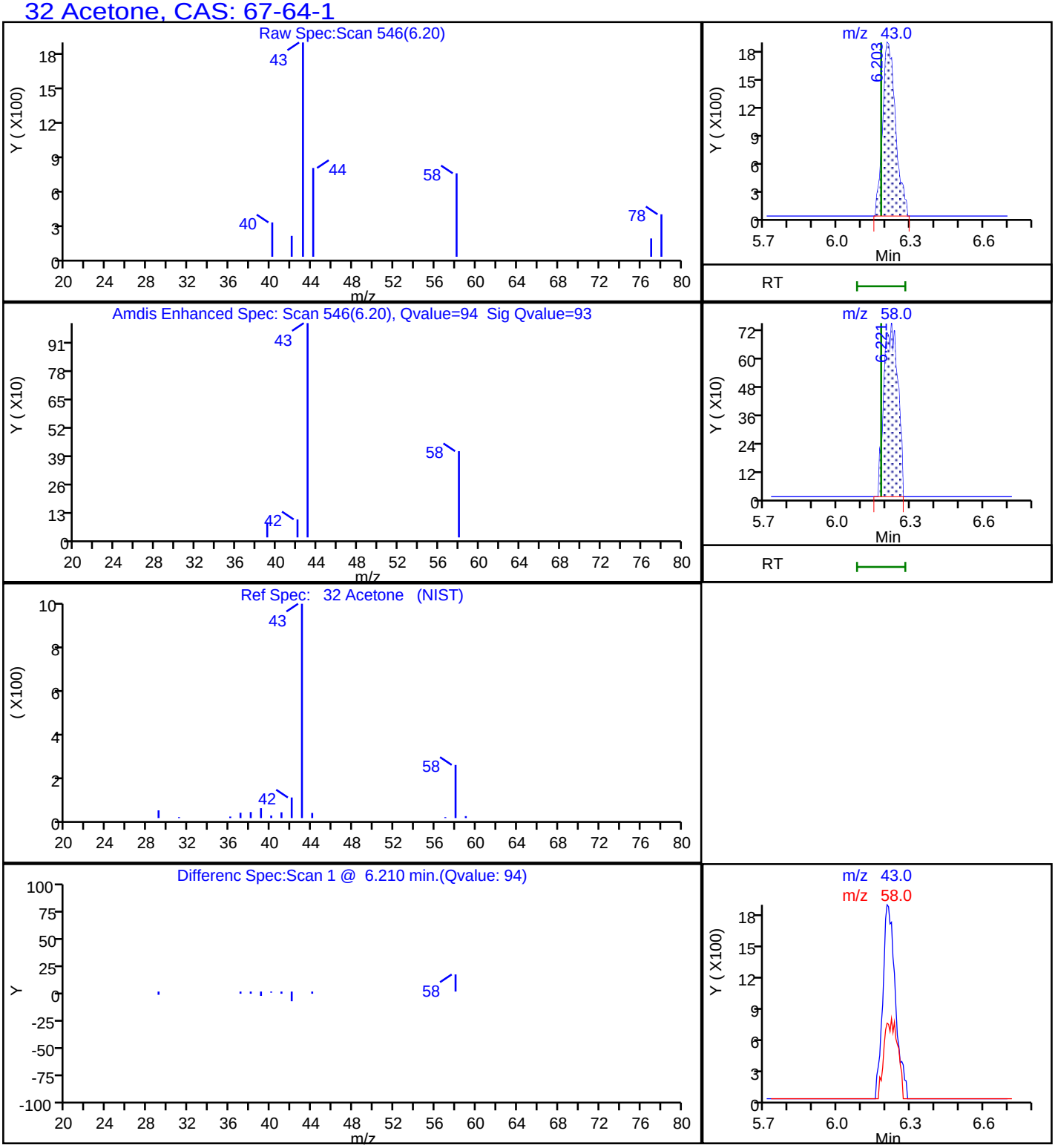


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

32 Acetone, CAS: 67-64-1

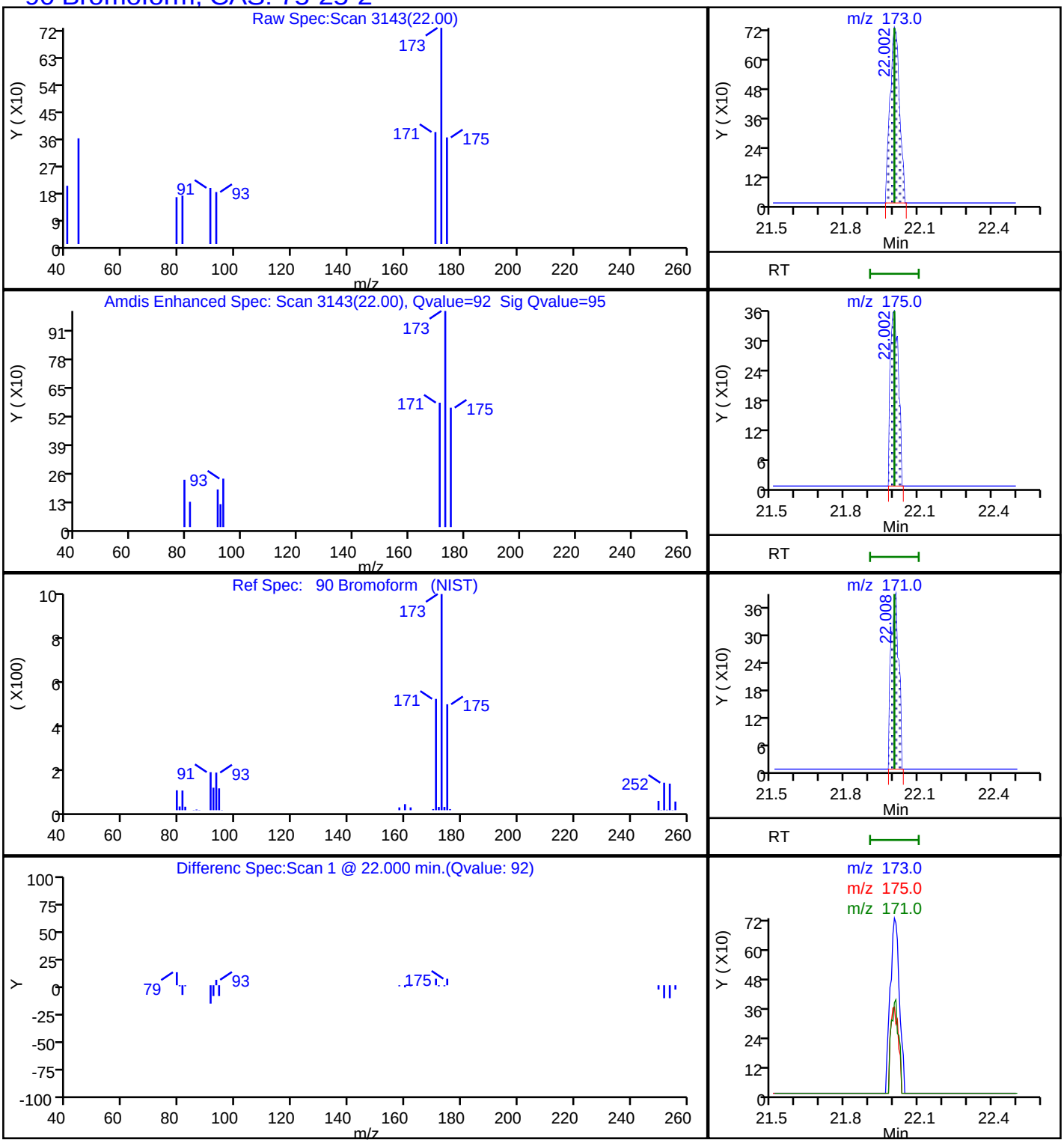


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

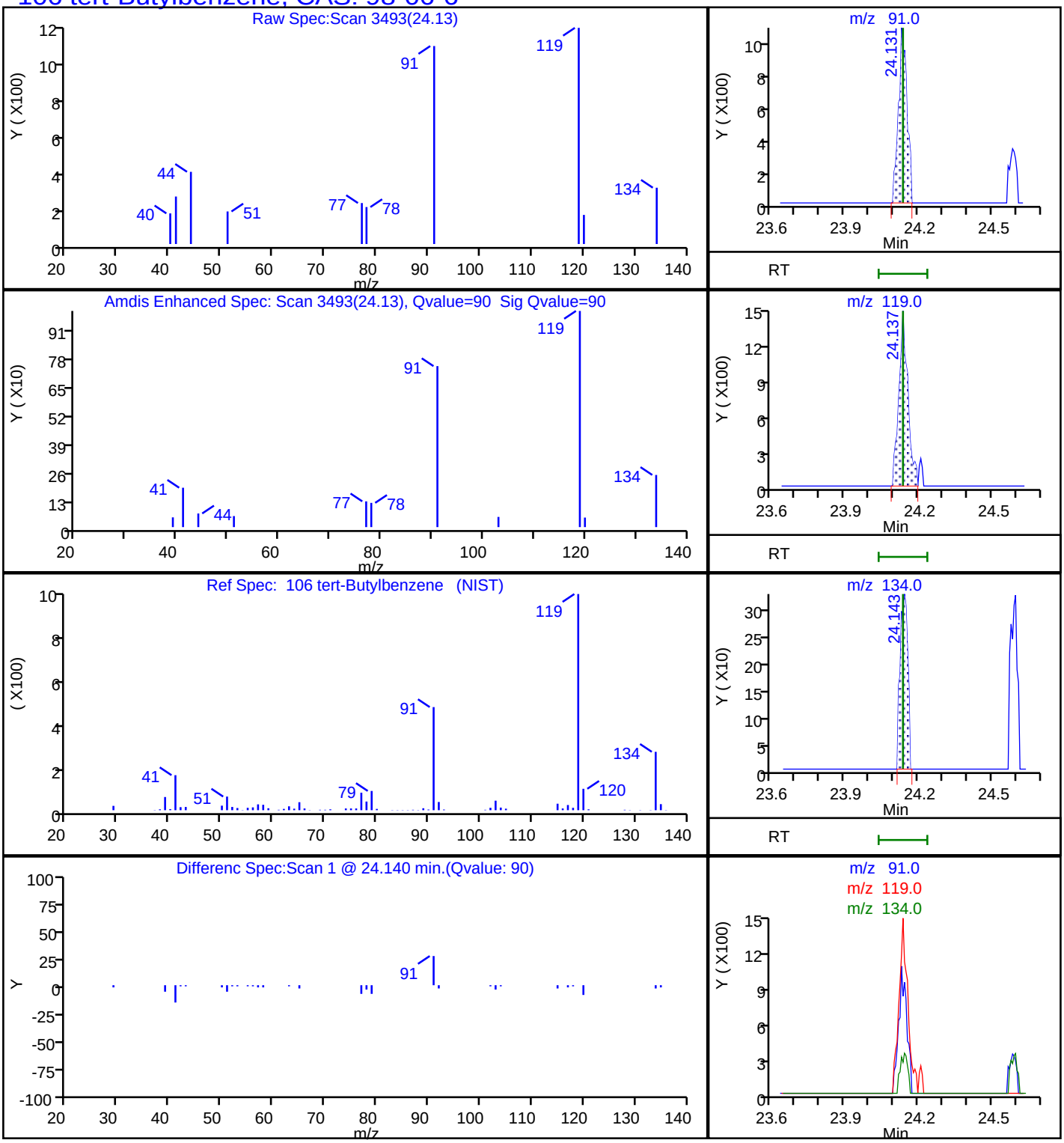
90 Bromoform, CAS: 75-25-2



Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

106 tert-Butylbenzene, CAS: 98-06-6

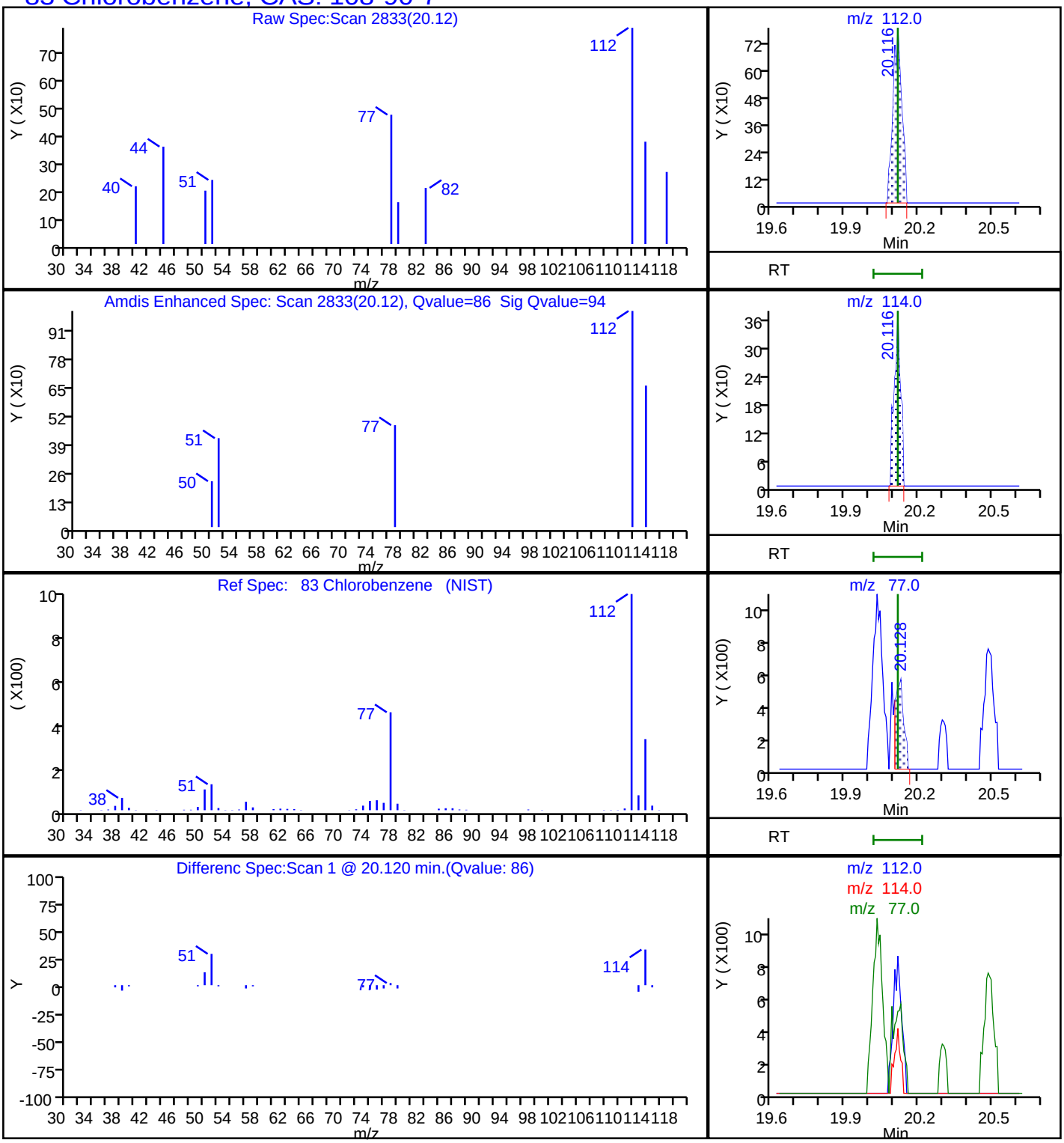


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

83 Chlorobenzene, CAS: 108-90-7

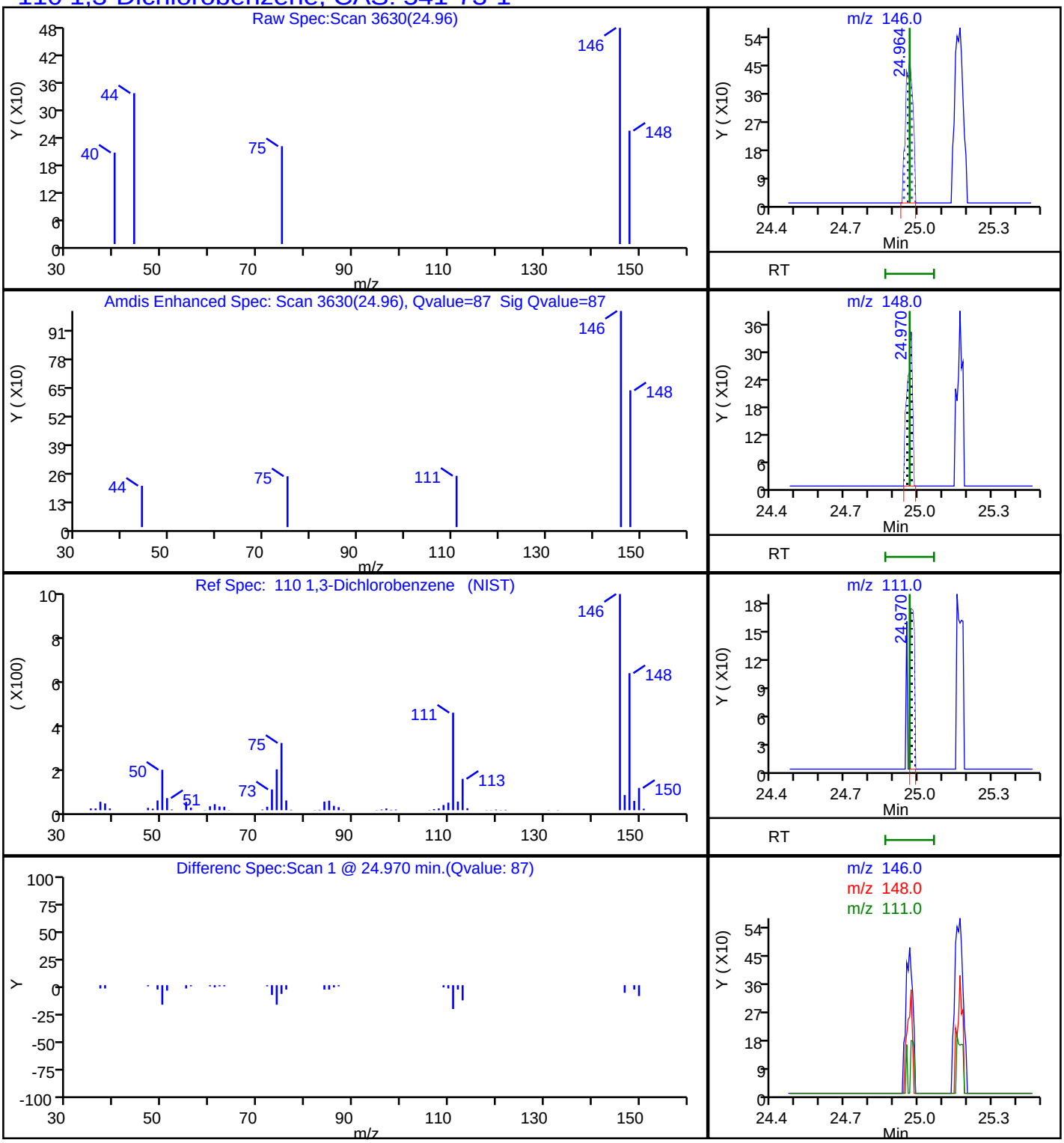


Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

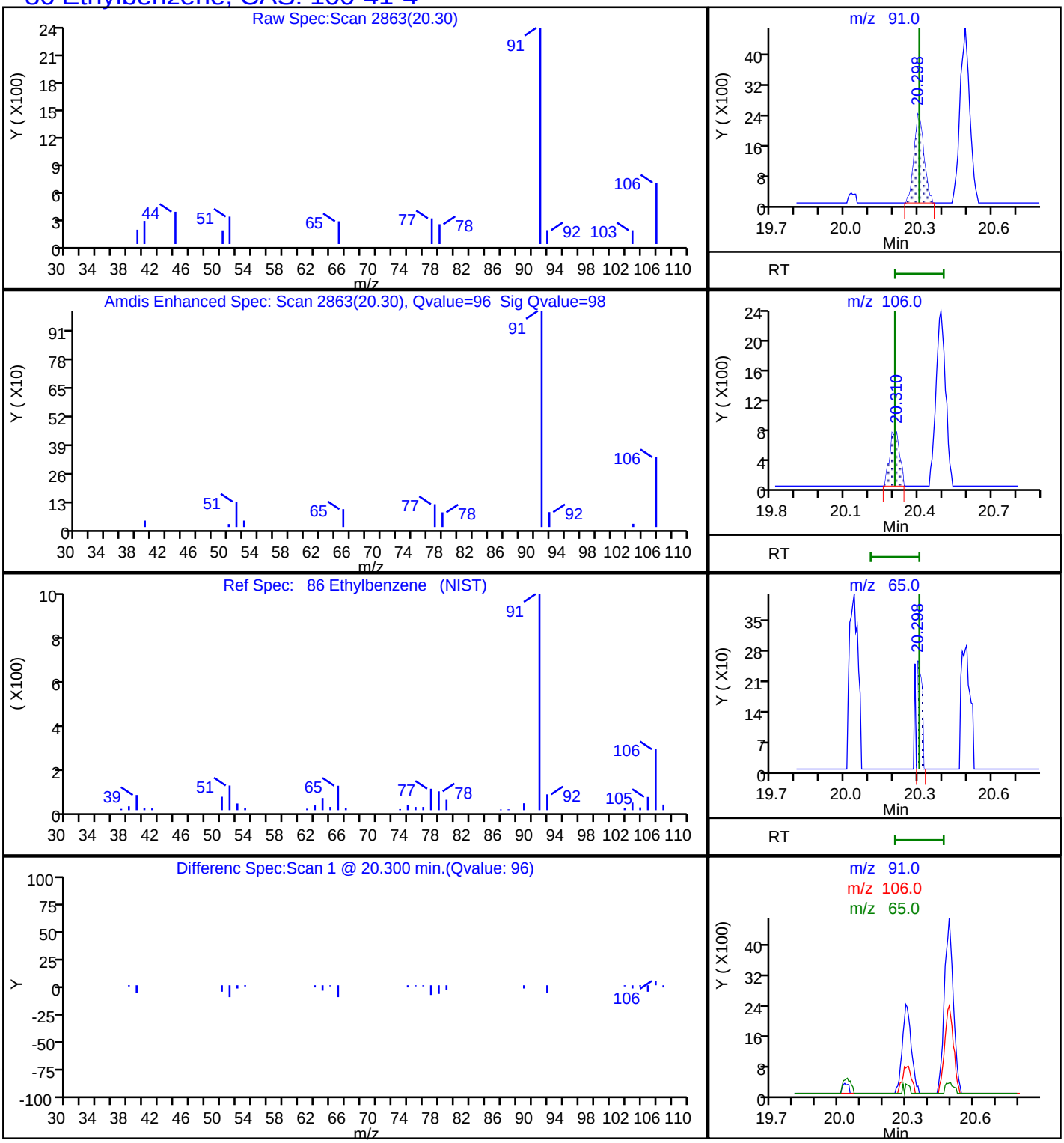
110 1,3-Dichlorobenzene, CAS: 541-73-1



Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

86 Ethylbenzene, CAS: 100-41-4

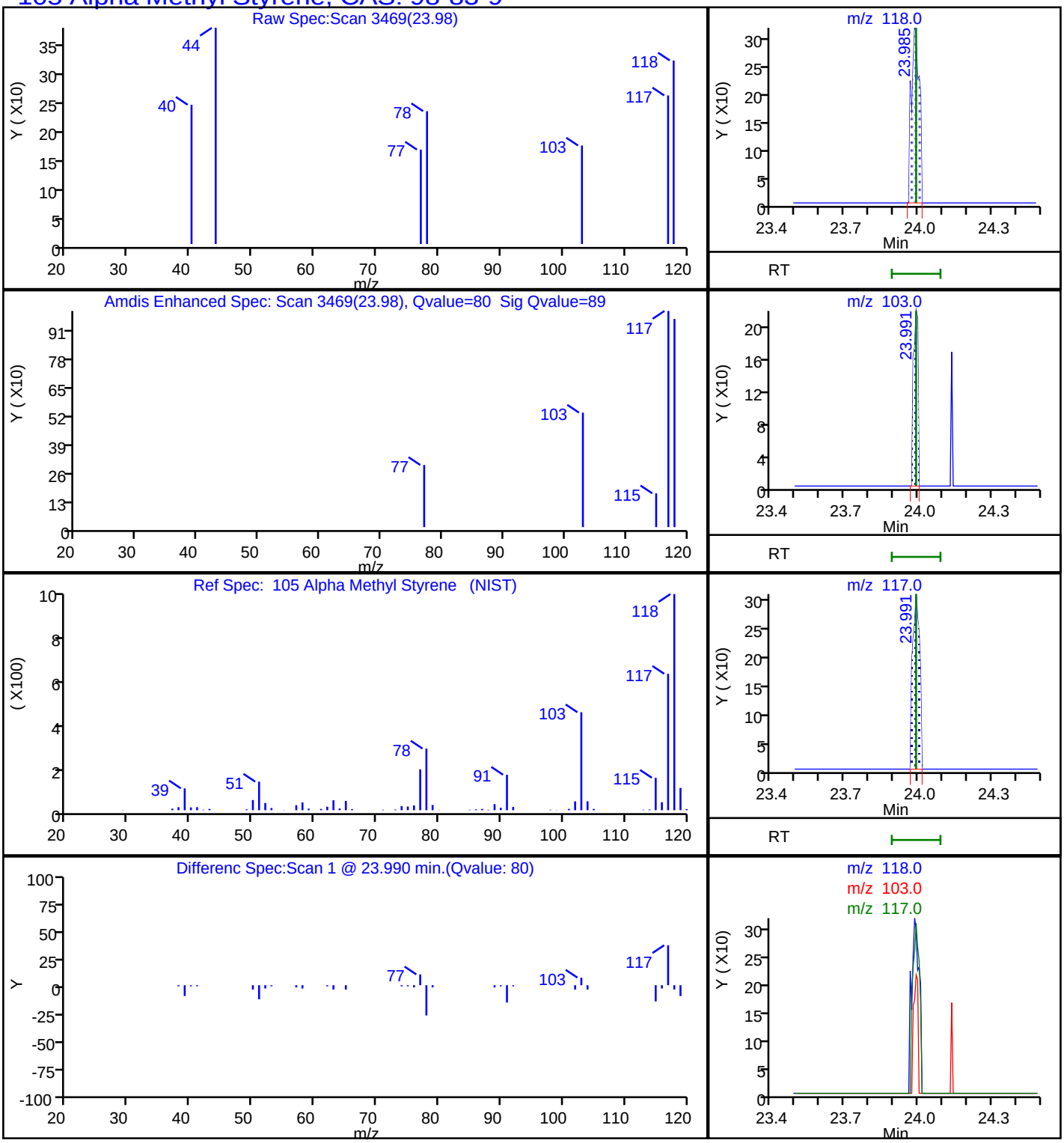


Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

105 Alpha Methyl Styrene, CAS: 98-83-9

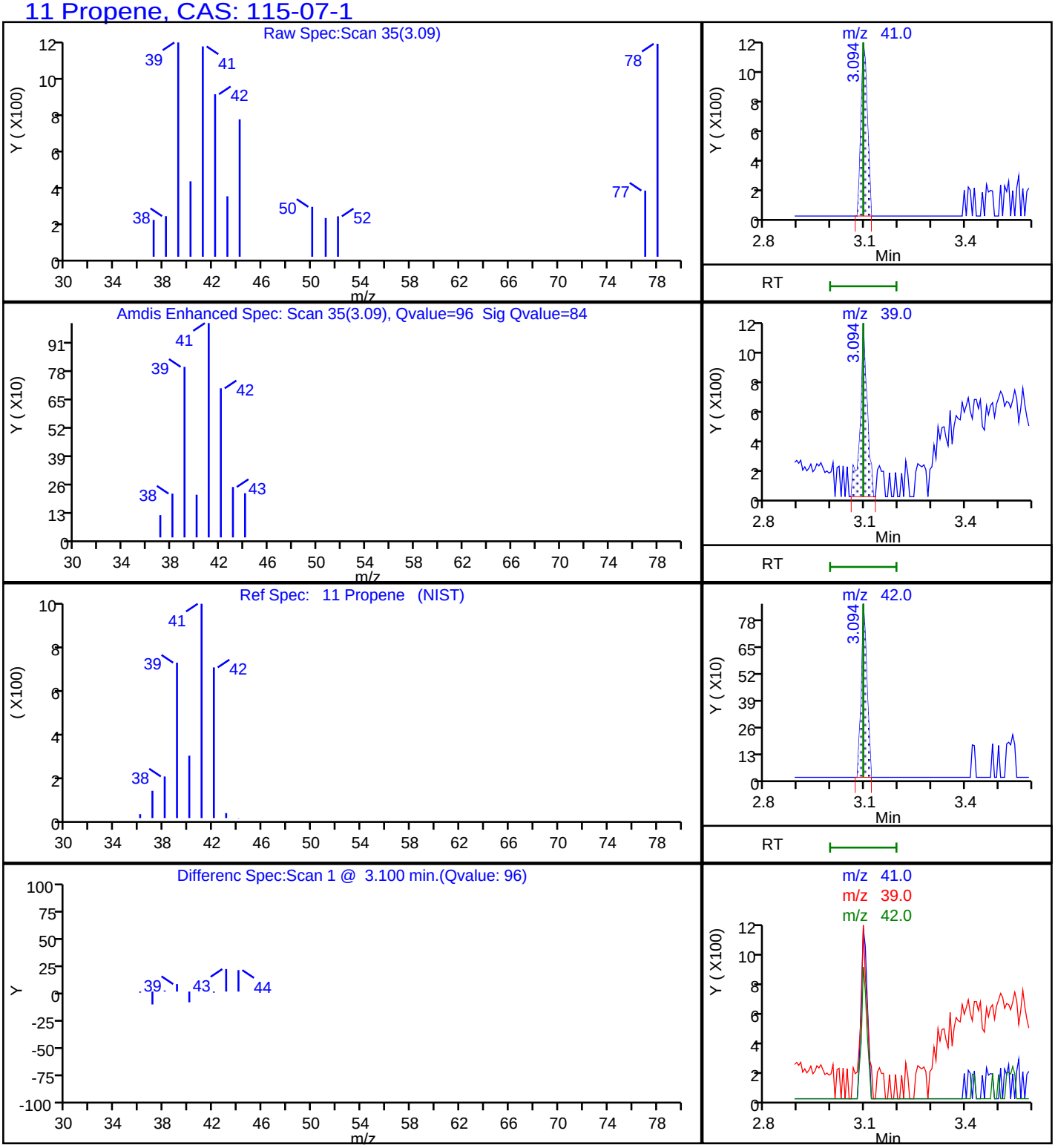


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

11 Propene, CAS: 115-07-1

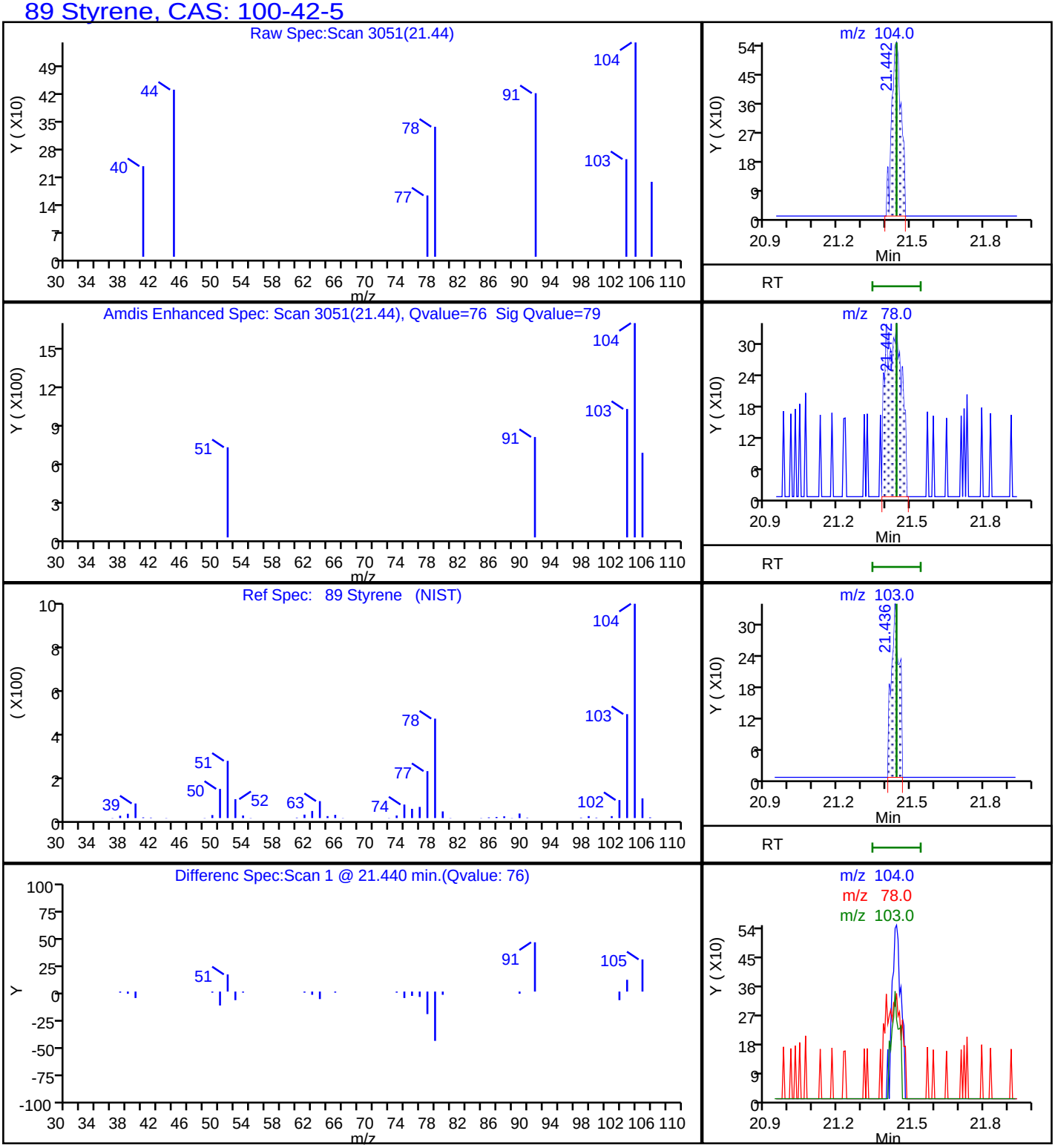


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

89 Styrene, CAS: 100-42-5

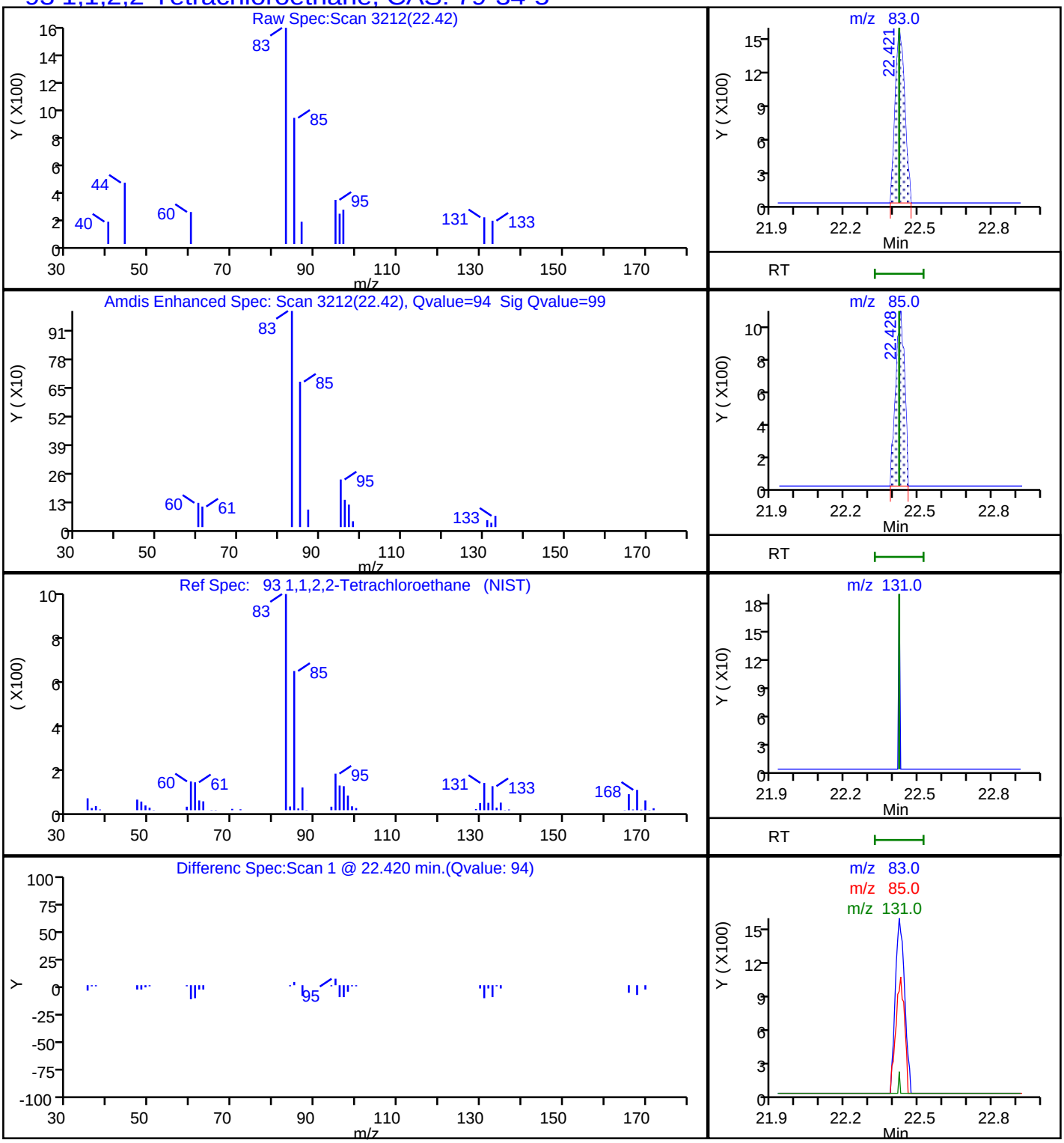


Report Date: 02-Oct-2019 10:19:58 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

93 1,1,2,2-Tetrachloroethane, CAS: 79-34-5

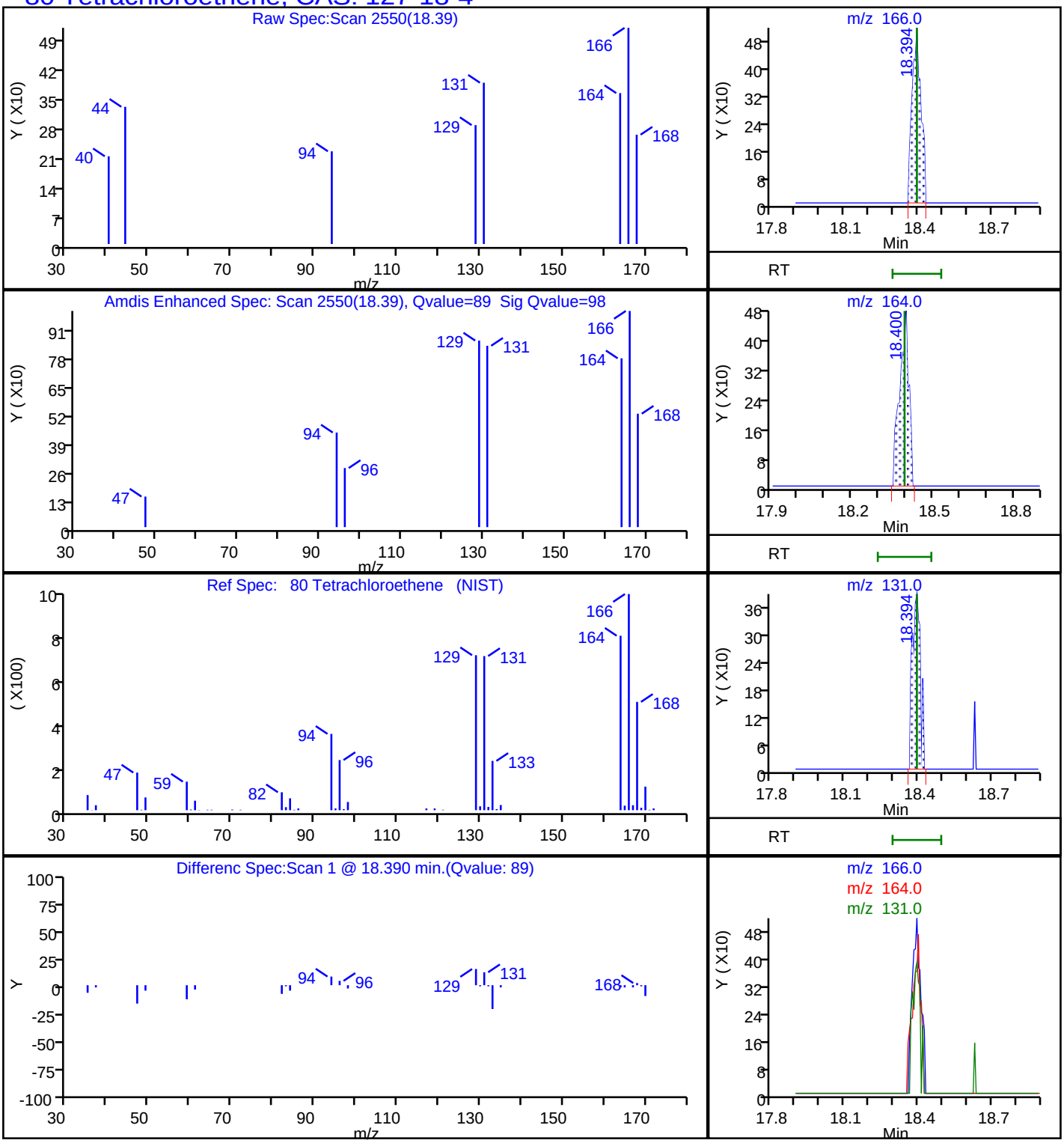


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

80 Tetrachloroethene, CAS: 127-18-4



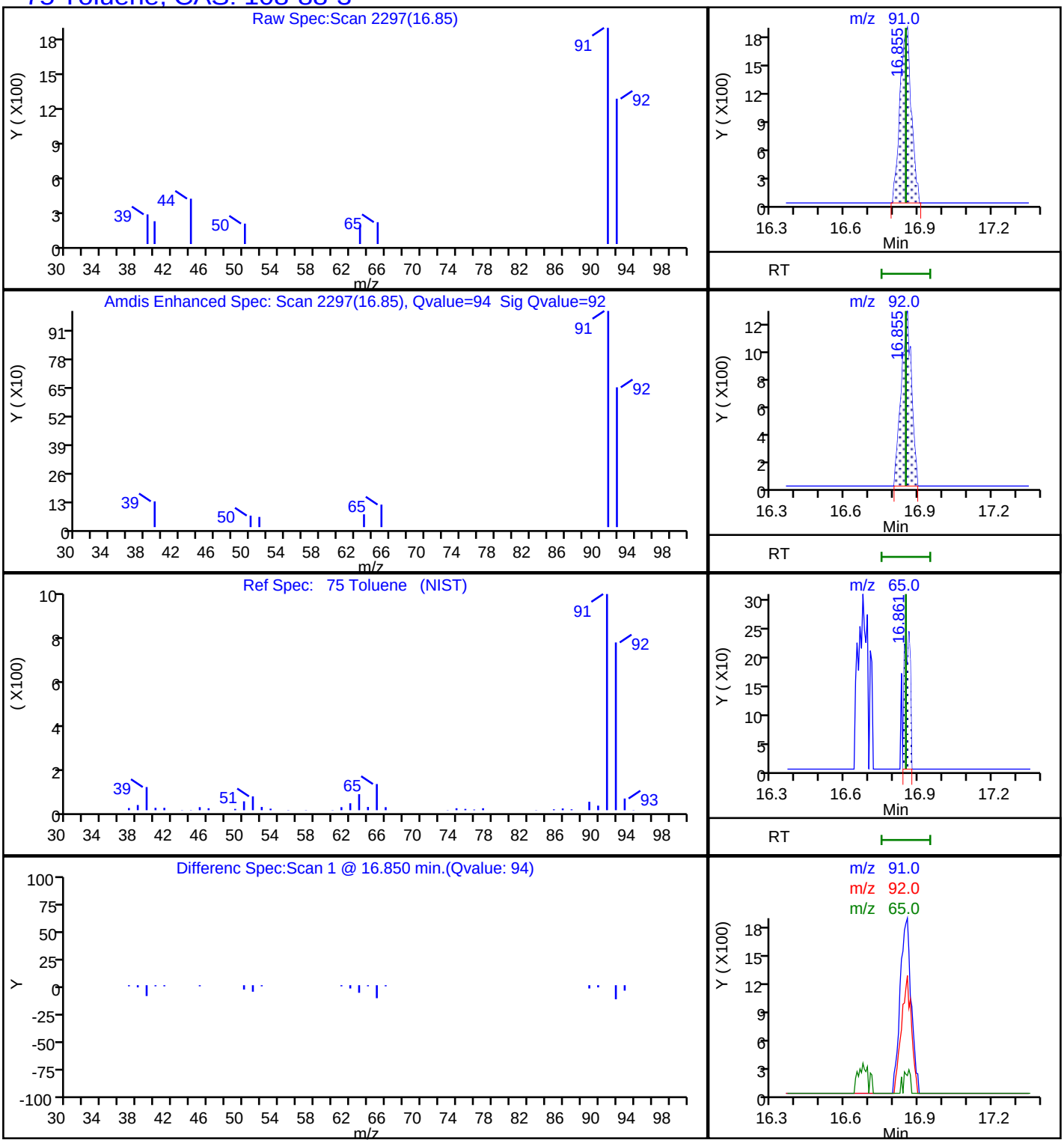
Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D

Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

75 Toluene, CAS: 108-88-3

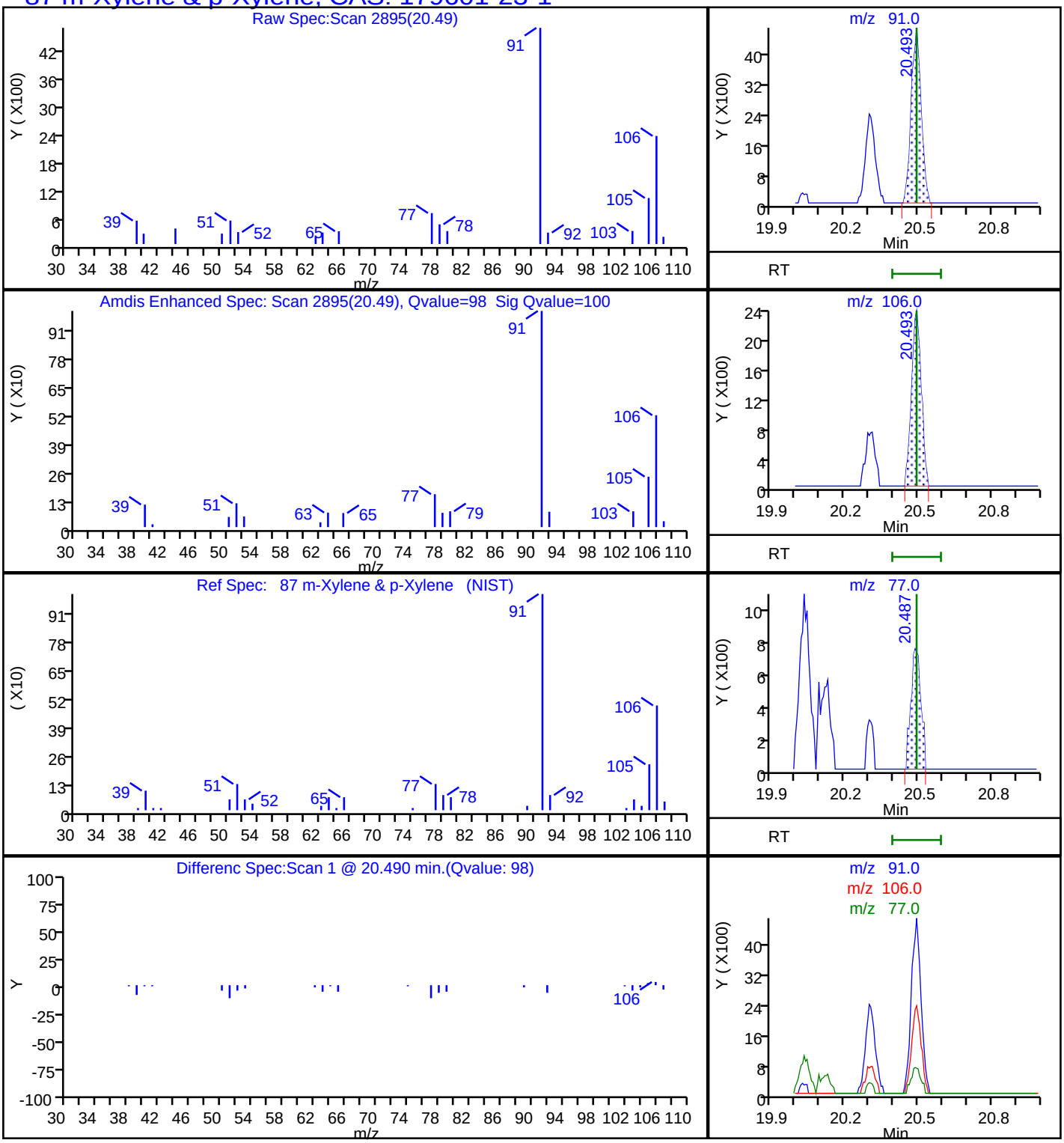


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

87 m-Xylene & p-Xylene, CAS: 179601-23-1

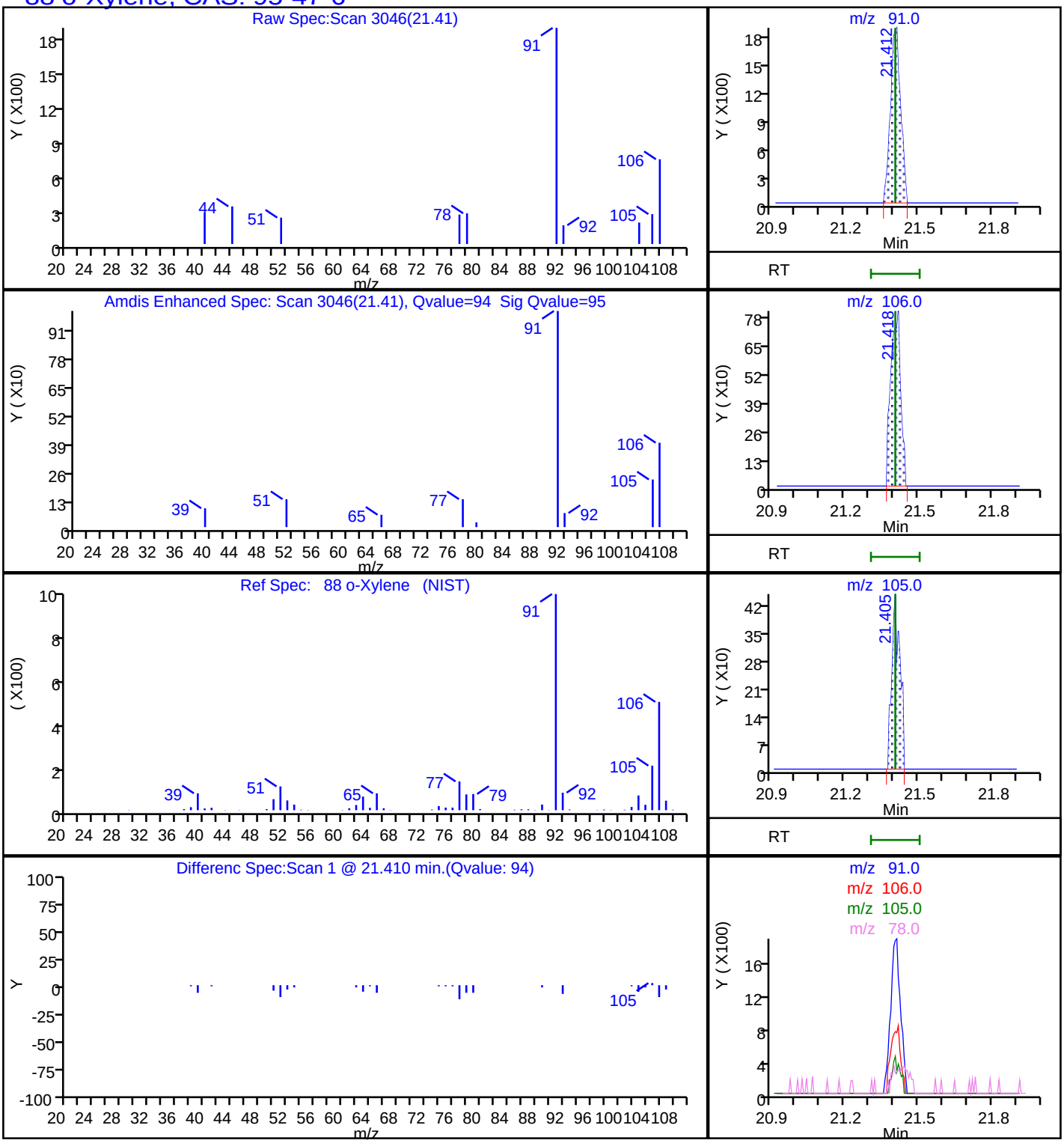


Report Date: 02-Oct-2019 10:19:57 Chrom Revision: 2.3 17-Sep-2019 16:19:08

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

88 o-Xylene, CAS: 95-47-6



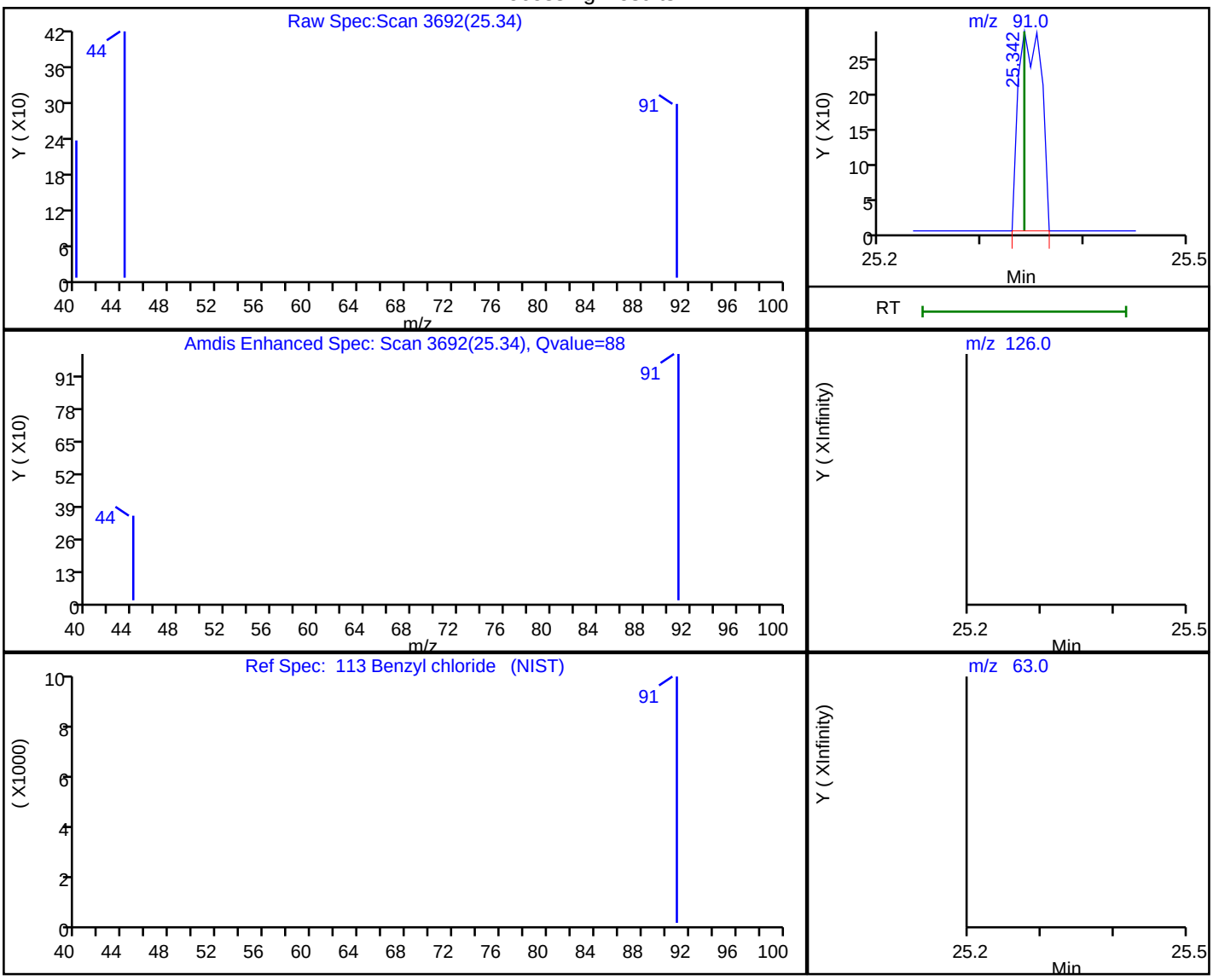
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

113 Benzyl chloride, CAS: 100-44-7

Processing Results



RT	Mass	Response	Amount
25.34	91.00	457	0.416242
25.34	126.00	0	
25.34	63.00	0	

Reviewer: vanommens, 02-Oct-2019 10:19:23

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

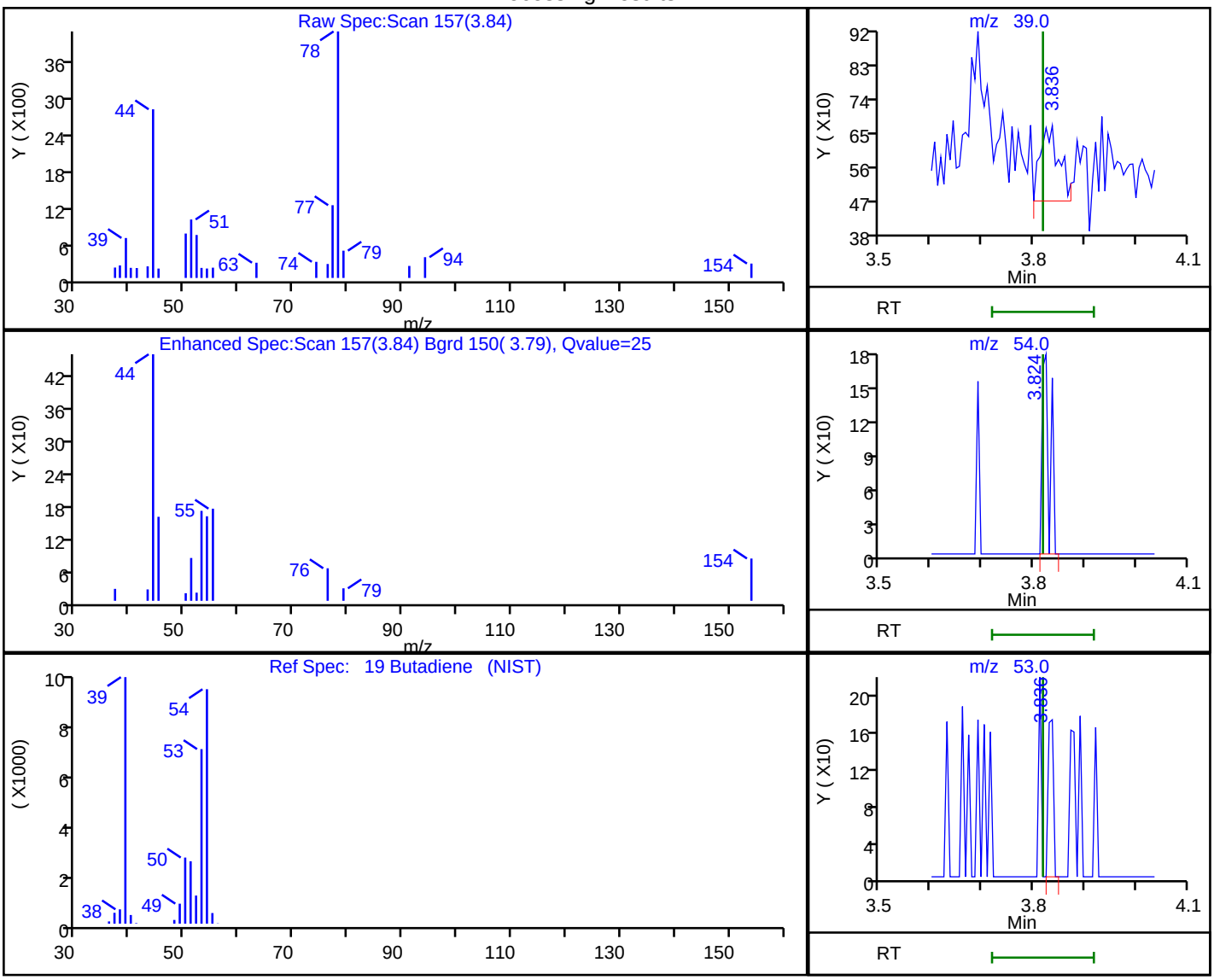
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

19 Butadiene, CAS: 106-99-0

Processing Results



RT	Mass	Response	Amount
3.84	39.00	511	0.062037
3.82	54.00	182	
3.84	53.00	120	

Reviewer: vanommens, 02-Oct-2019 10:17:47

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

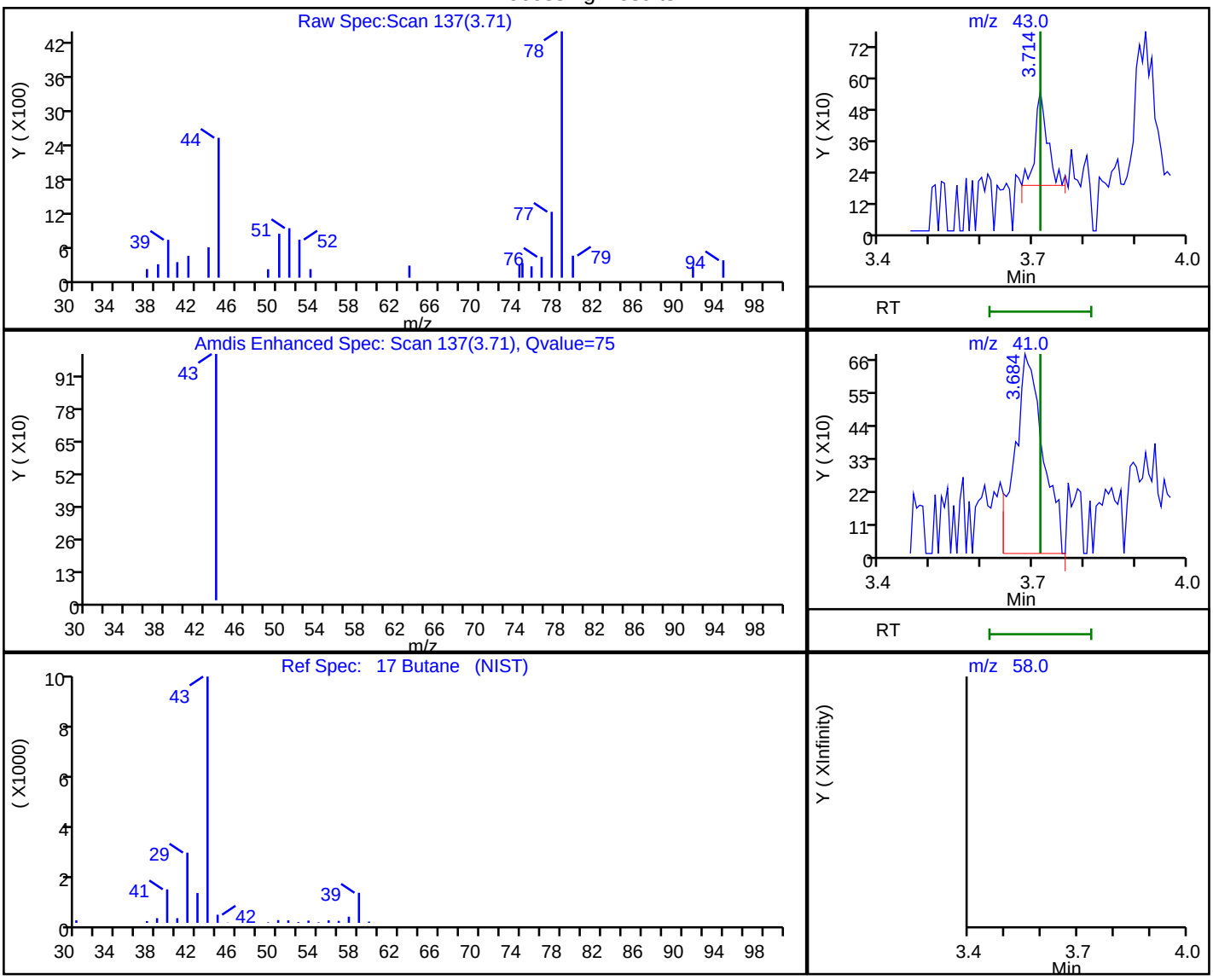
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

17 Butane, CAS: 106-97-8

Processing Results



RT	Mass	Response	Amount
3.71	43.00	609	0.038232
3.68	41.00	2563	
3.71	58.00	0	

Reviewer: vanommens, 02-Oct-2019 10:17:44

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

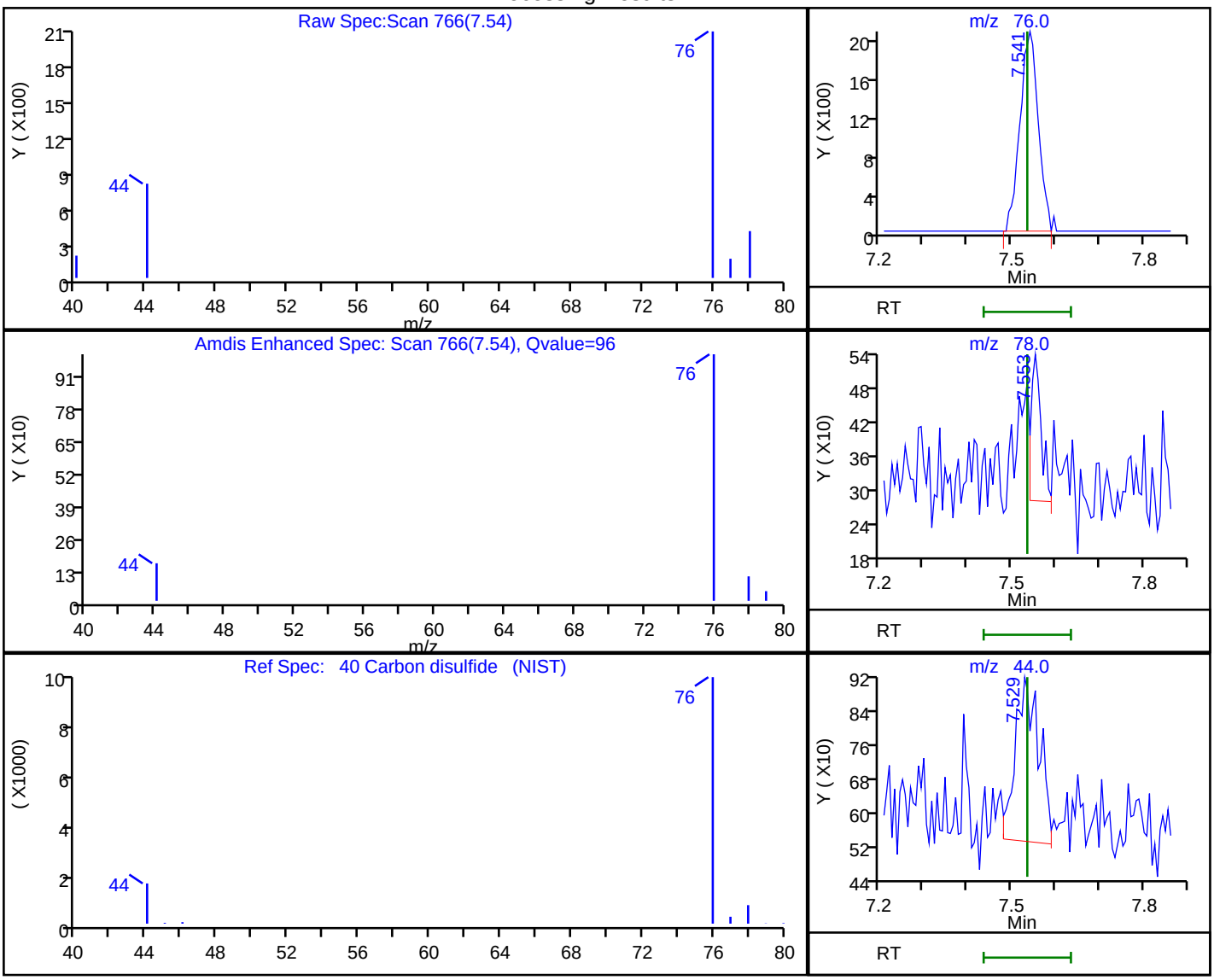
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

40 Carbon disulfide, CAS: 75-15-0

Processing Results



RT	Mass	Response	Amount
7.54	76.00	6009	0.169151
7.55	78.00	410	
7.53	44.00	1469	

Reviewer: vanommens, 02-Oct-2019 10:17:56

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

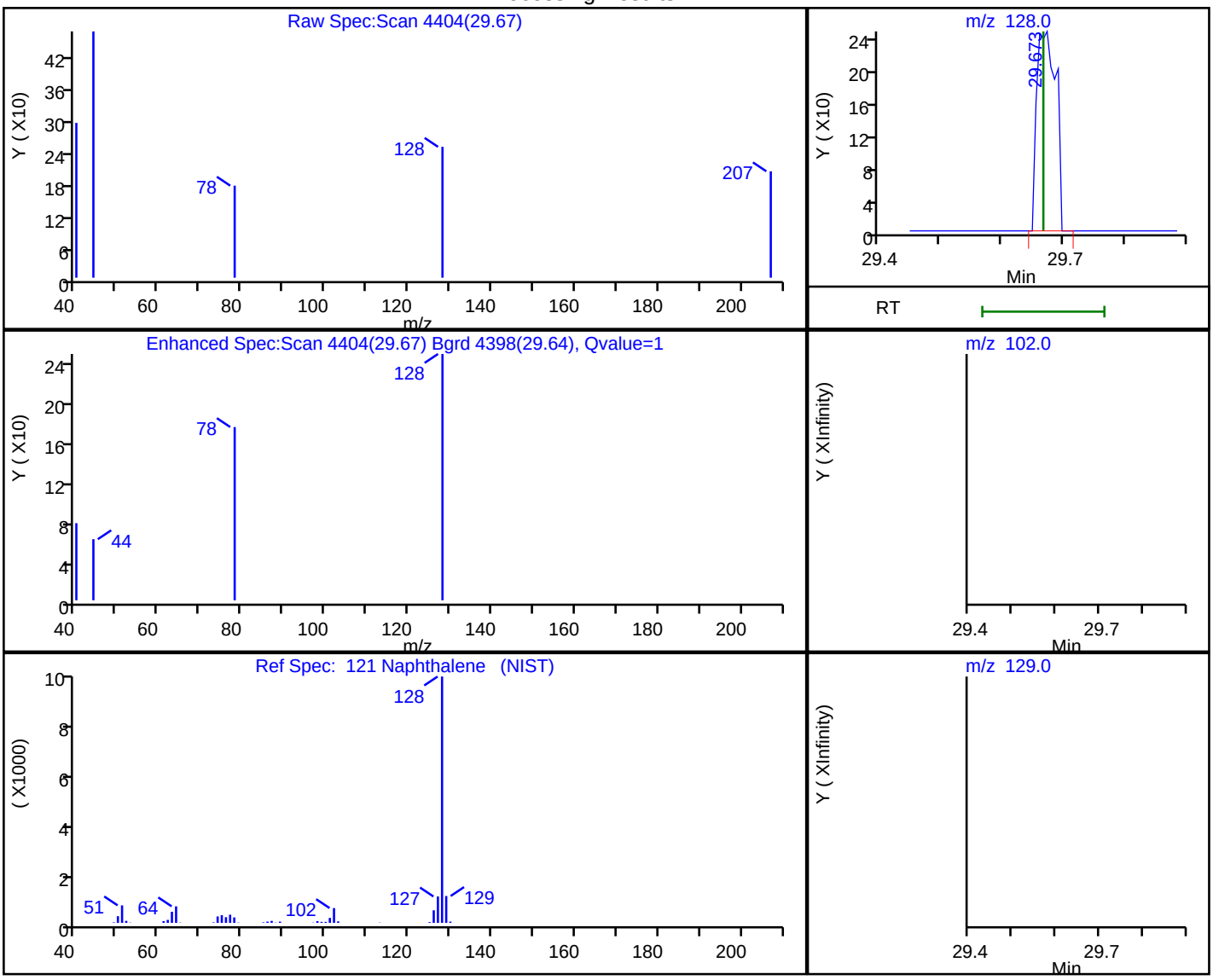
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

121 Naphthalene, CAS: 91-20-3

Processing Results



RT	Mass	Response	Amount
29.67	128.00	538	0.317773
29.67	102.00	0	
29.67	129.00	0	

Reviewer: vanommens, 02-Oct-2019 10:19:37

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

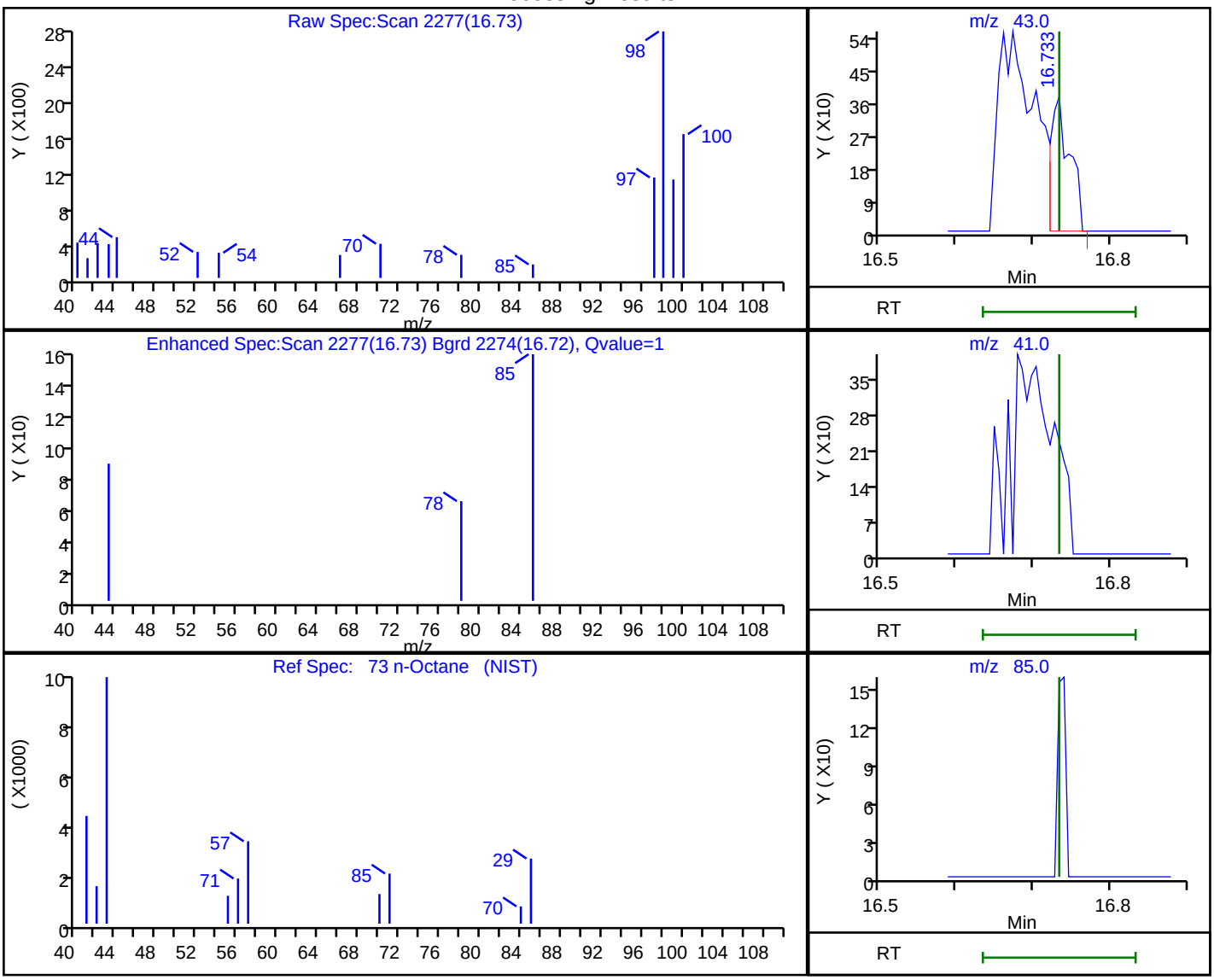
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

73 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
16.73	43.00	640	0.023468
16.73	41.00	0	
16.73	85.00	0	

Reviewer: vanommens, 02-Oct-2019 10:18:21

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

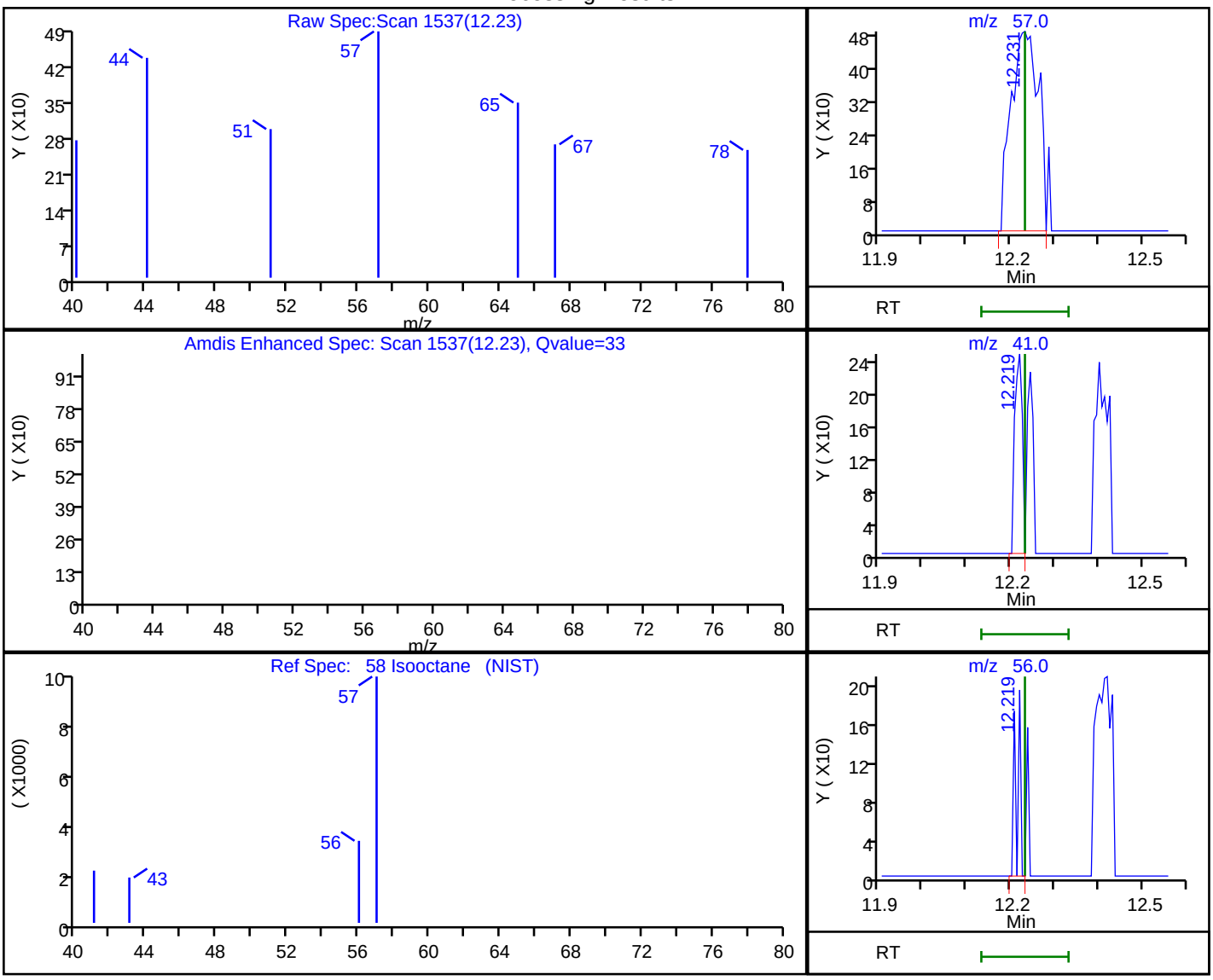
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

58 Isooctane, CAS: 540-84-1

Processing Results



RT	Mass	Response	Amount
12.23	57.00	2112	0.035976
12.22	41.00	288	
12.22	56.00	134	

Reviewer: vanommens, 02-Oct-2019 10:18:06

Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

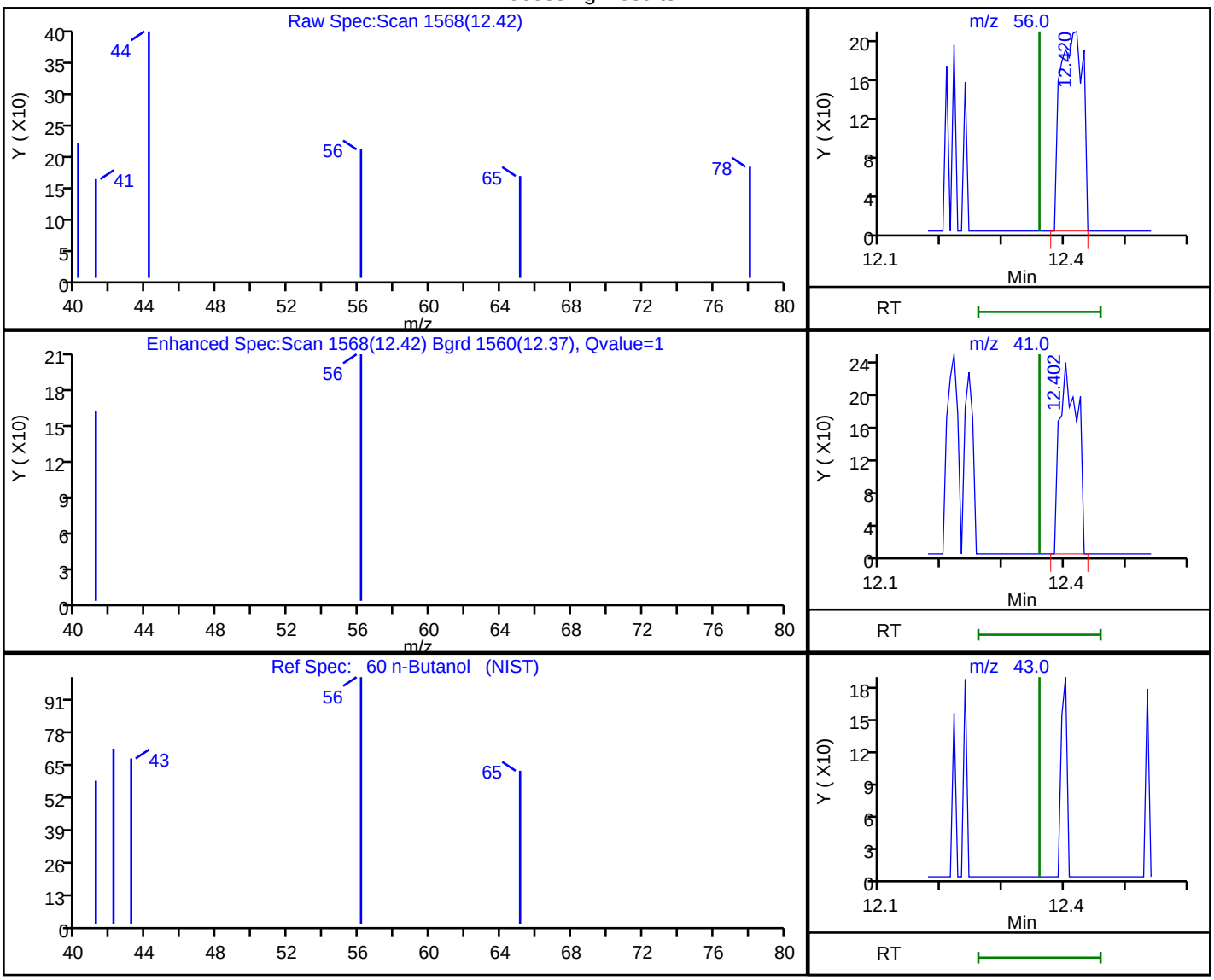
User Disabled Compound Report

Eurofins TestAmerica, Sacramento

Data File:	\\chromna\Sacramento\ChromData\ATMS6\20190930-84081.b\MS6100120.D				
Injection Date:	02-Oct-2019 09:05:30	Instrument ID:	ATMS6		
Lims ID:	320-54181-A-1	Lab Sample ID:	320-54181-1		
Client ID:	8362				
Operator ID:	SRS	ALS Bottle#:	14	Worklist Smp#:	21
Purge Vol:	25.000 mL	Dil. Factor:	1.0000		
Method:	TO15_ATMS6	Limit Group:	MSA - TO15 - ICAL		
Column:	RTX Volatiles (0.32 mm)	Detector	MS SCAN		

60 n-Butanol, CAS: 71-36-3

Processing Results



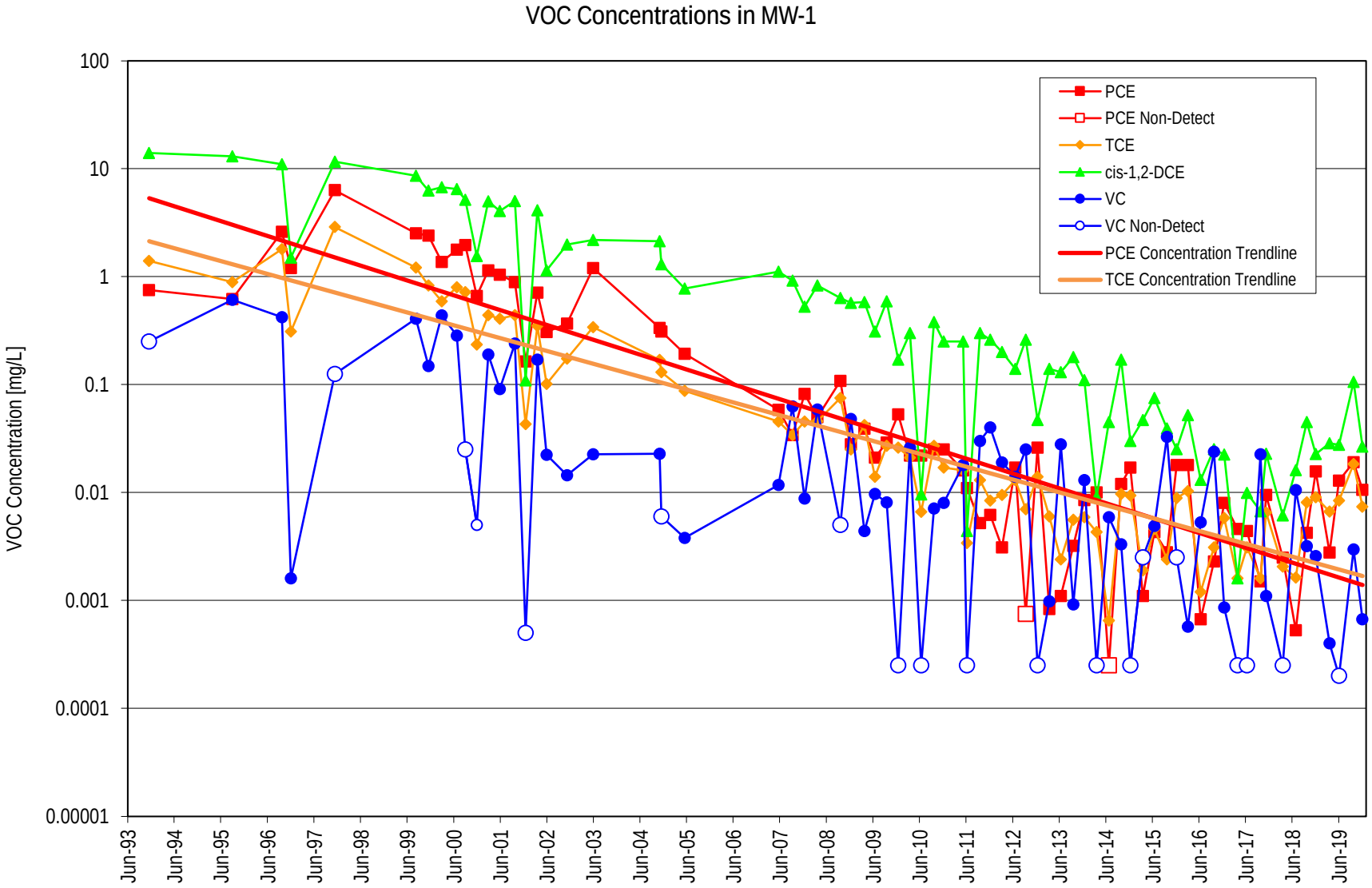
RT	Mass	Response	Amount
12.42	56.00	533	0.064080
12.40	41.00	467	
12.36	43.00	0	

Reviewer: vanommens, 02-Oct-2019 10:18:18

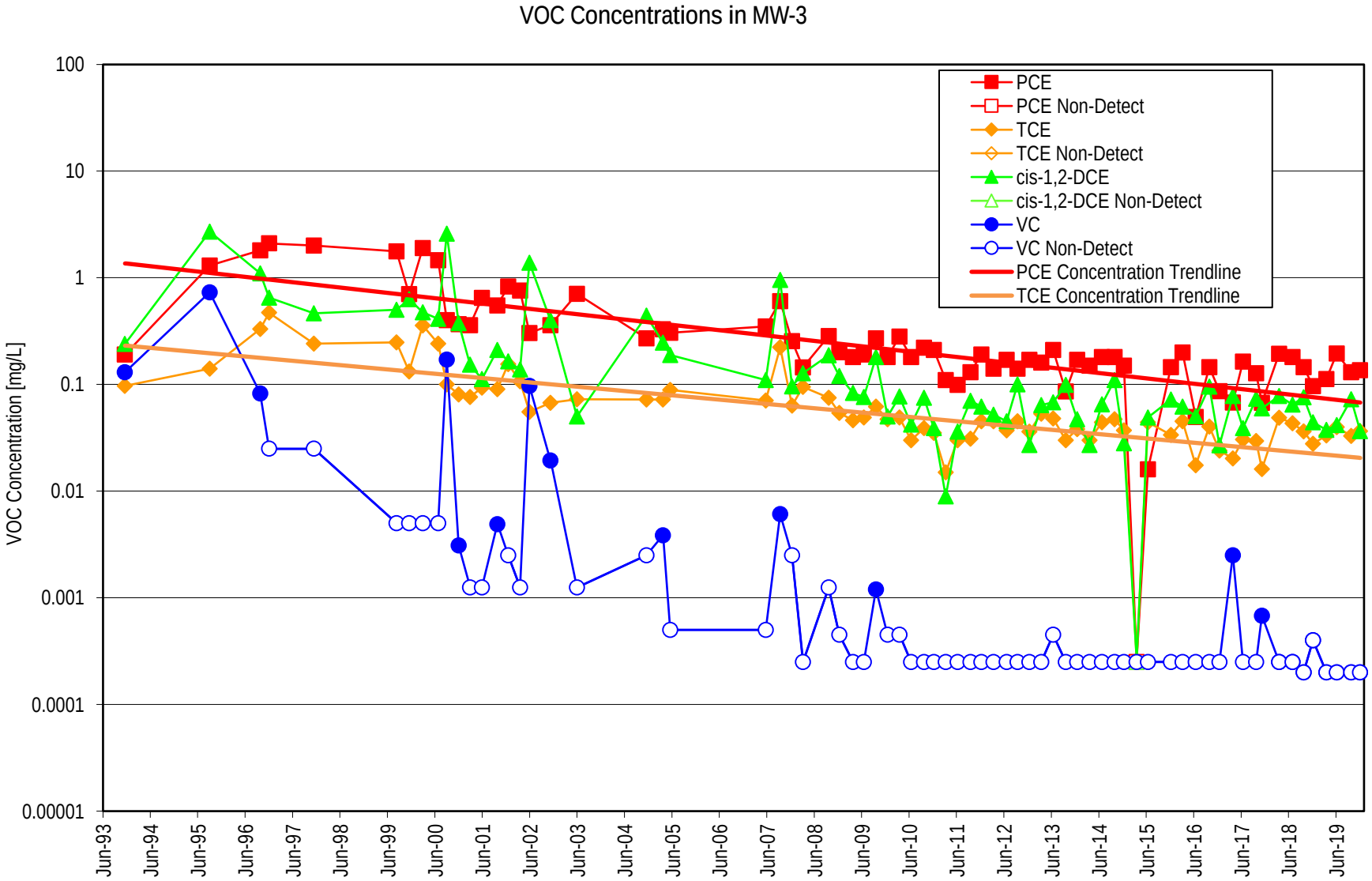
Audit Action: Marked Compound Undetected Audit Reason: Invalid Compound ID

APPENDIX D

CONCENTRATION TREND PLOTS

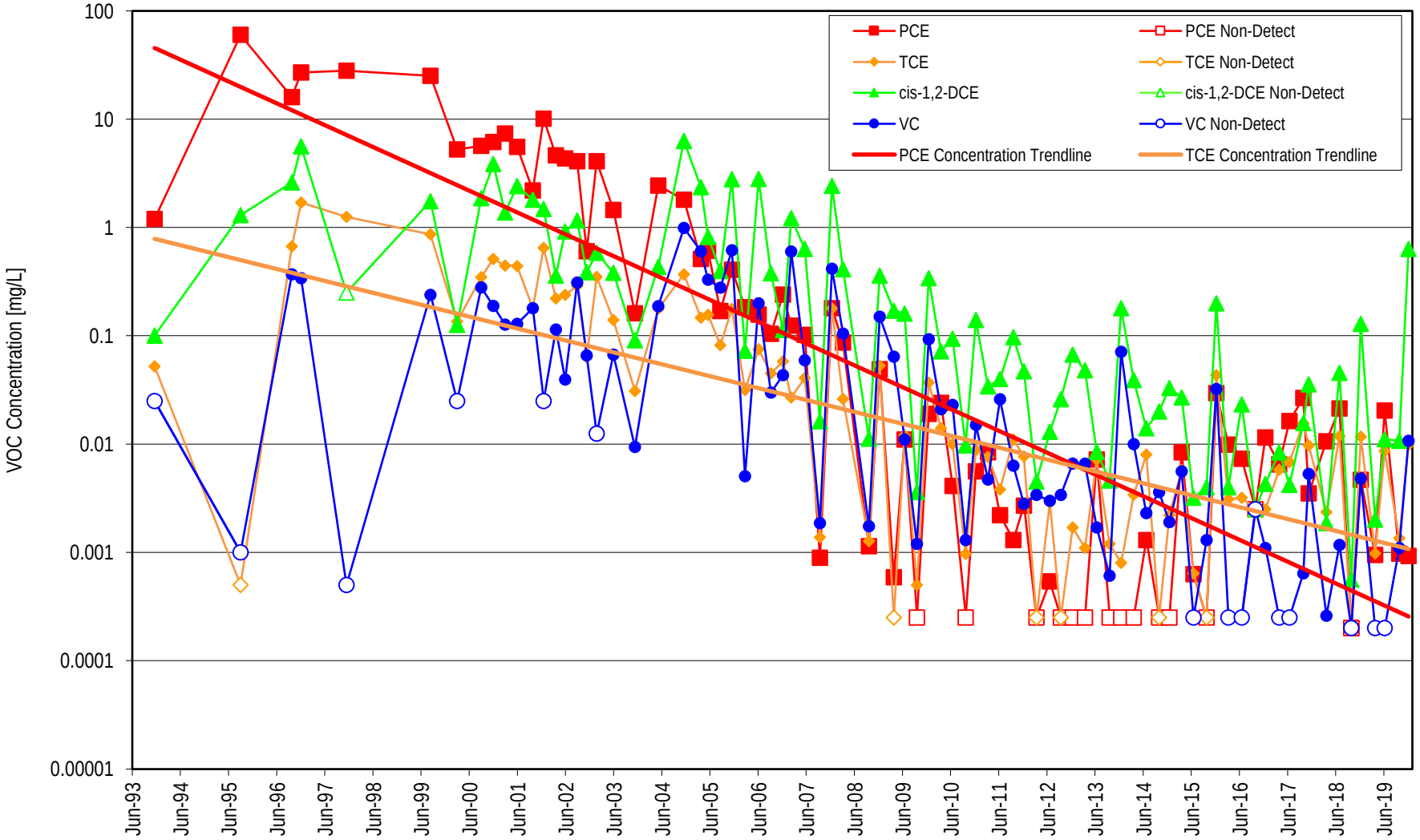


Note: Not detected values plotted at 1/2 the reporting limit.



Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-5



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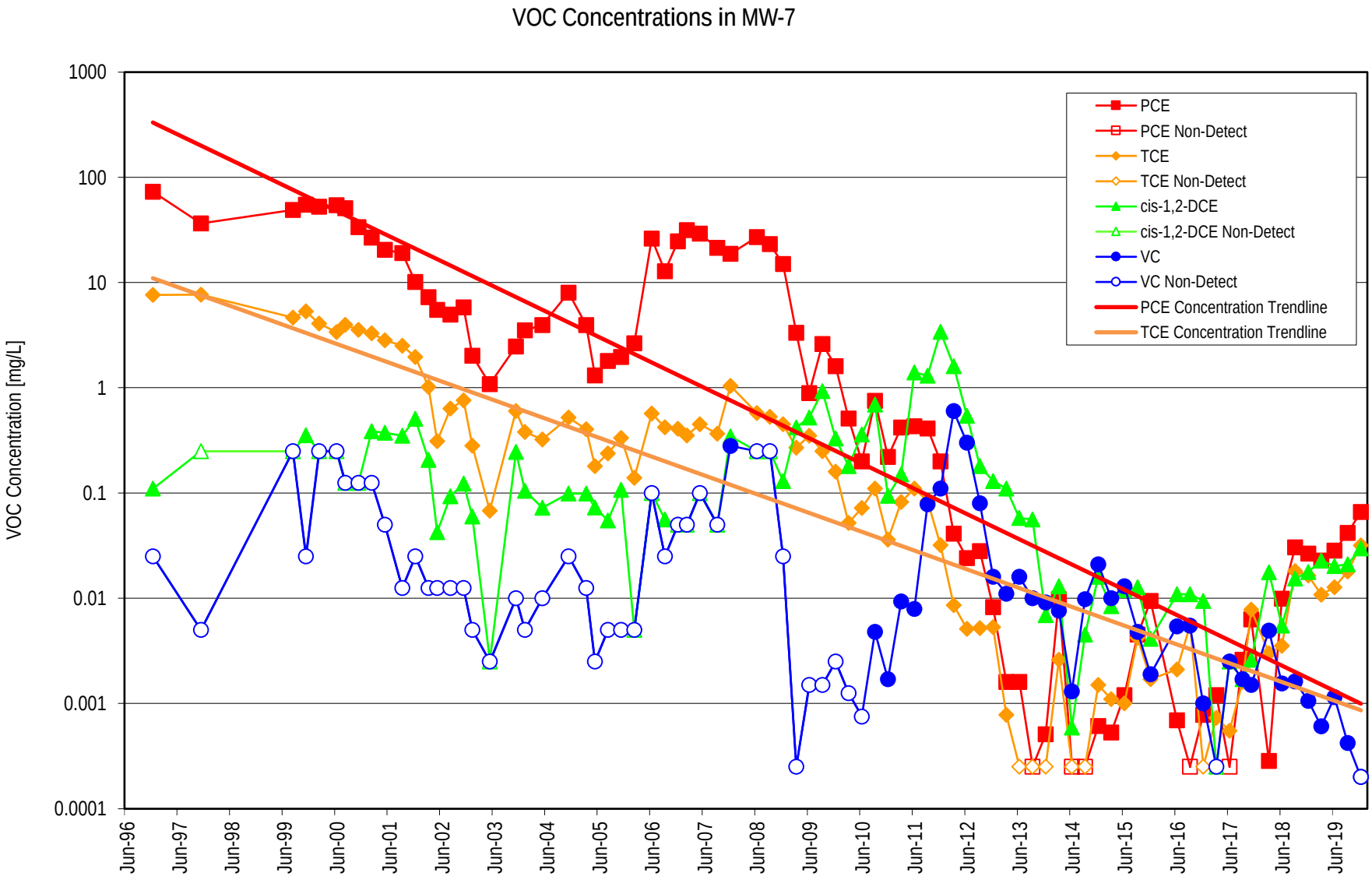

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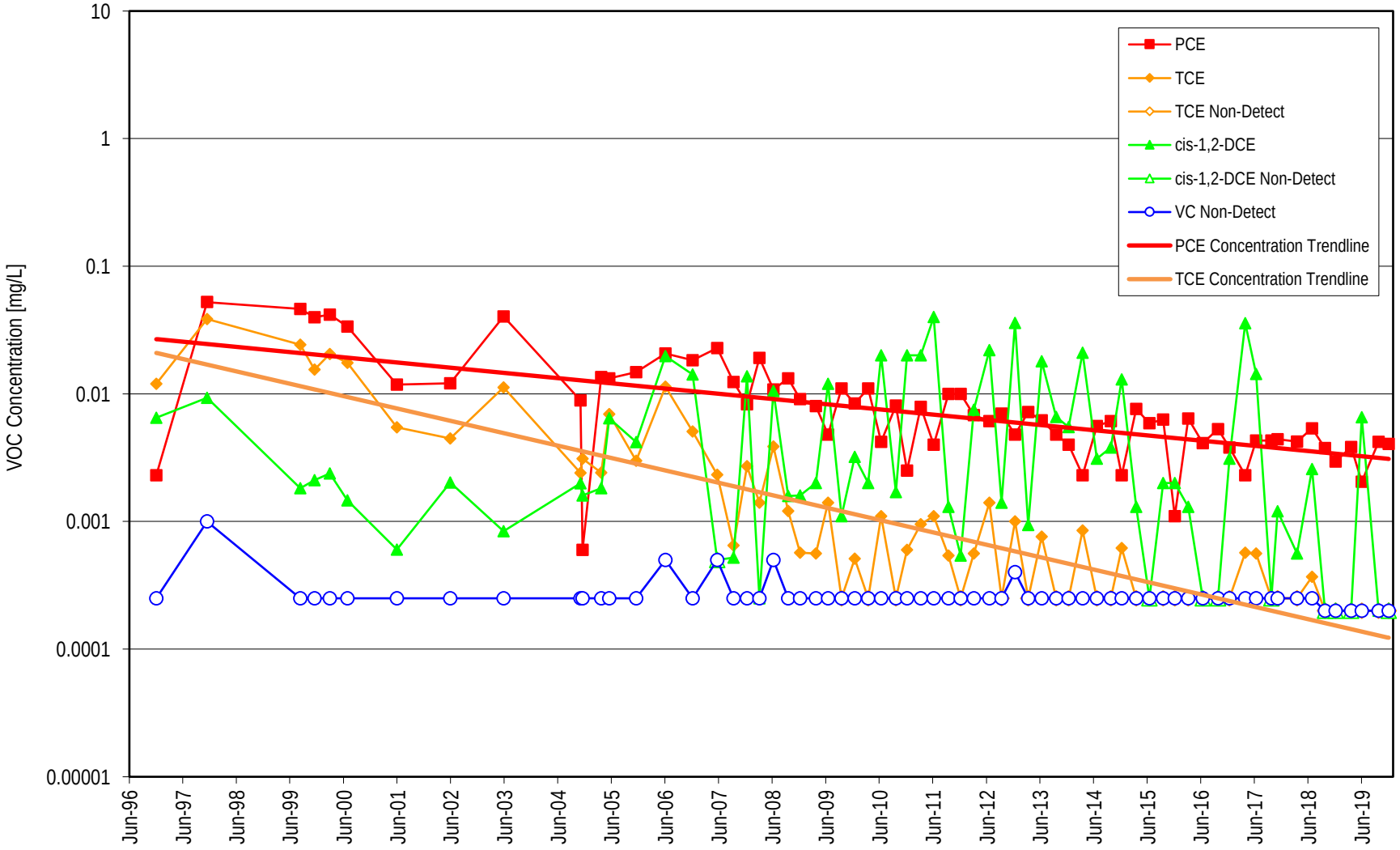
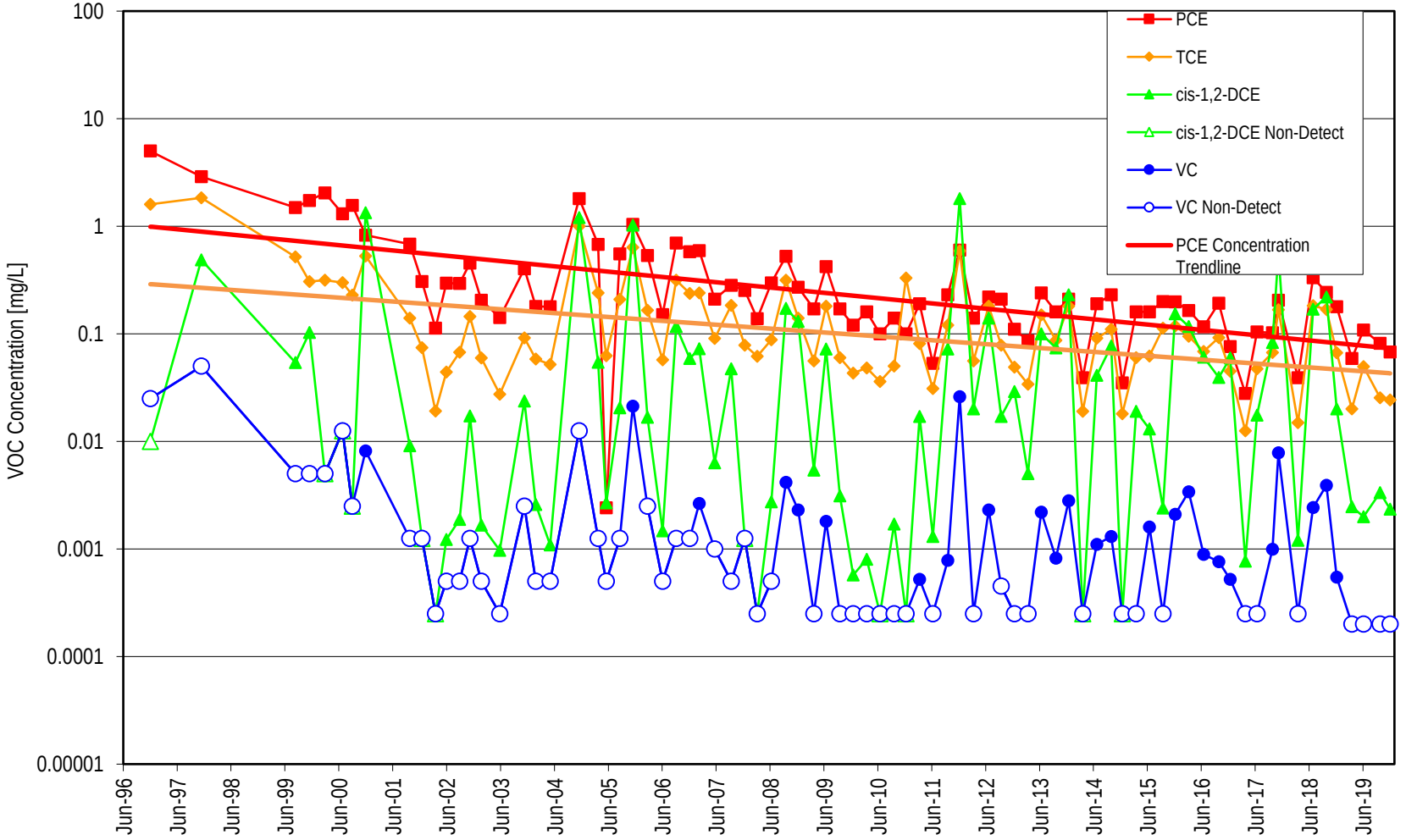
VOC Concentrations in MW-8



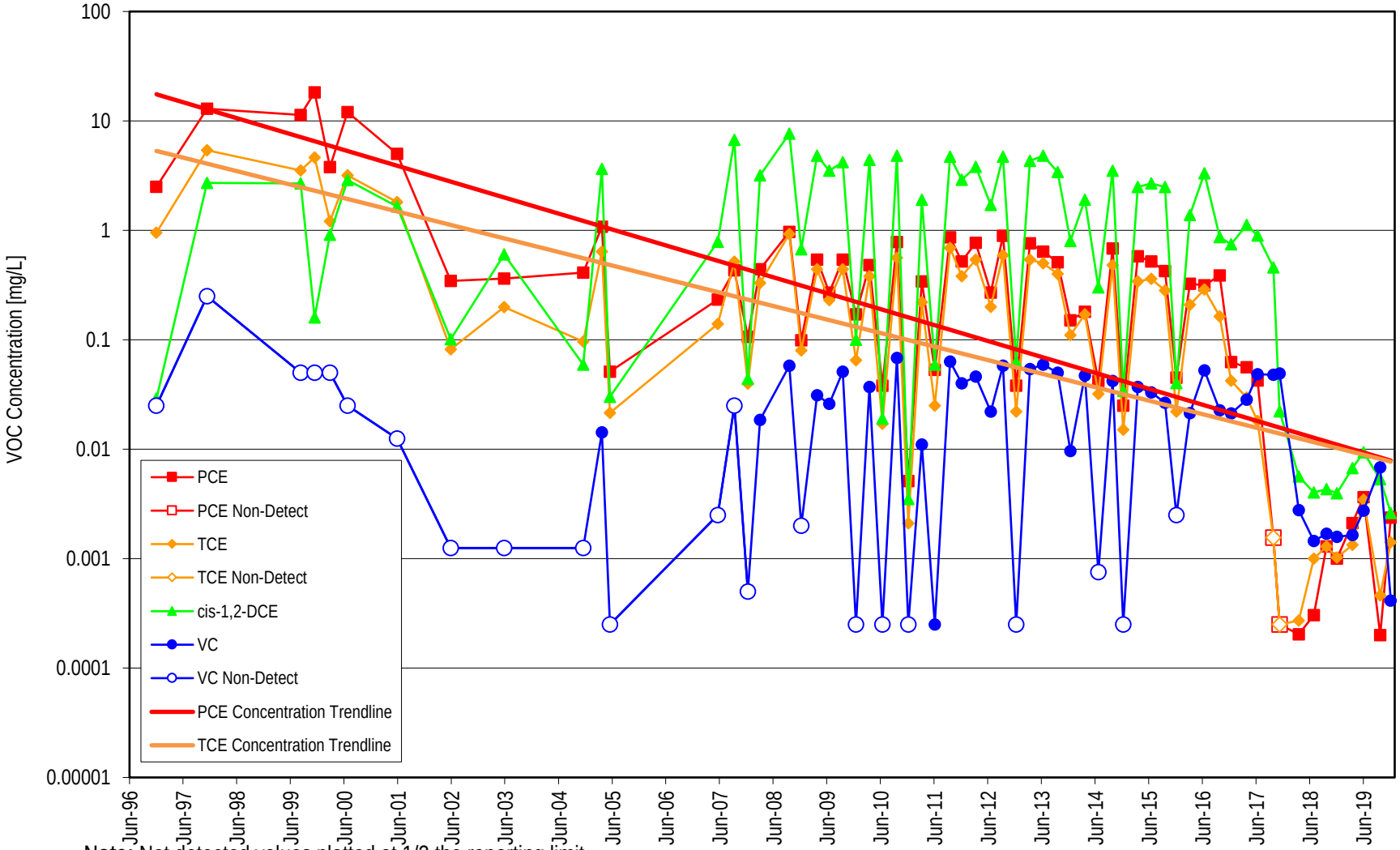
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-9



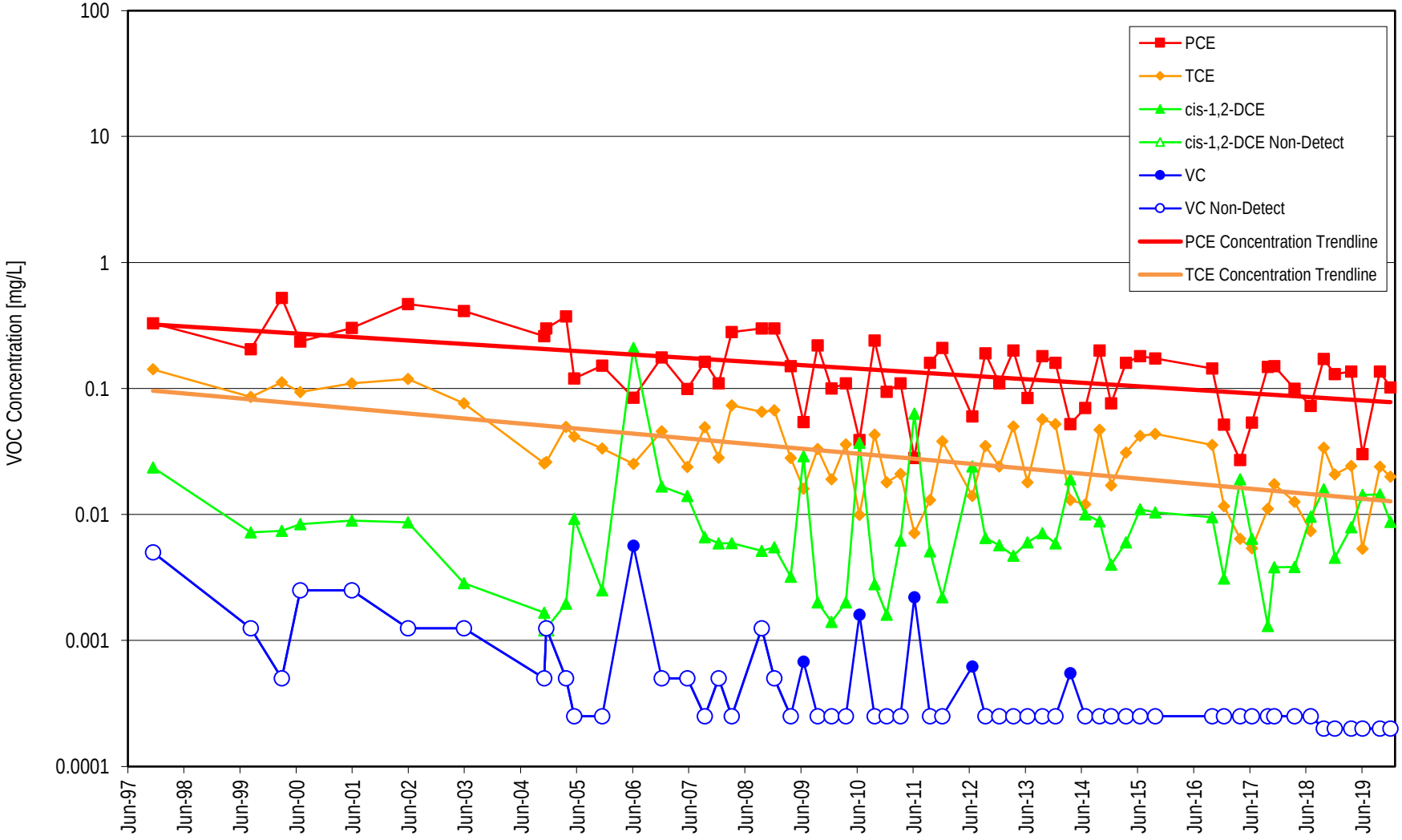
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-12



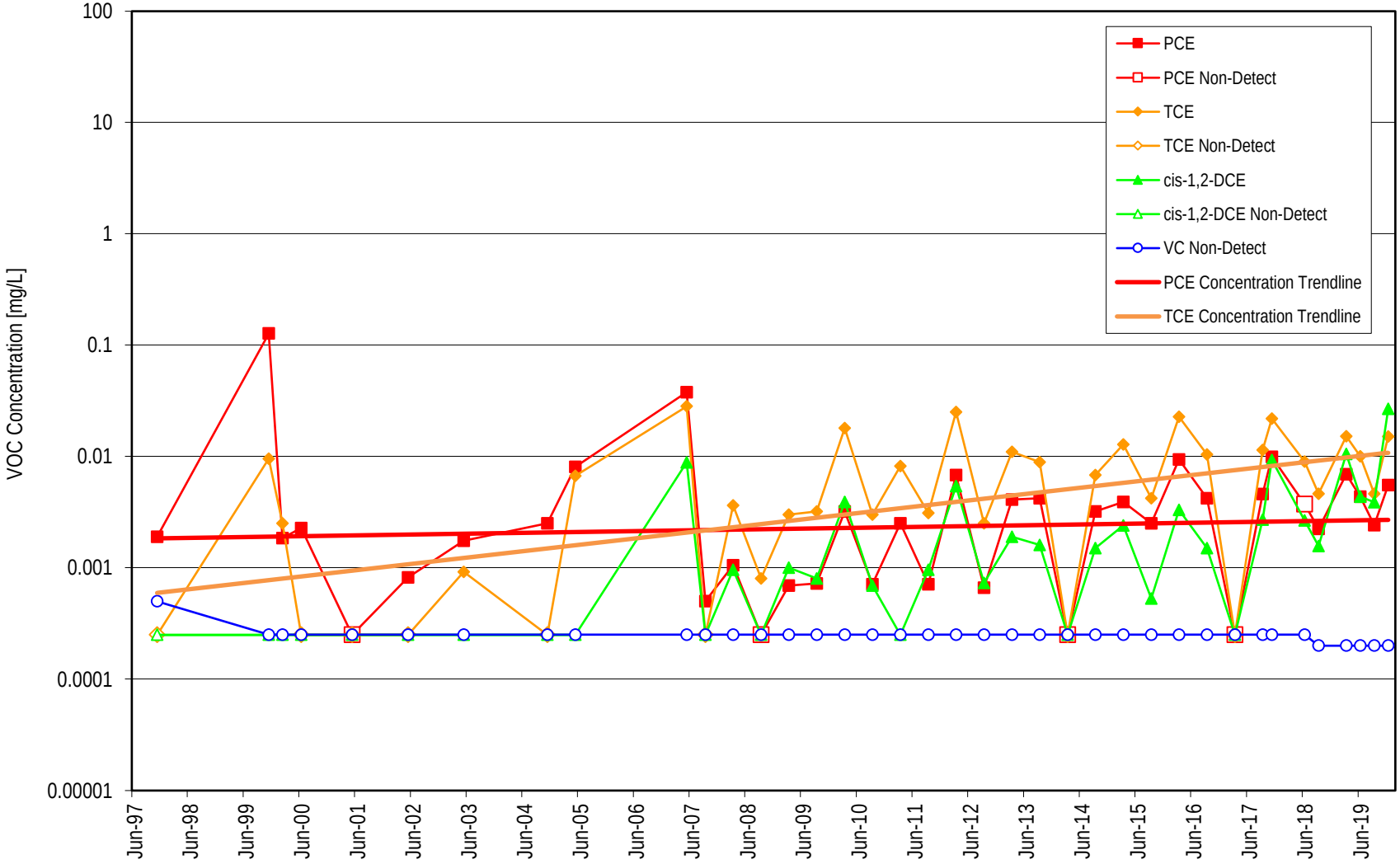
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-16



Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-17



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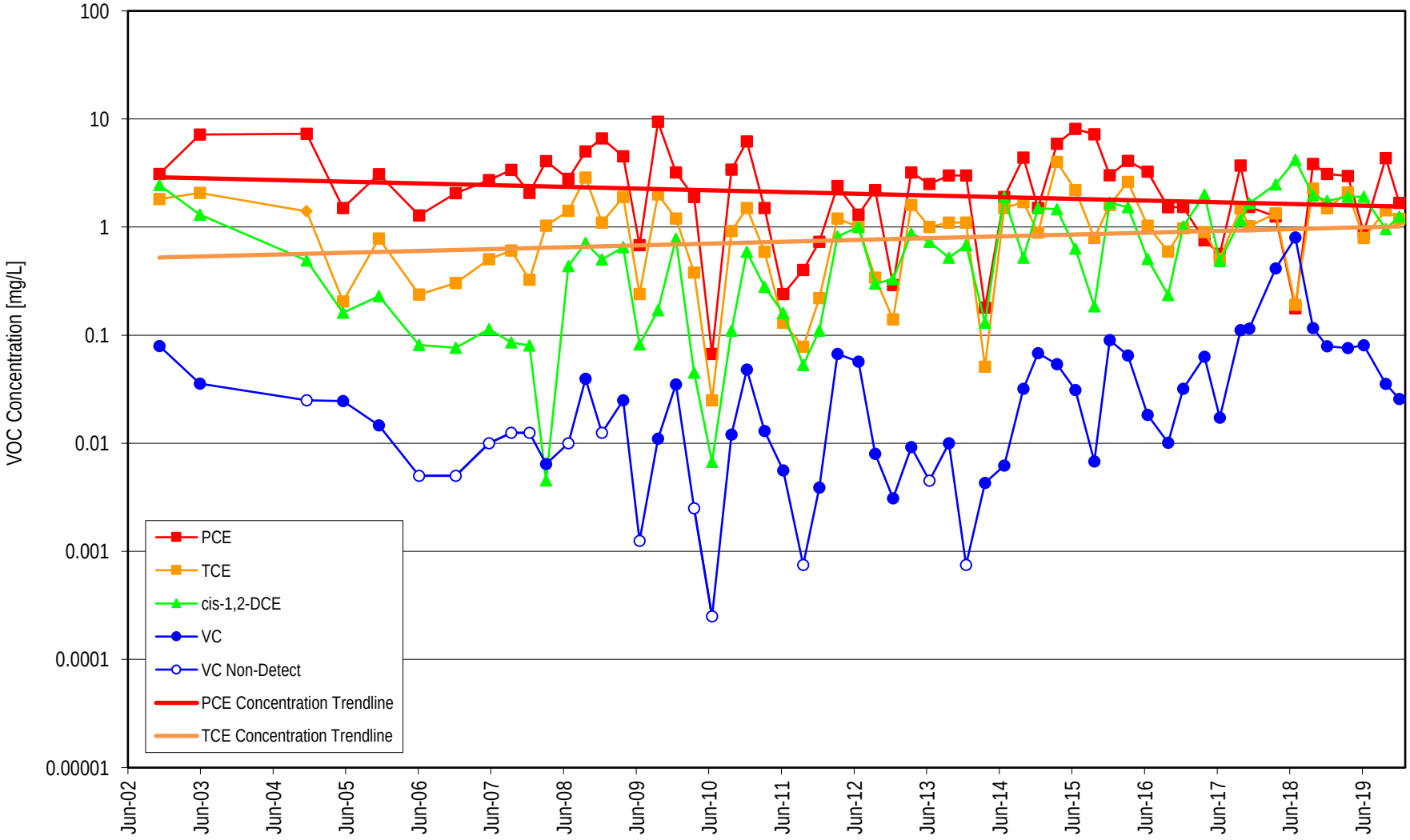
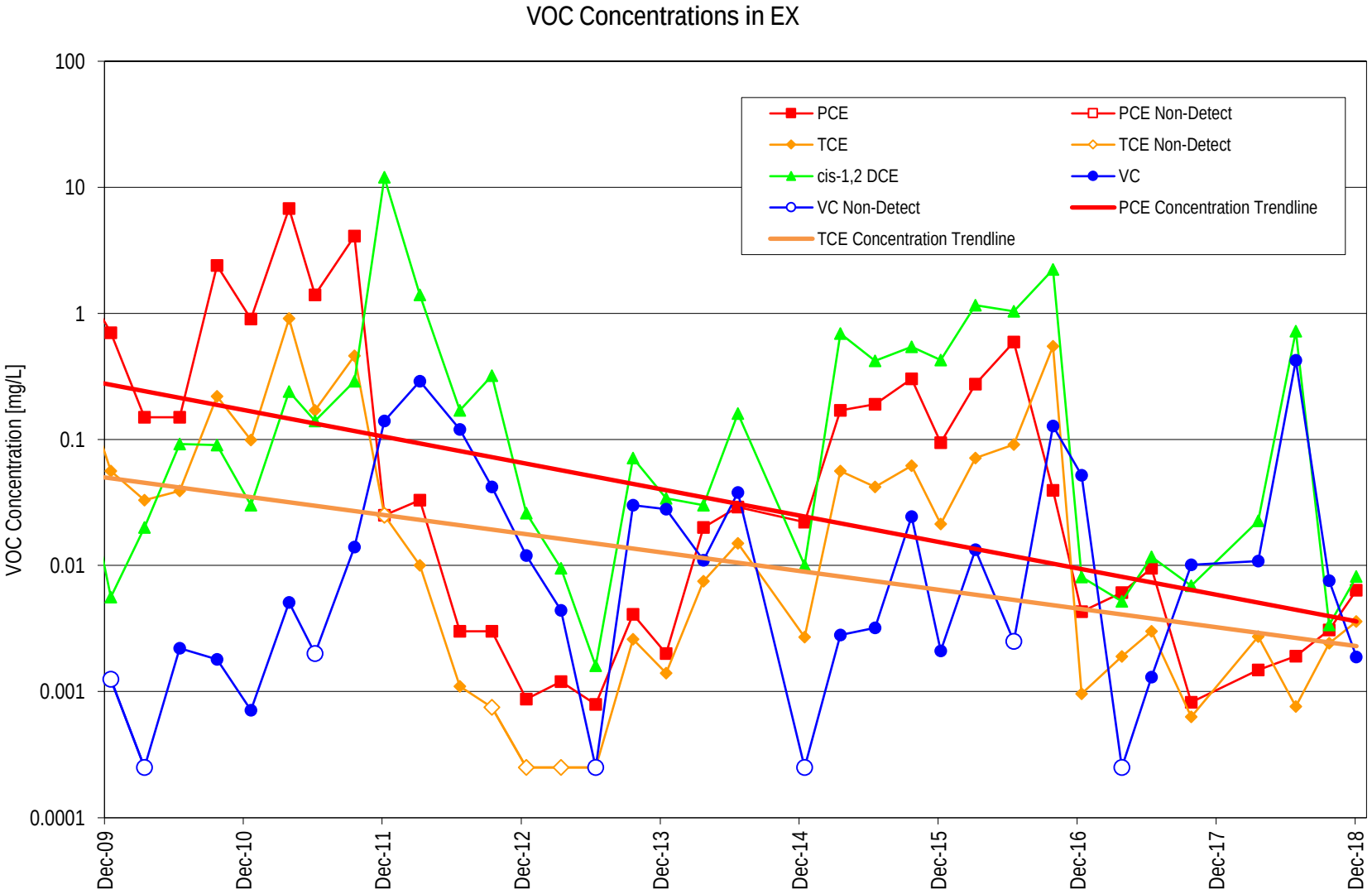
VOC Concentrations in MW-19

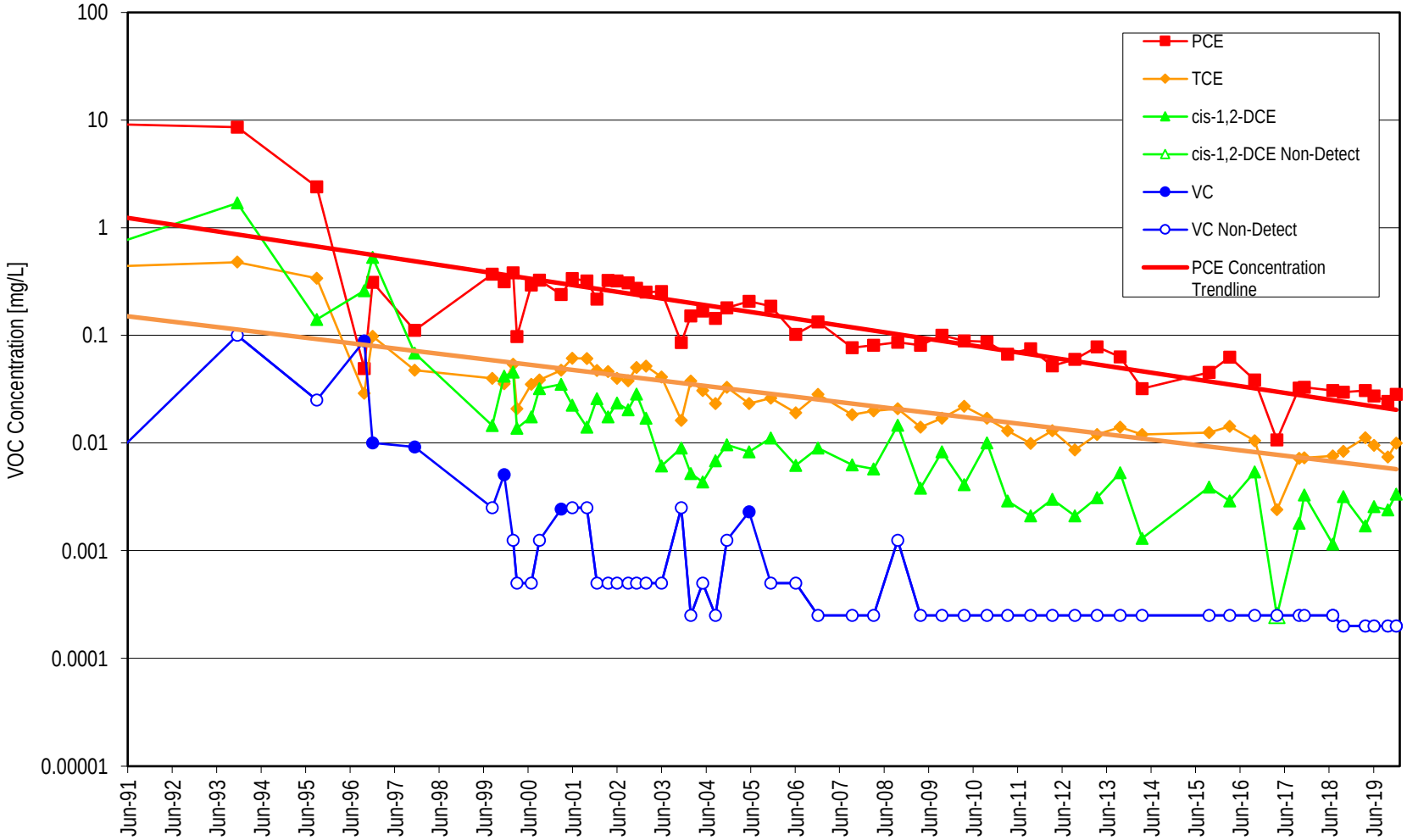


Note: Not detected values plotted at 1/2 the reporting limit.



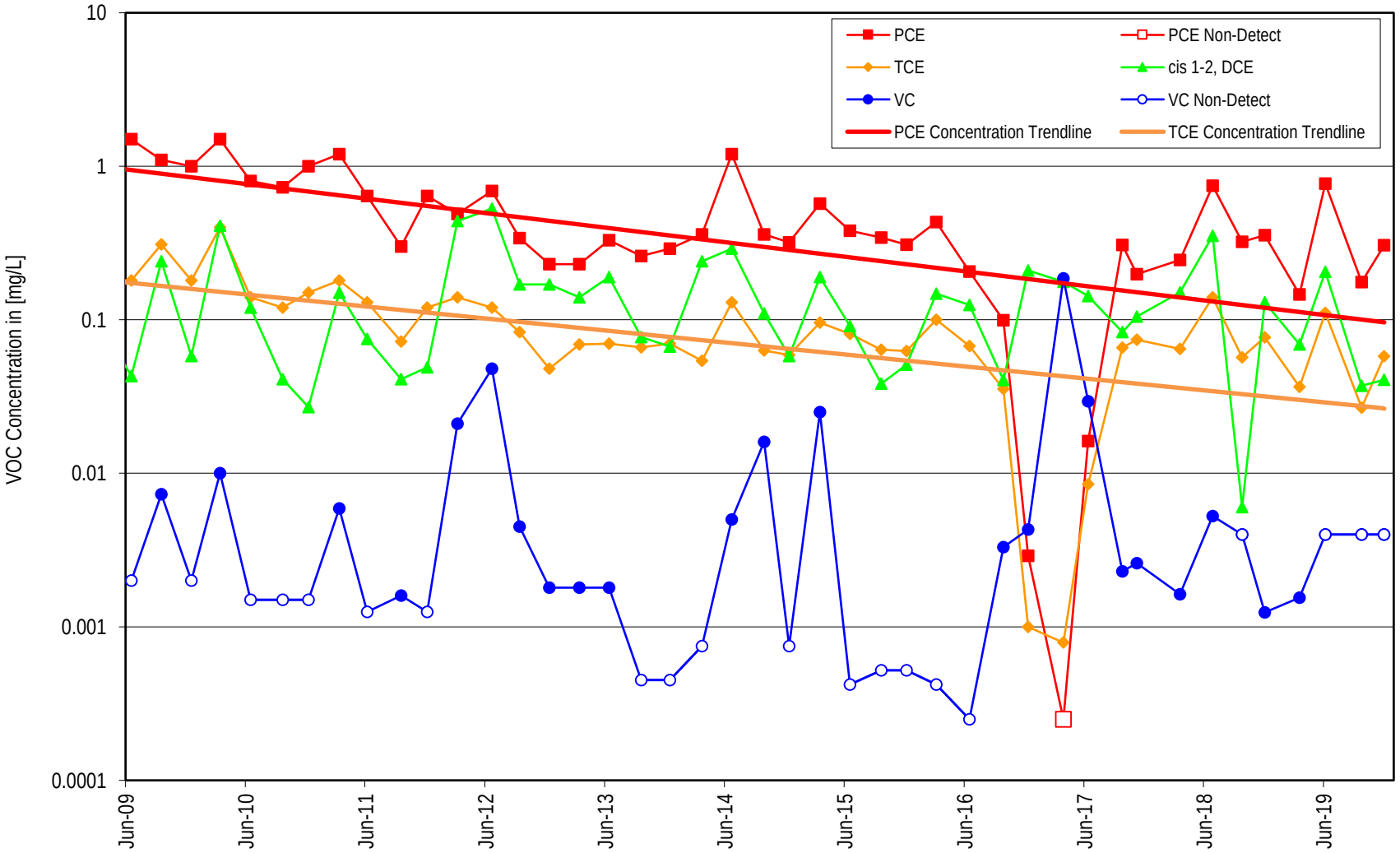
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in EW-1



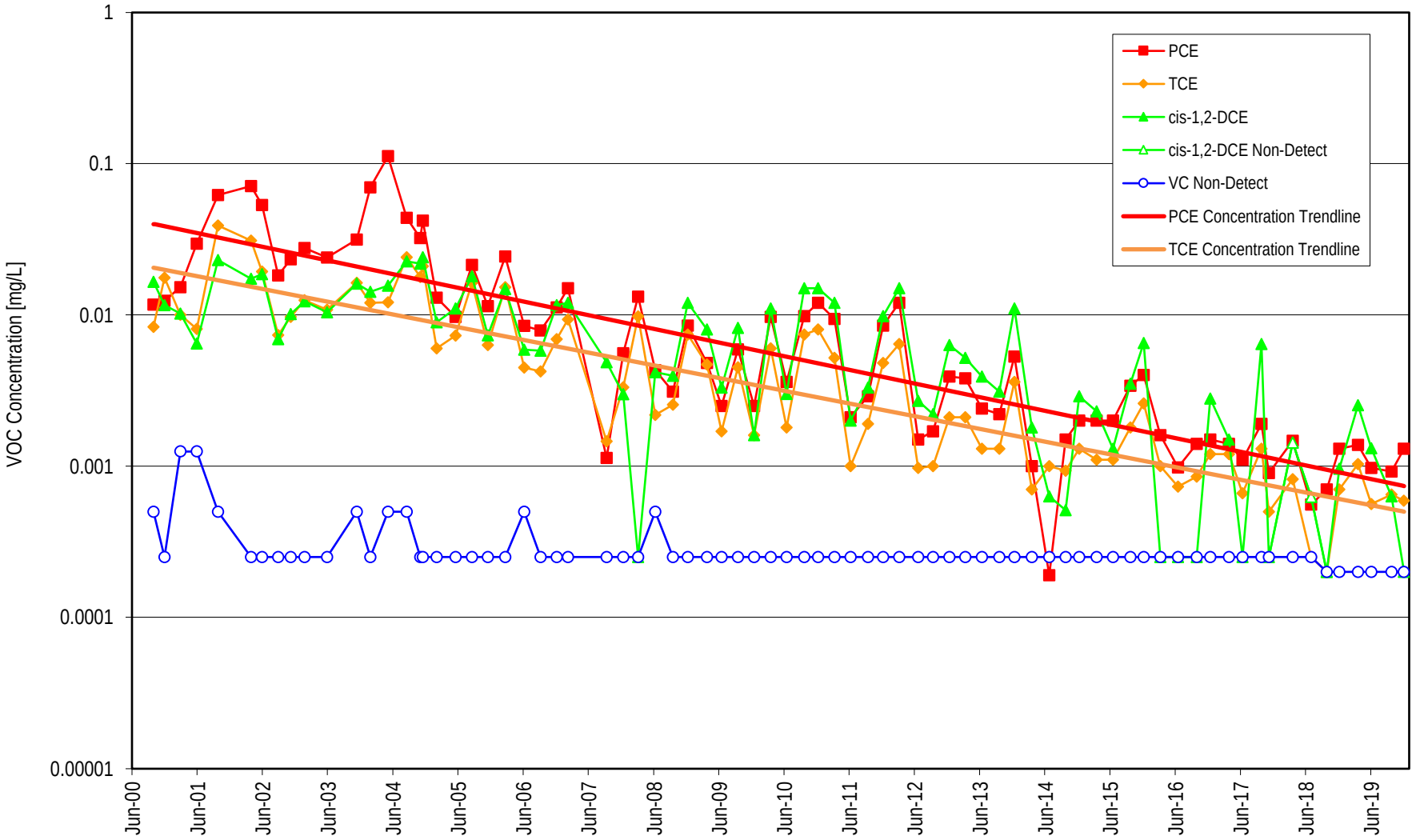
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MP-1



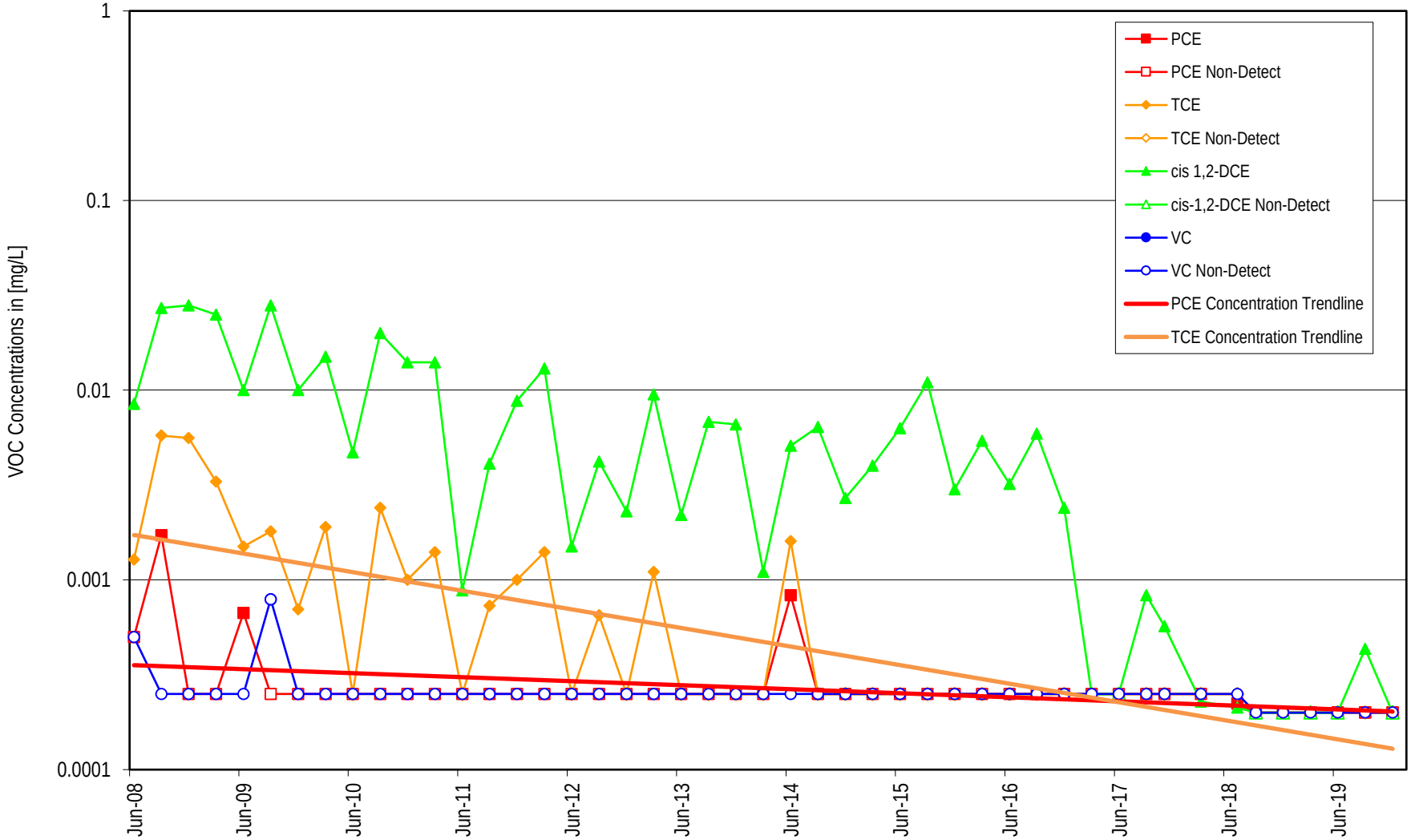
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-18i



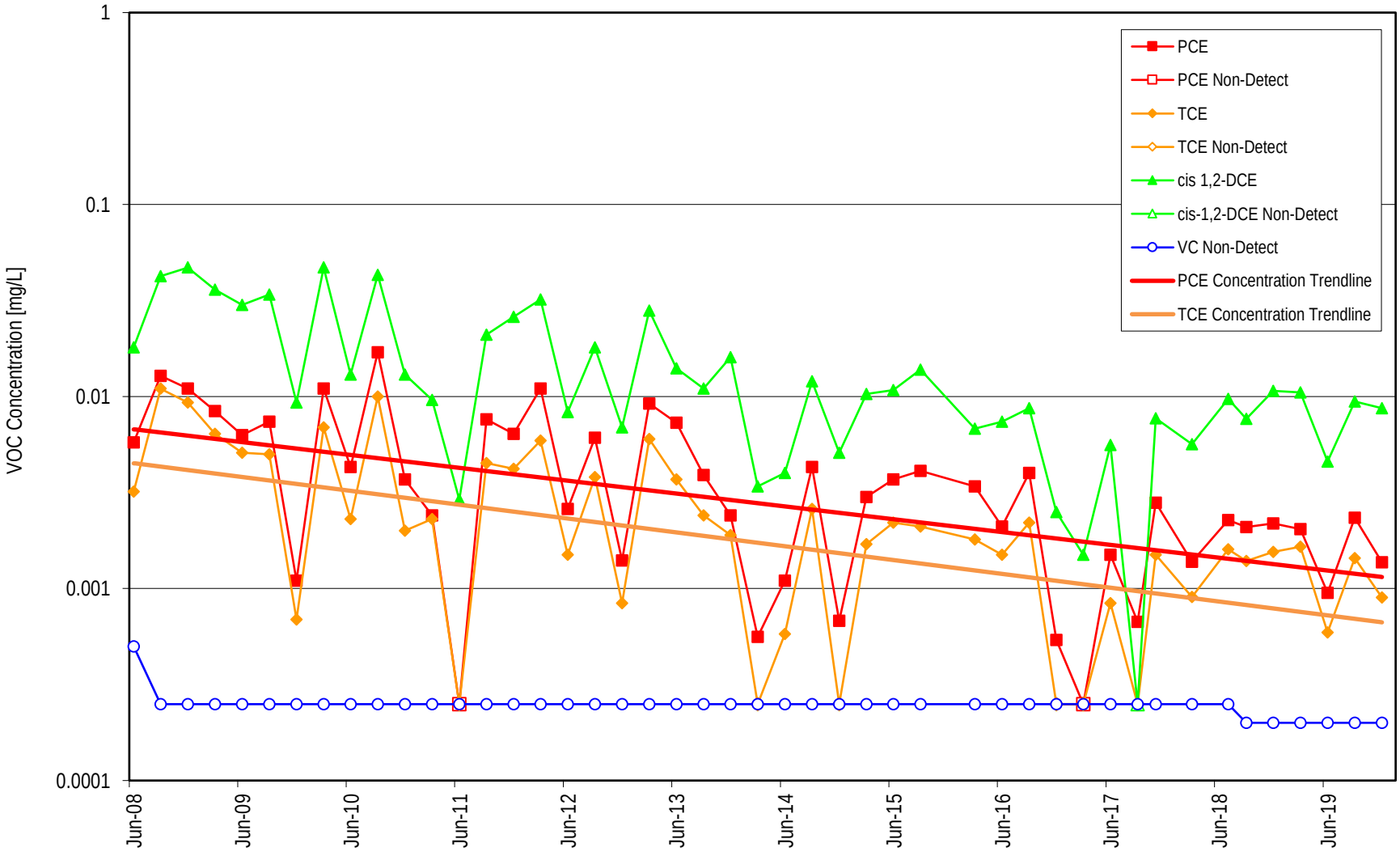
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-19i



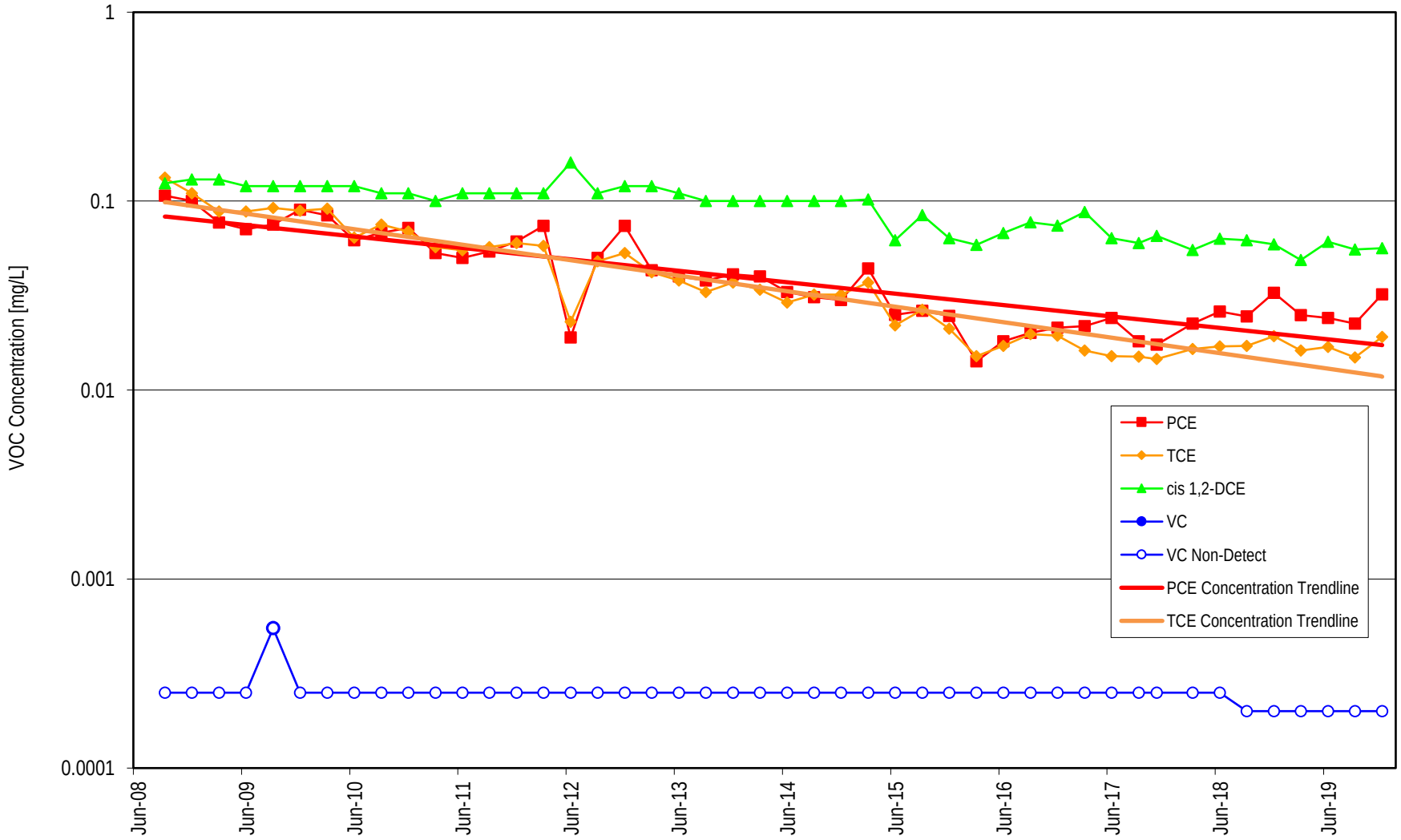
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-20i



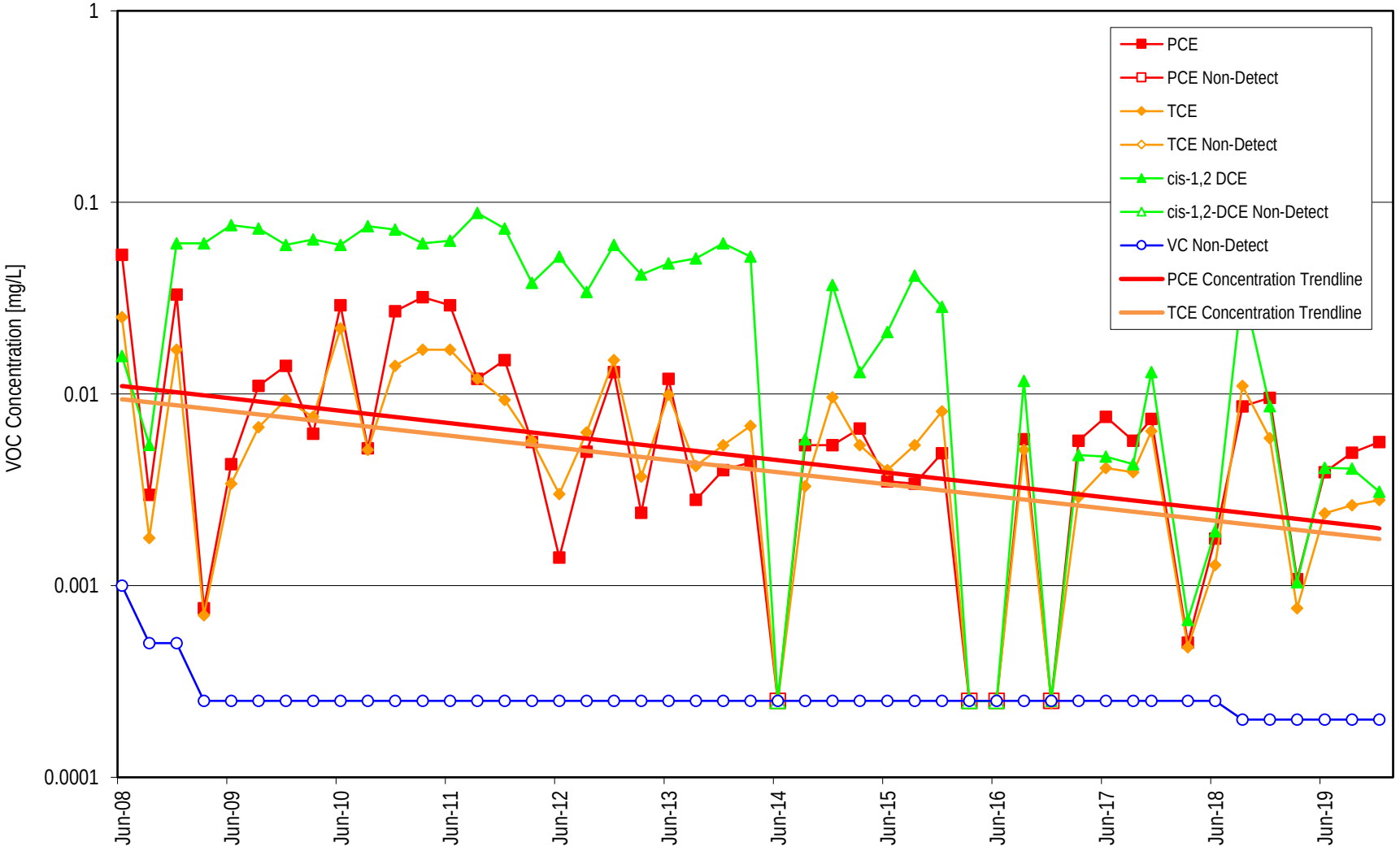
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-21i-40



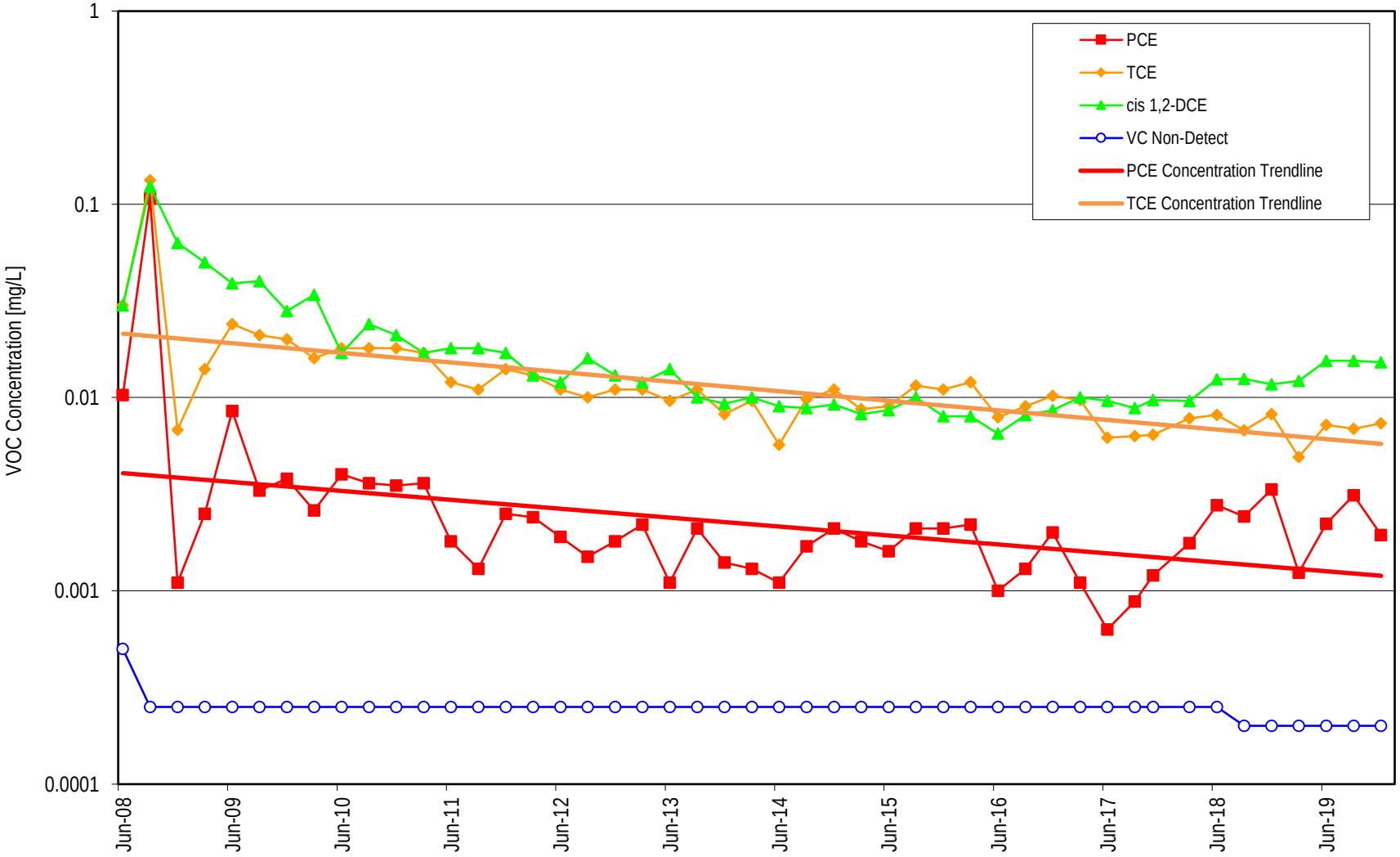
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-21i-105

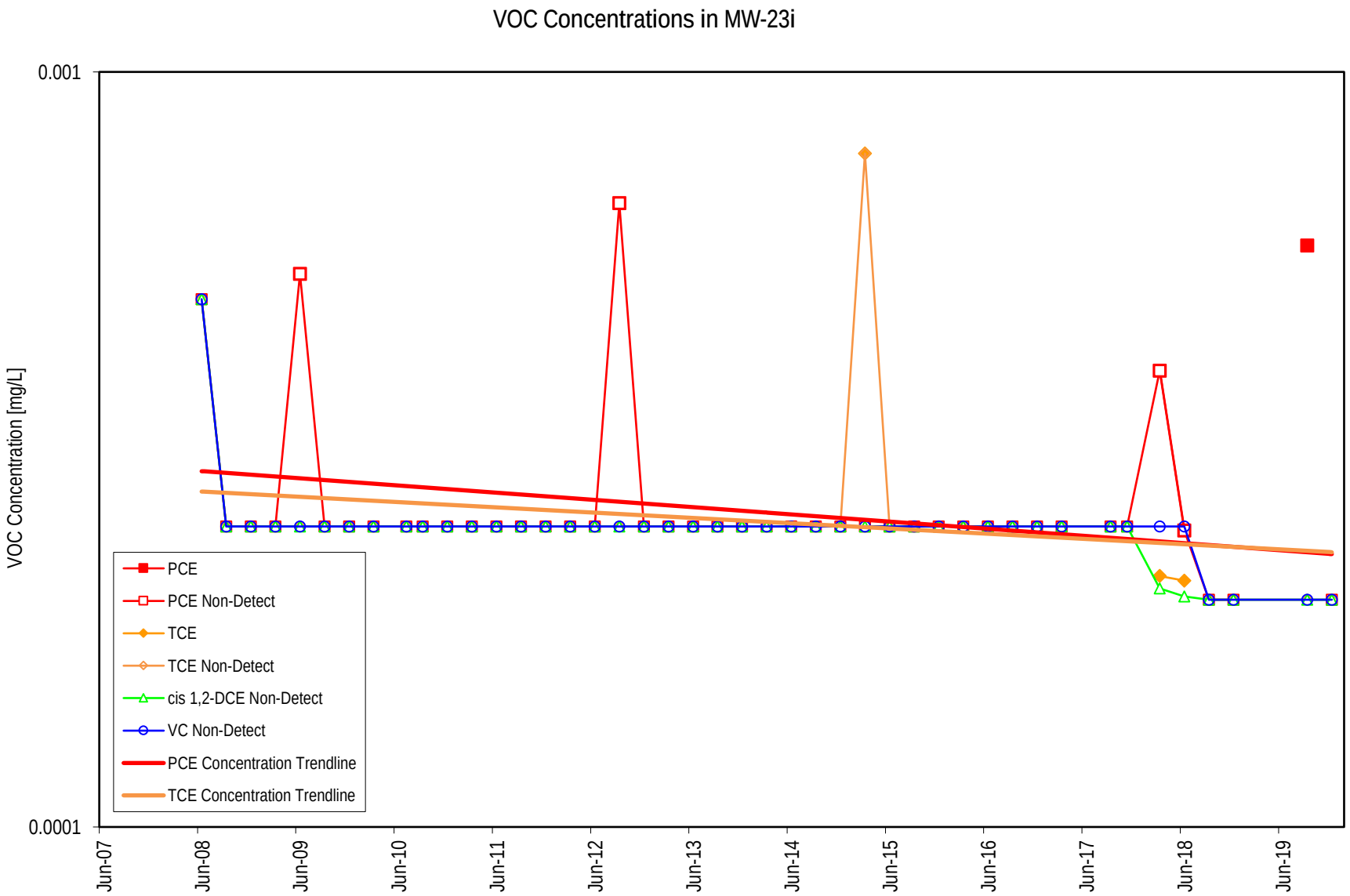


Note: Not detected values plotted at 1/2 the reporting limit.

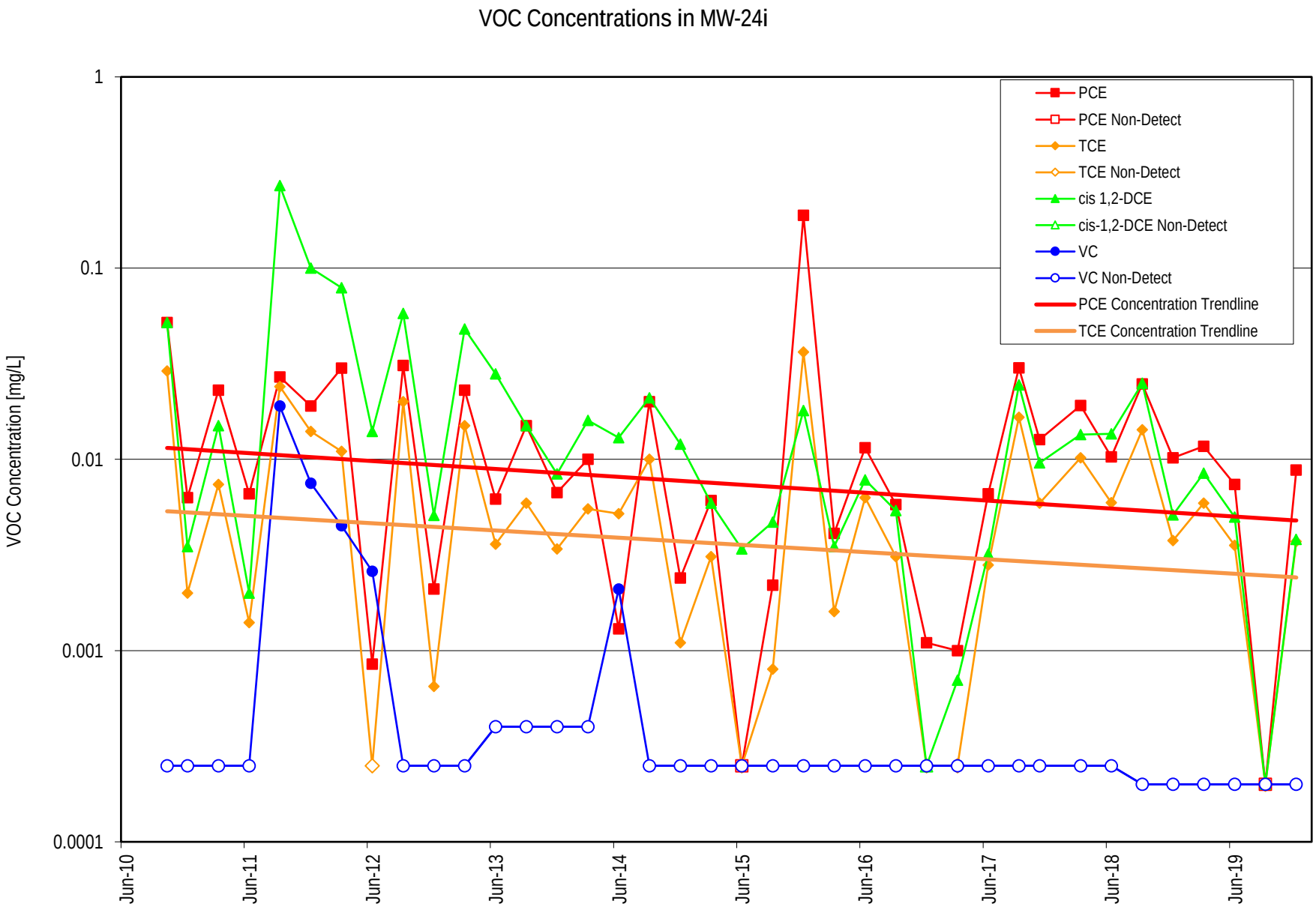
VOC Concentrations in MW-22i



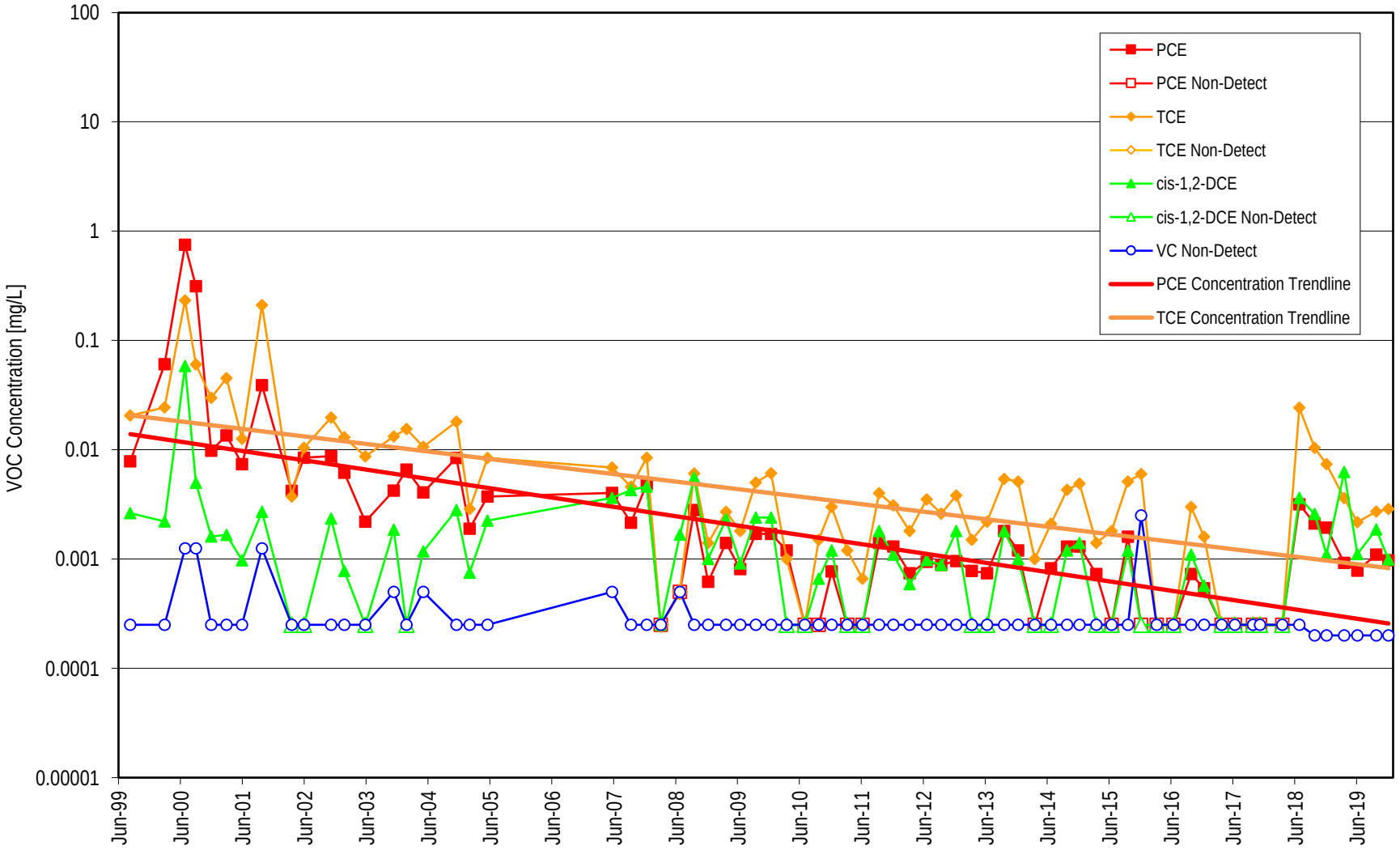
Note: Not detected values plotted at 1/2 the reporting limit.



Note: Not detected values plotted at 1/2 the reporting limit.

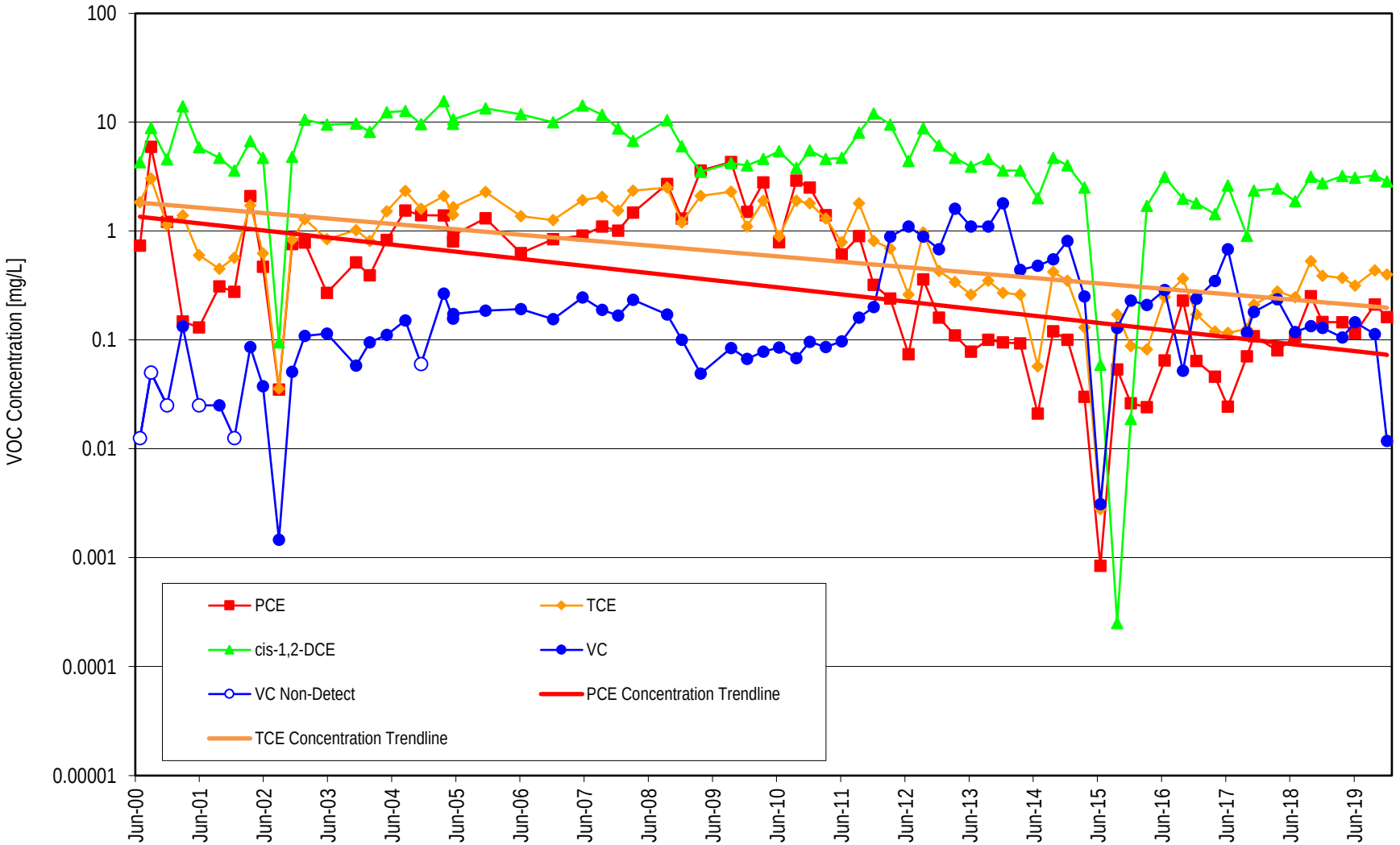


Note: Not detected values plotted at 1/2 the reporting limit.



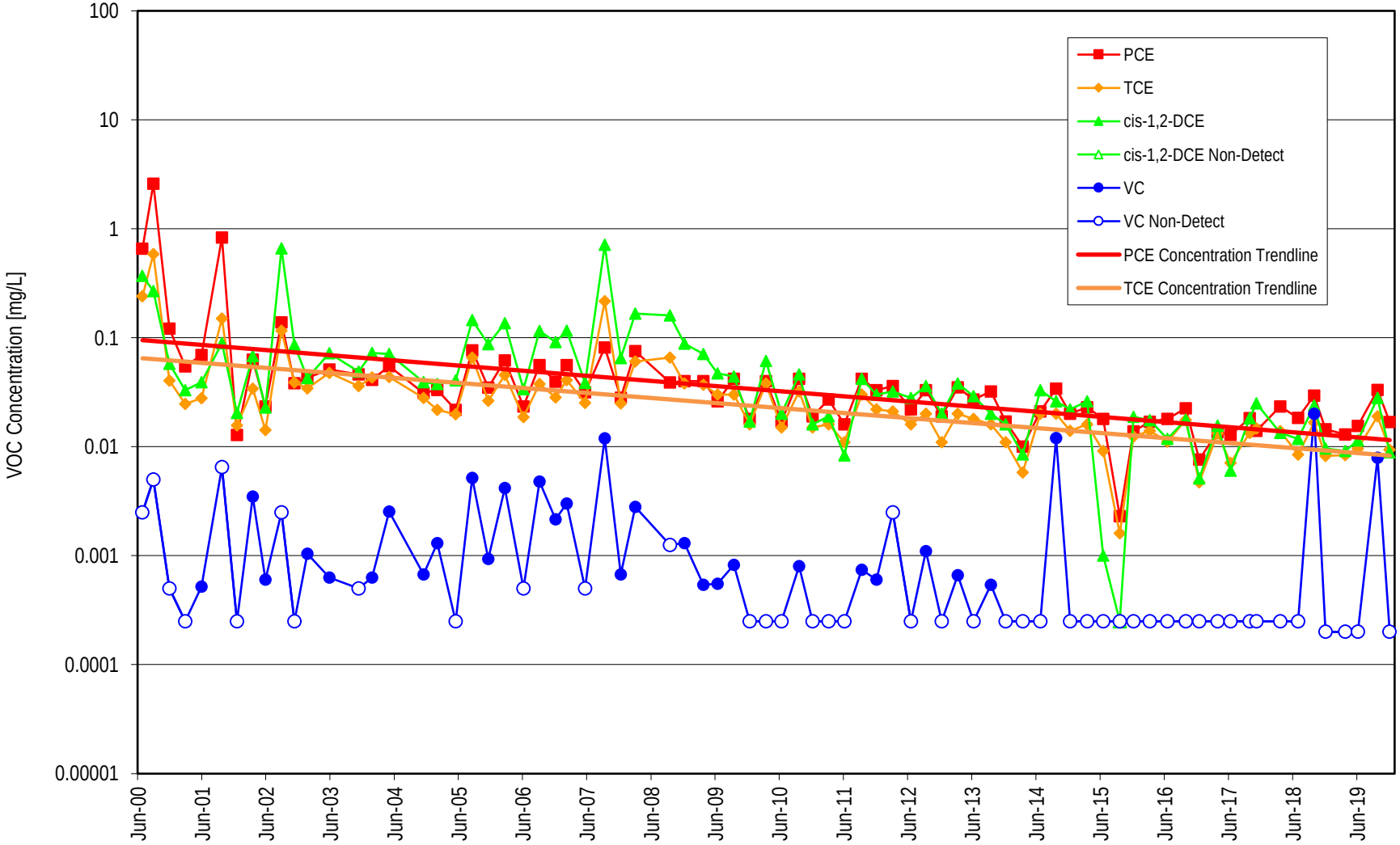
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS1-43



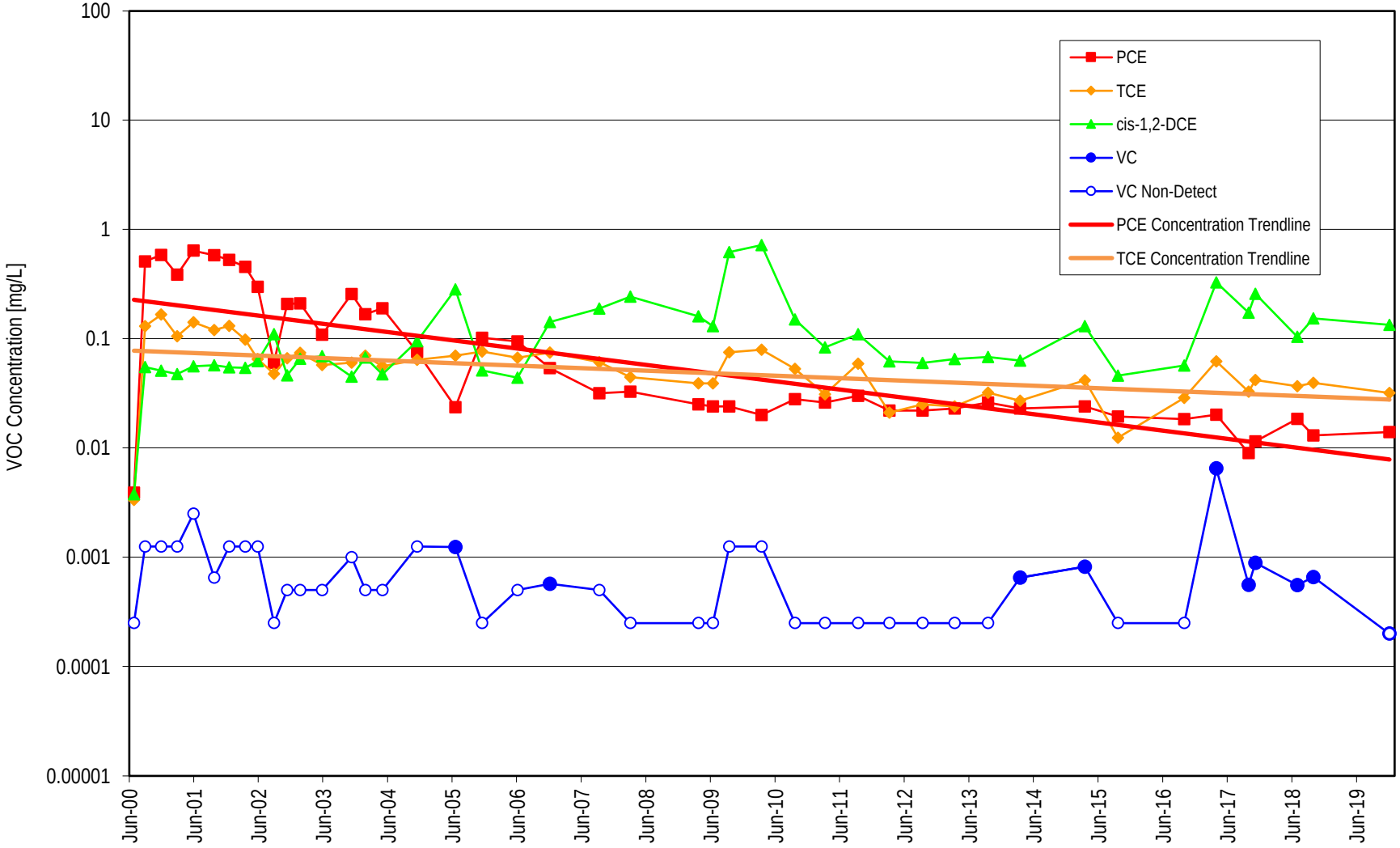
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS1-60



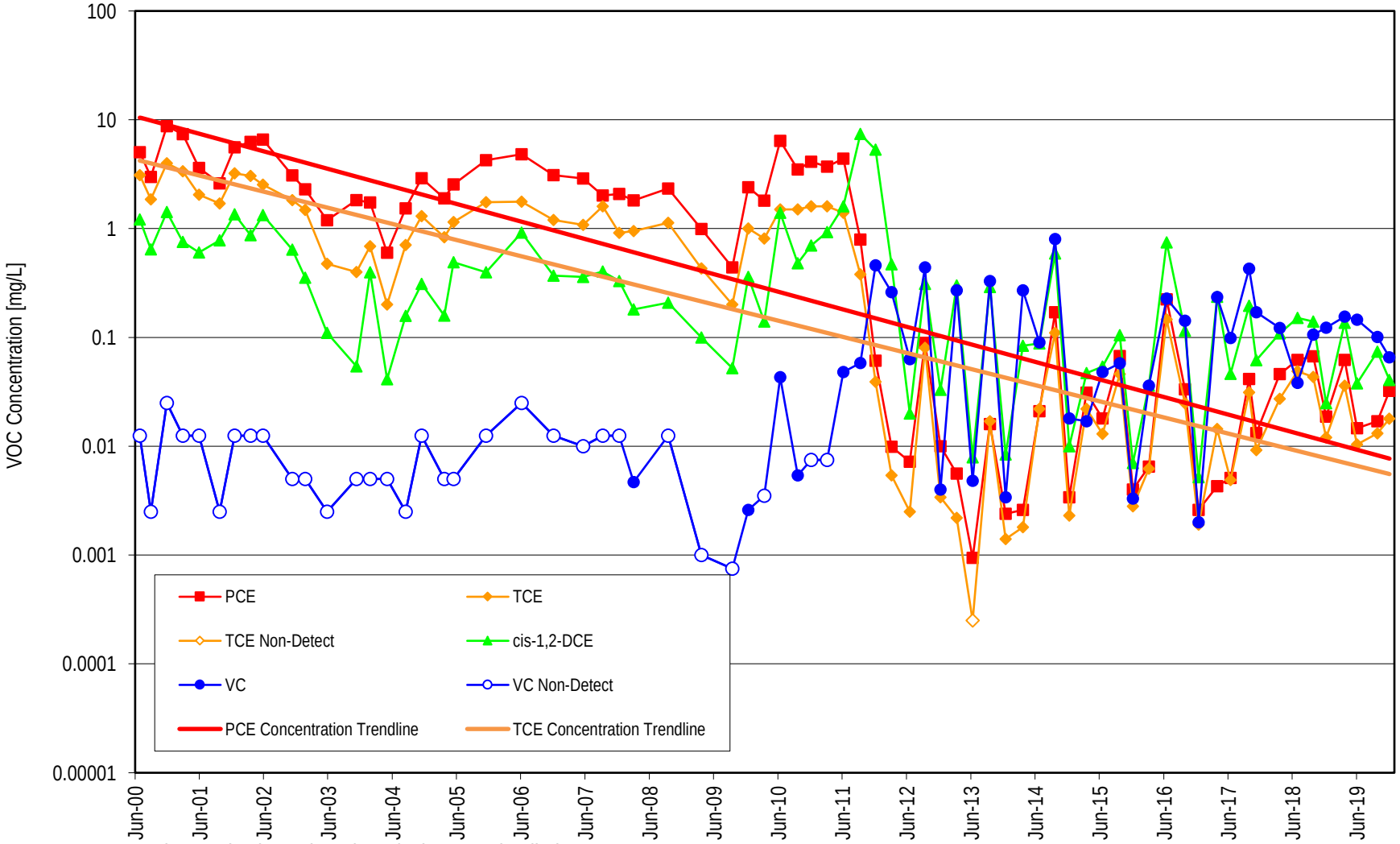
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS1-110



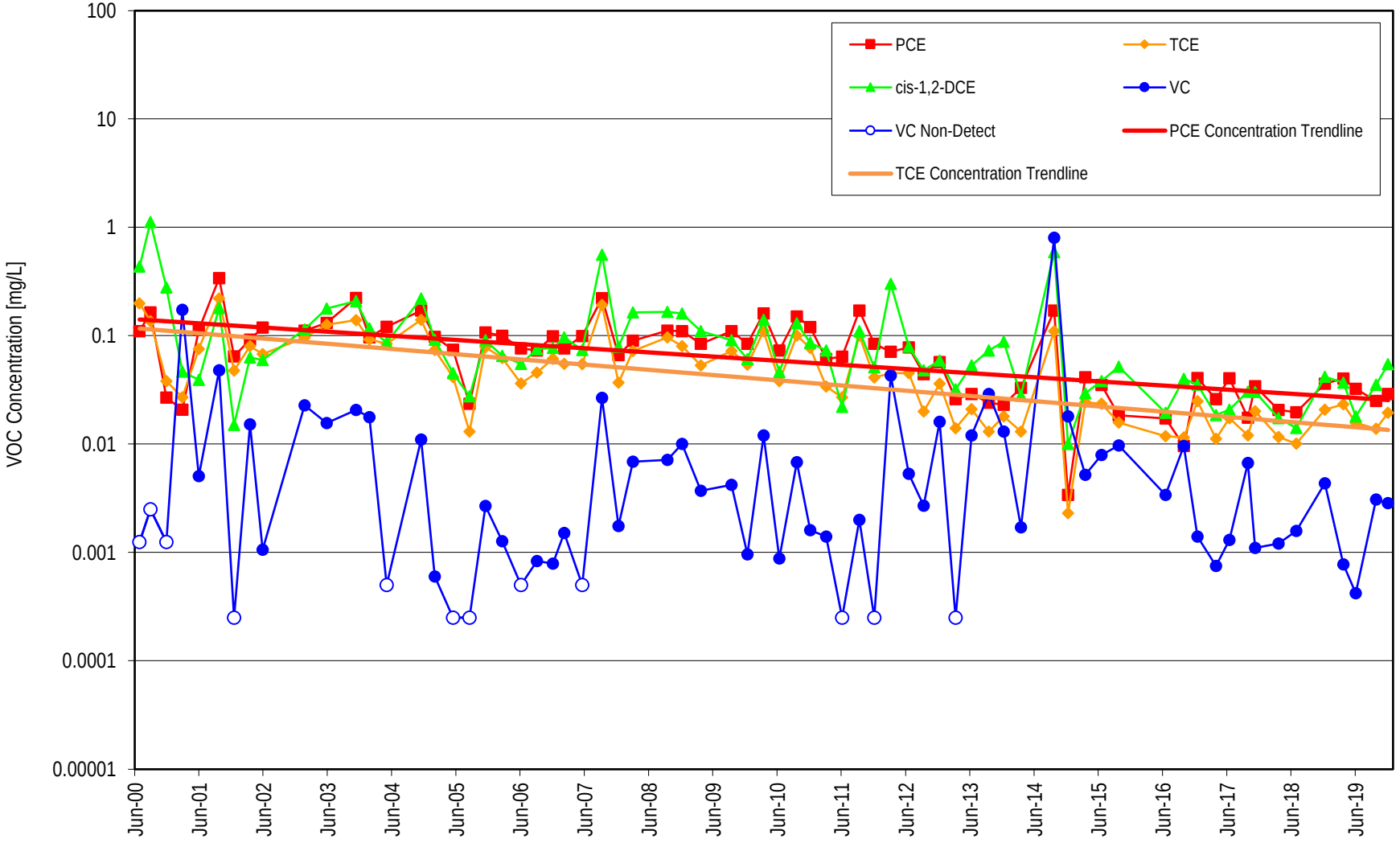
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-40



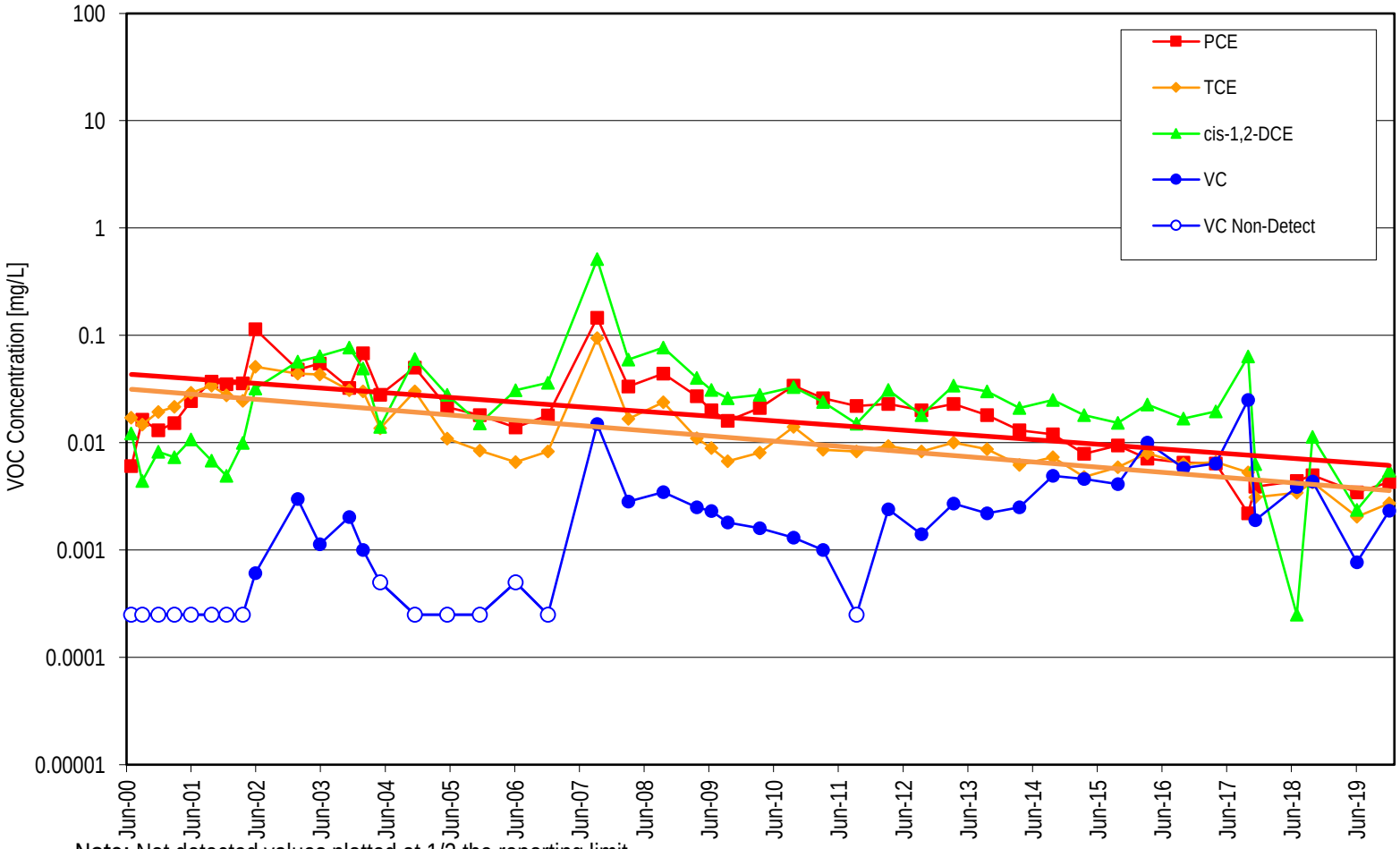
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-60



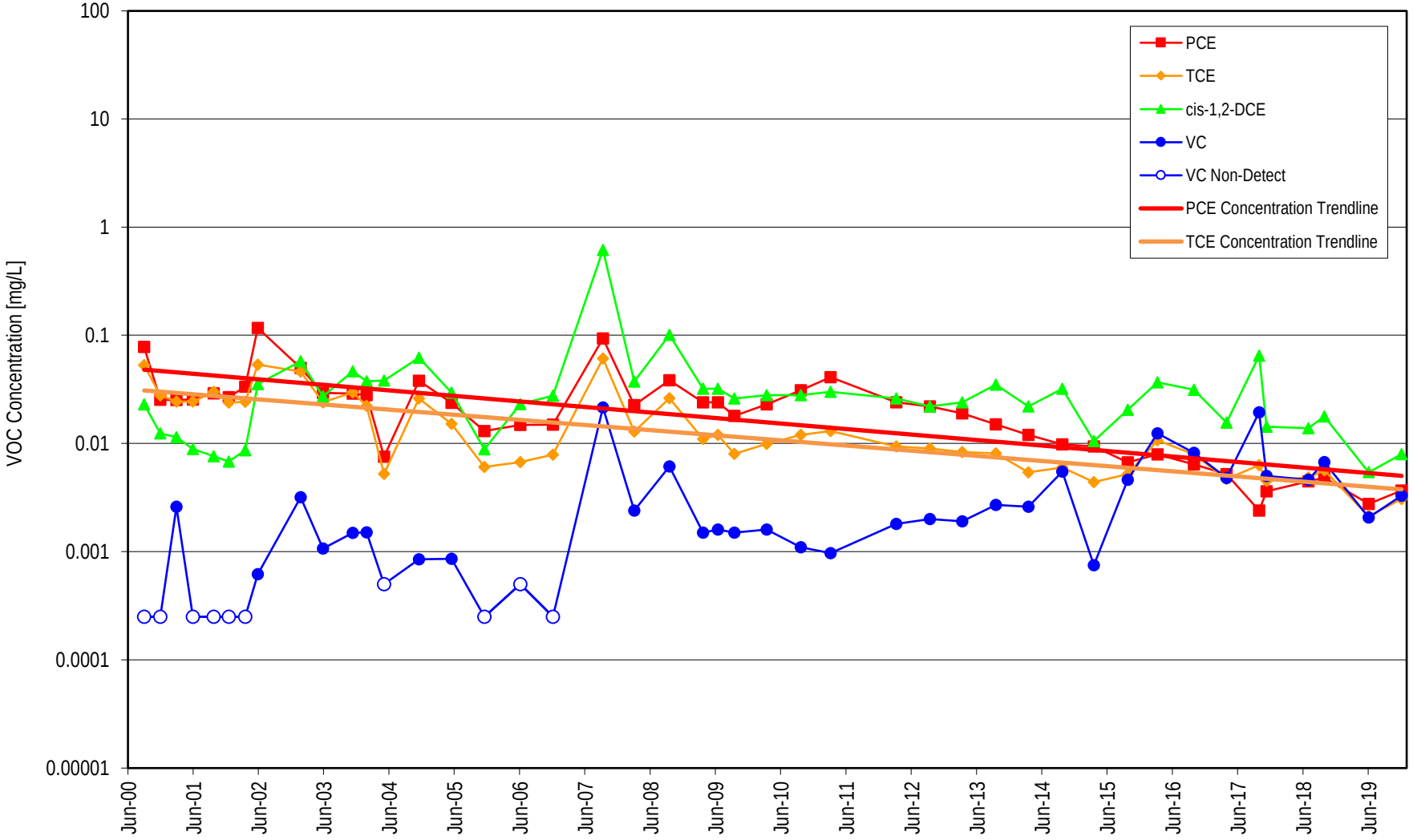
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-110

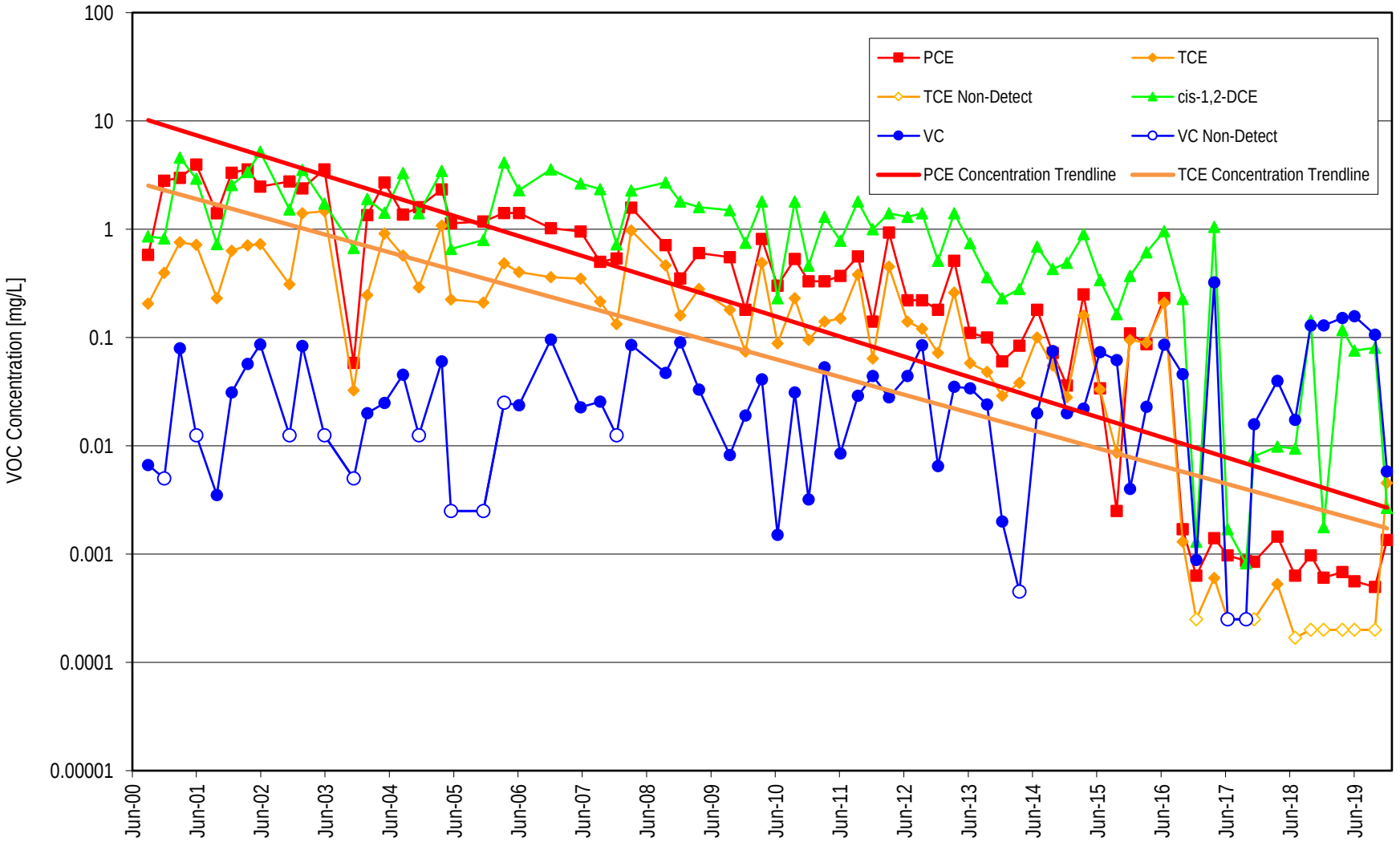


Note: Not detected values plotted at 1/2 the reporting limit.

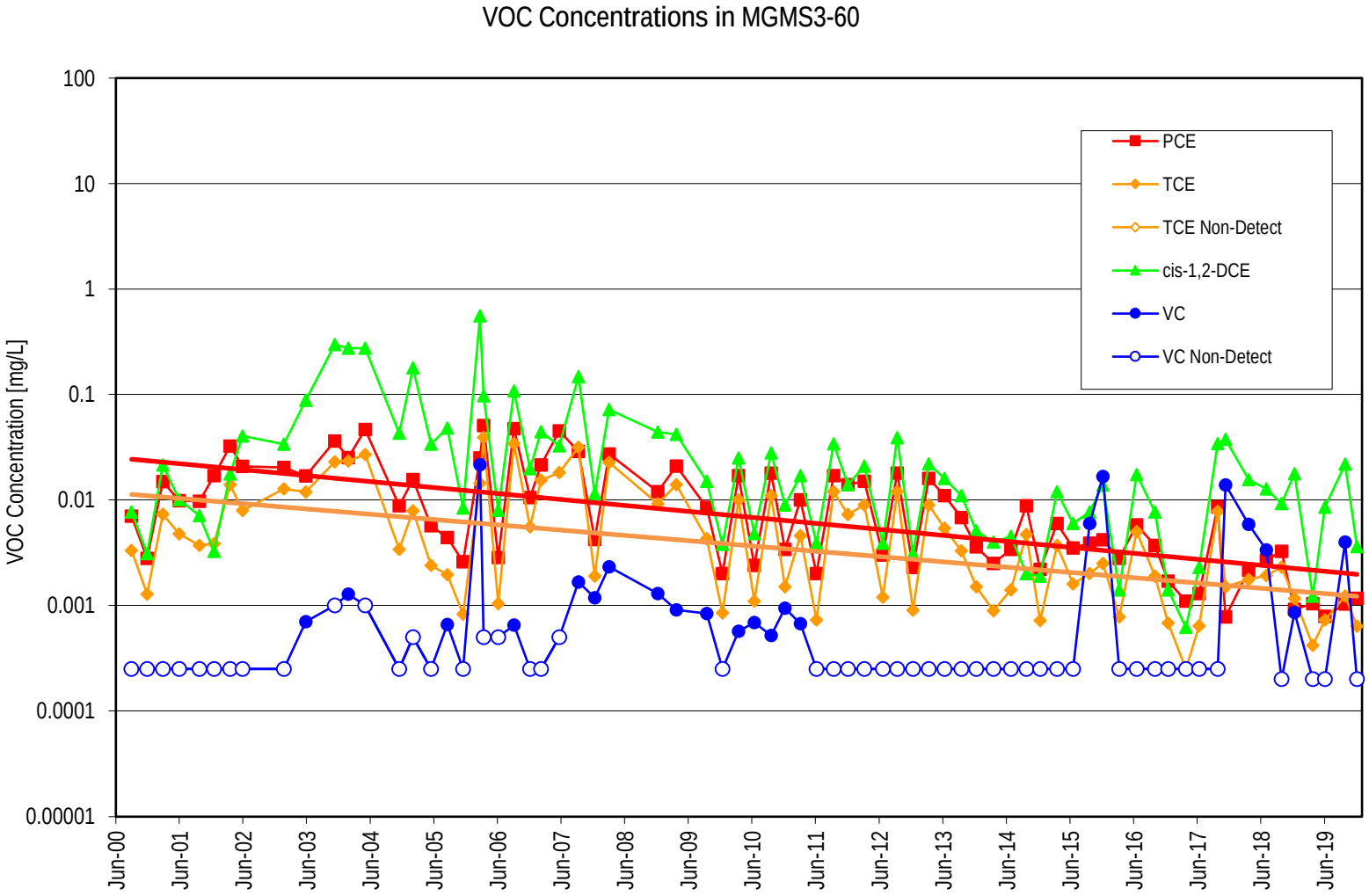
VOC Concentrations in MGMS2-132



Note: Not detected values plotted at 1/2 the reporting limit.

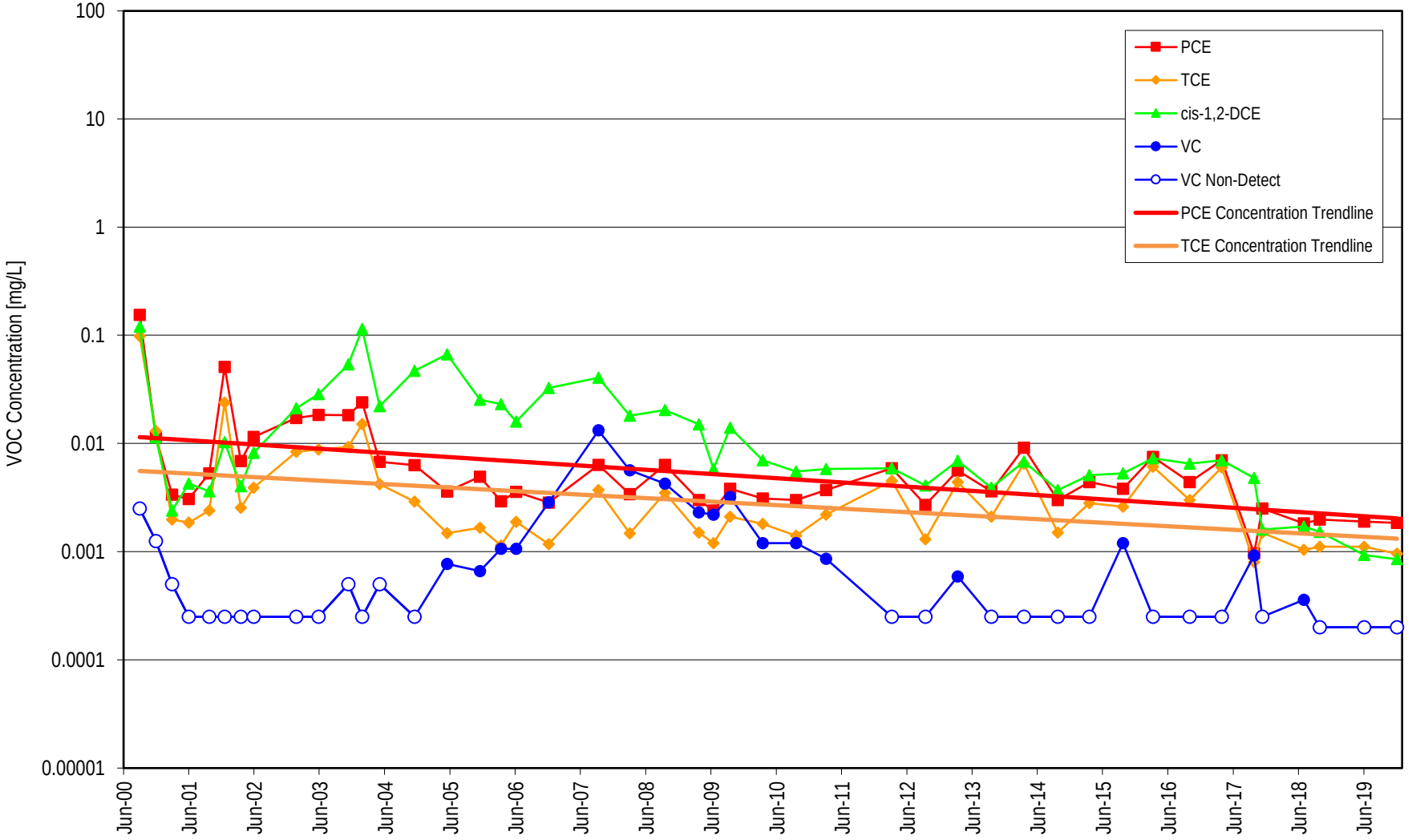


Note: Not detected values plotted at 1/2 the reporting limit.



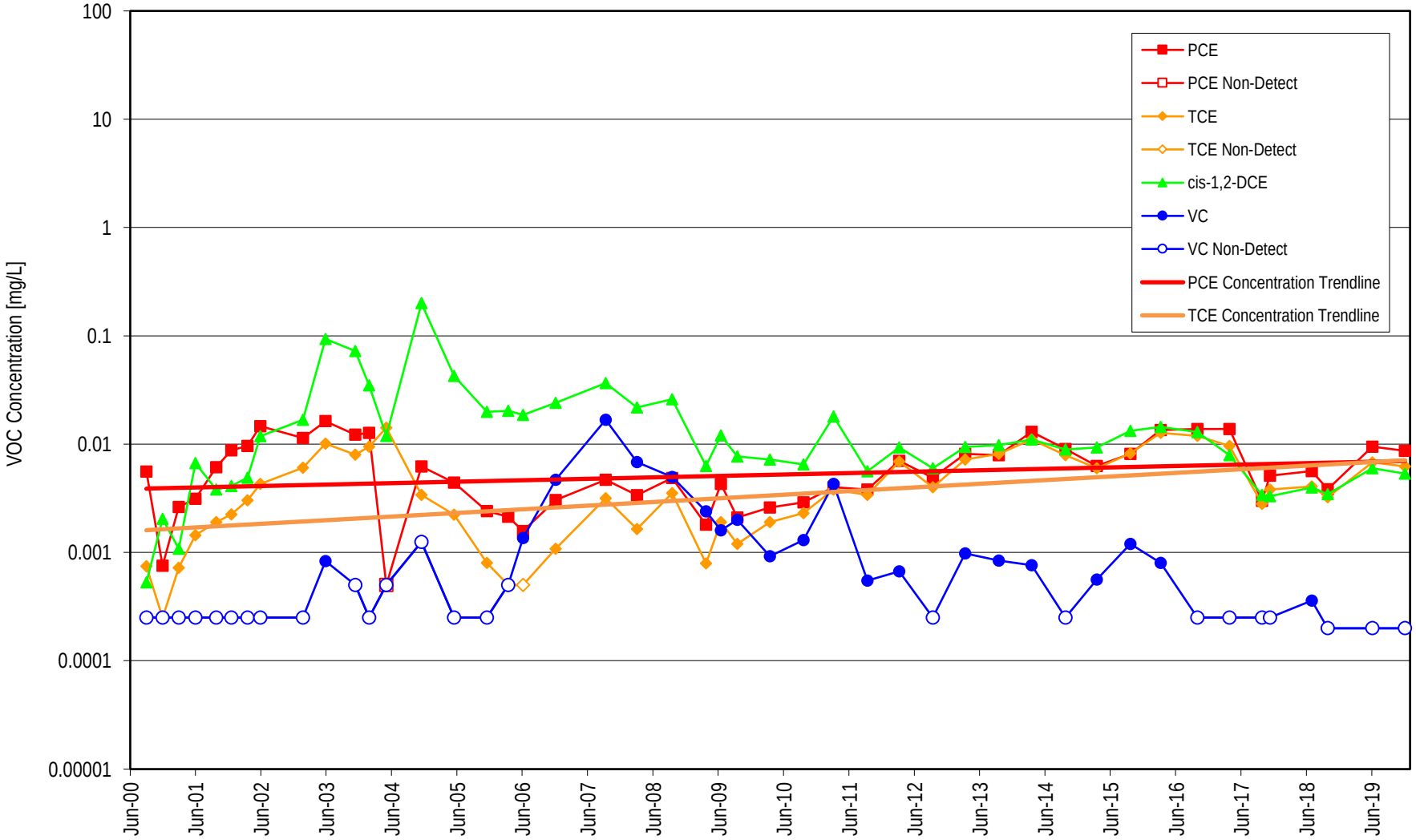
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS3-101



Note: Not detected values plotted at 1/2 the reporting limit.

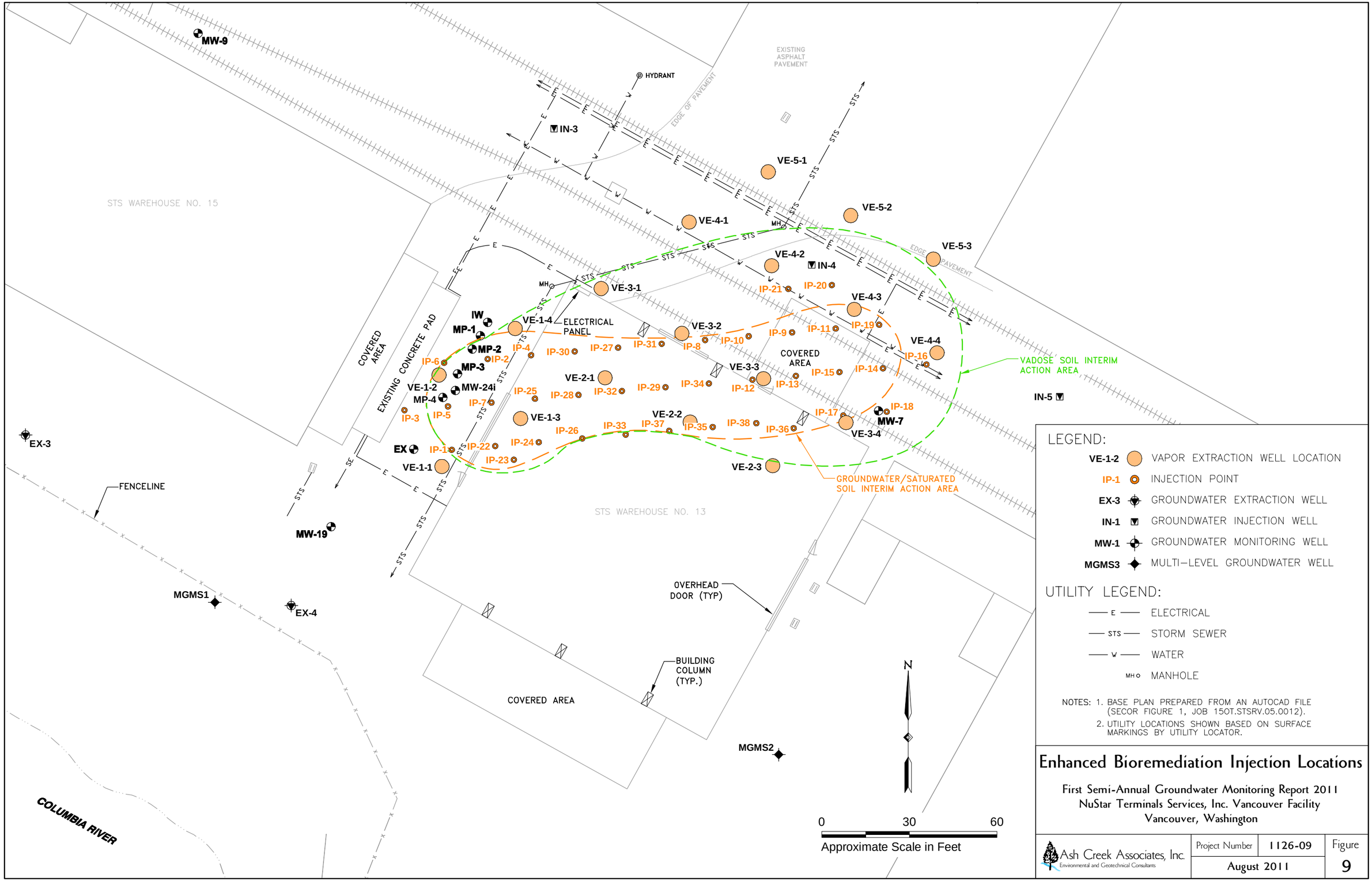
VOC Concentrations in MGMS3-132



Note: Not detected values plotted at 1/2 the reporting limit.

APPENDIX E

2008 – SVE AND BIOREMEDIATION INJECTION LAYOUT AND HISTORICAL MONITORING TABLES



LEGEND:

VE-1-2	VAPOR EXTRACTION WELL LOCATION
IP-1	INJECTION POINT
EX-3	GROUNDWATER EXTRACTION WELL
IN-1	GROUNDWATER INJECTION WELL
MW-1	GROUNDWATER MONITORING WELL
MGMS3	MULTI-LEVEL GROUNDWATER WELL

UTILITY LEGEND:

E	ELECTRICAL
STS	STORM SEWER
W	WATER
MH	MANHOLE

NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.

Enhanced Bioremediation Injection Locations

First Semi-Annual Groundwater Monitoring Report 2011
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Project Number	1126-09	Figure
August 2011		9

SOIL VAPOR EXTRACTION SYSTEM
(SEE FIGURES 7 and 8)

ELECTRICAL SERVICE
INSTALLED FROM EXISTING
BUILDING SERVICE

VAPOR EXTRACTION
PIPING IN TRENCH
(TYPICAL OF 5
ZONES).

WELL VAULT INSTALLED
AT EACH WELLHEAD
(TYPICAL OF 18).

VADOSE SOIL INTERIM
ACTION AREA

SOIL VAPOR
EXTRACTION WELL
(TYPICAL OF 18;
NUMBER REPRESENTS
MANIFOLD ZONE).

IN-1
IN-2
IN-3
IN-4
IN-5
MW-9
MW-13
EX-3
MW-19
EX-4
MGMS1
EX-5
MW-12
MGMS2
MW-7
MW-24i
MP-1
MP-2
MP-3
MP4
IW
EX
VE-1-1
VE-1-2
VE-1-3
VE-1-4
VE-2-1
VE-2-2
VE-2-3
VE-3-1
VE-3-2
VE-3-3
VE-3-4
VE-4-1
VE-4-2
VE-4-3
VE-4-4
VE-5-1
VE-5-2
VE-5-3
STS WAREHOUSE NO. 15
STS WAREHOUSE NO. 13
COVERED AREA
EXISTING CONCRETE PAD
ELECTRICAL PANEL
COVERED AREA
EXISTING ASPHALT PAVEMENT
EDGE OF PAVEMENT
EDGE OF GRAVEL
HYDRANT
OVERHEAD DOOR (TYP)
BUILDING COLUMN (TYP.)
COVERED AREA
COLUMBIA RIVER

N

0 40 80
Approximate Scale in Feet

LEGEND:

- VE-1-2 — VAPOR EXTRACTION WELL LOCATION
- EX-3 — GROUNDWATER EXTRACTION WELL
- IN-1 — GROUNDWATER INJECTION WELL
- MW-1 — GROUNDWATER MONITORING WELL
- MGMS3 — MULTI-LEVEL GROUNDWATER WELL

UTILITY LEGEND:

- E — ELECTRICAL
- SS — STORM SEWER
- W — WATER
- MH — MANHOLE

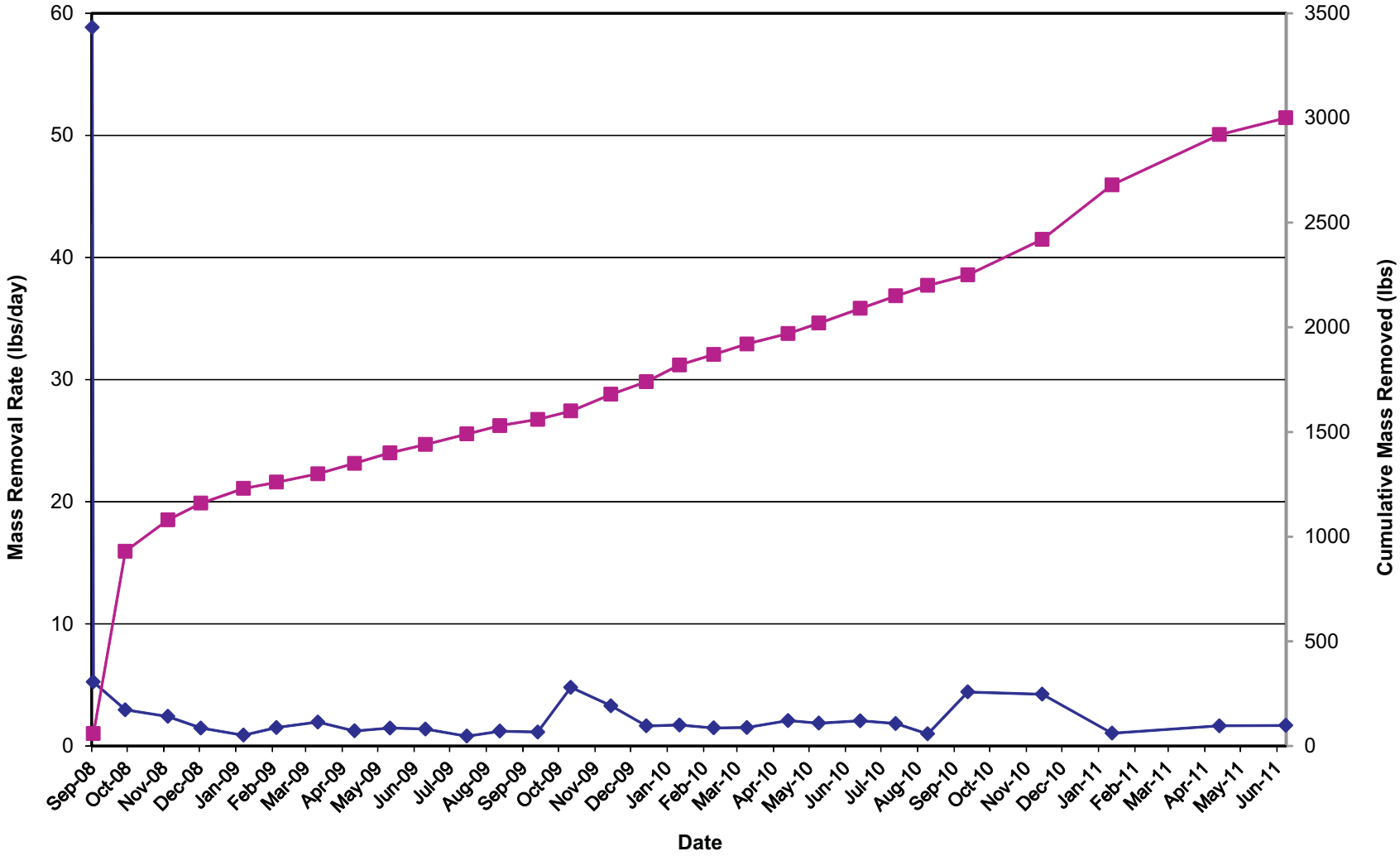
NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.
3. INJECTION LOCATIONS BASED ON FIELD MEASUREMENTS TO EXISTING SITE STRUCTURES.

Soil Vapor Extraction System Site Plan

First Semi-Annual Groundwater Monitoring Report 2011
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Project Number	1126-09	Figure
August 2011		10



Legend:

Removal Rate (lbs/day)

Cumulative Mass Removal

2008 SVE System - VOC Mass Removal

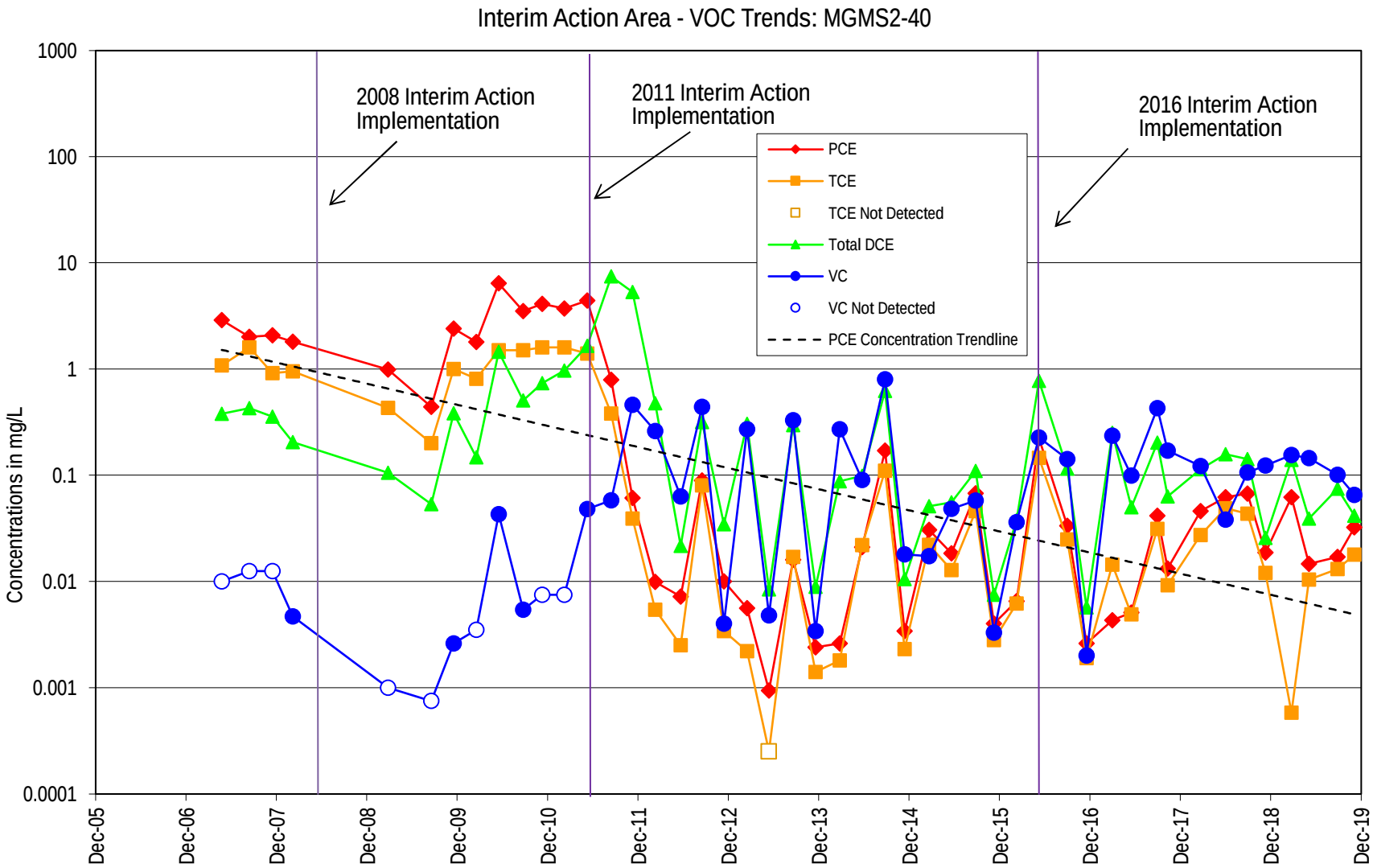
Second Semi-Annual Groundwater Monitoring Report 2011
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

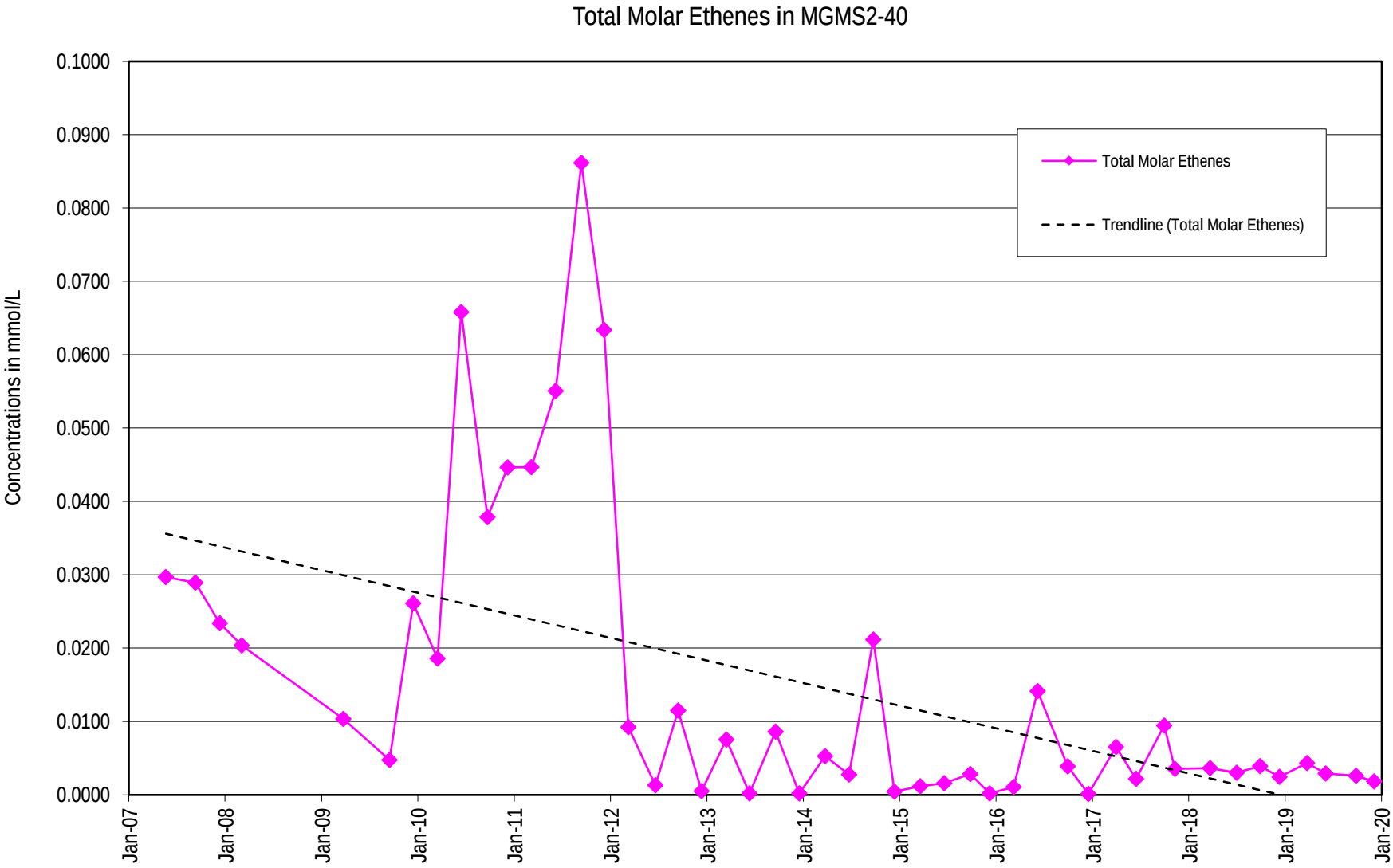
Project Number	1126-09	Figure
January 2012		11

APPENDIX F

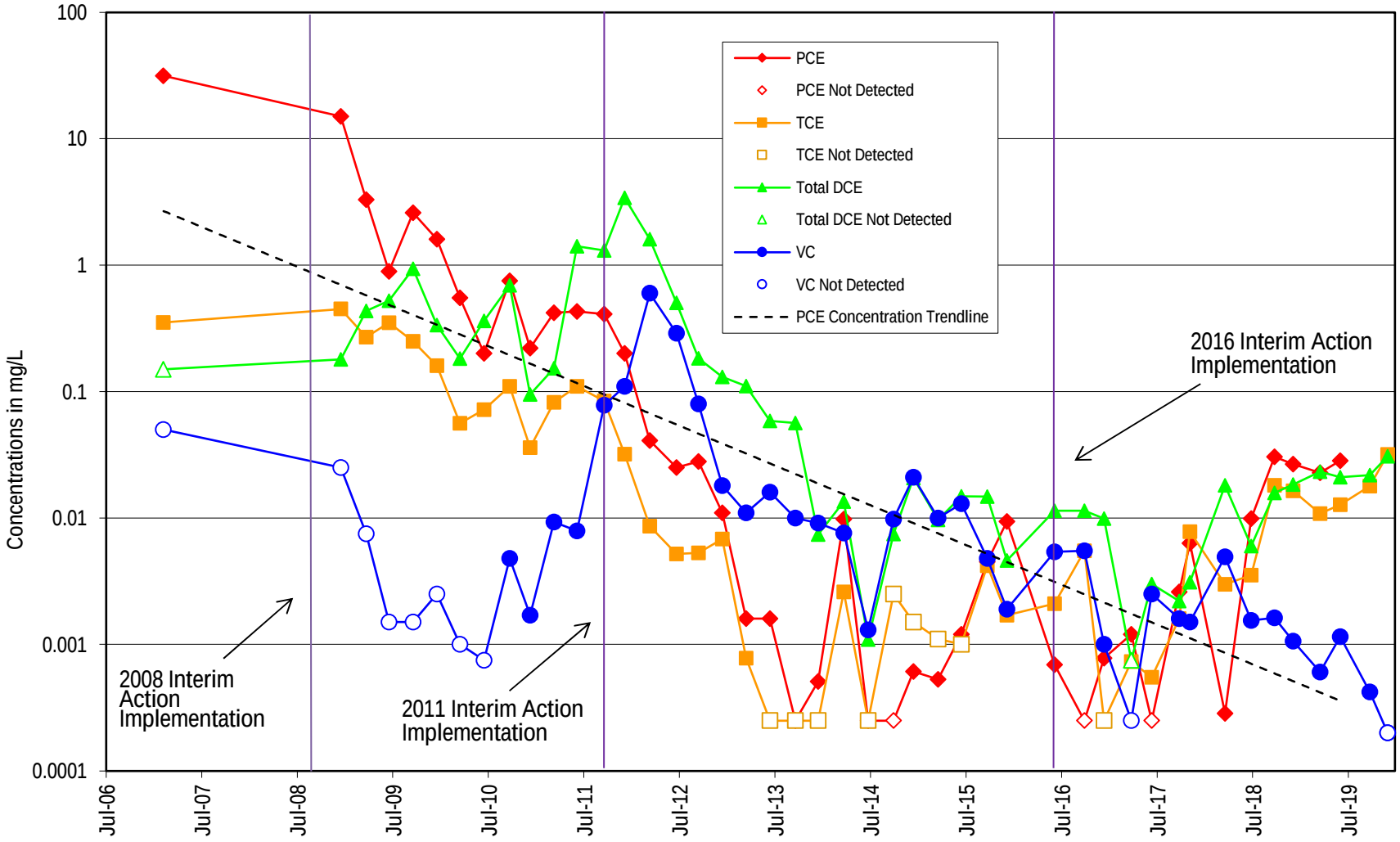
MOLAR CONCENTRATION TREND PLOTS –
INTERIM ACTION WELLS



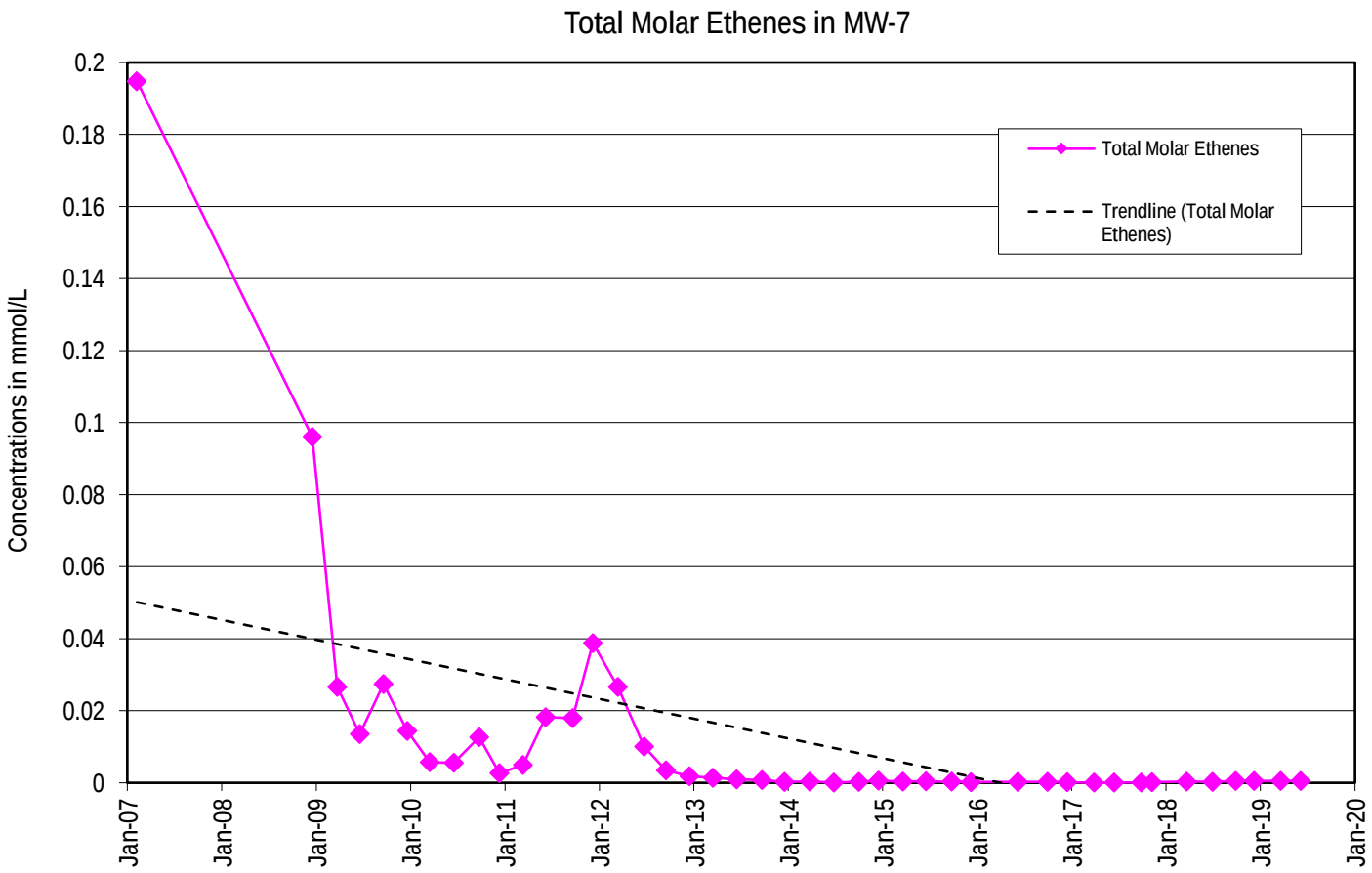
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MGMS2-40
Concentrations in mmol/L
0.1000
0.0900
0.0800
0.0700
0.0600
0.0500
0.0400
0.0300
0.0200
0.0100
0.0000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)

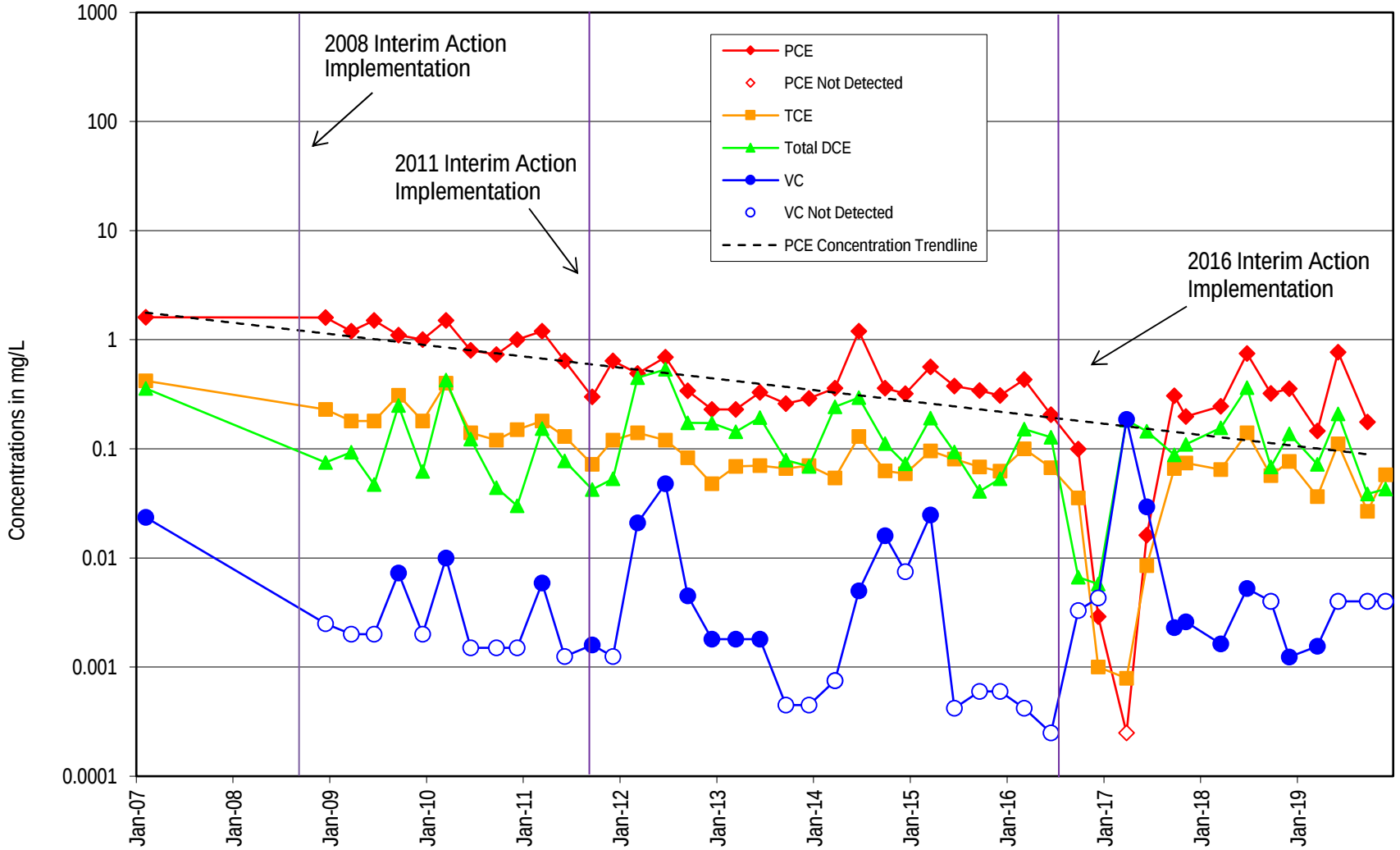
Interim Action Area - VOC Trends: MW-7



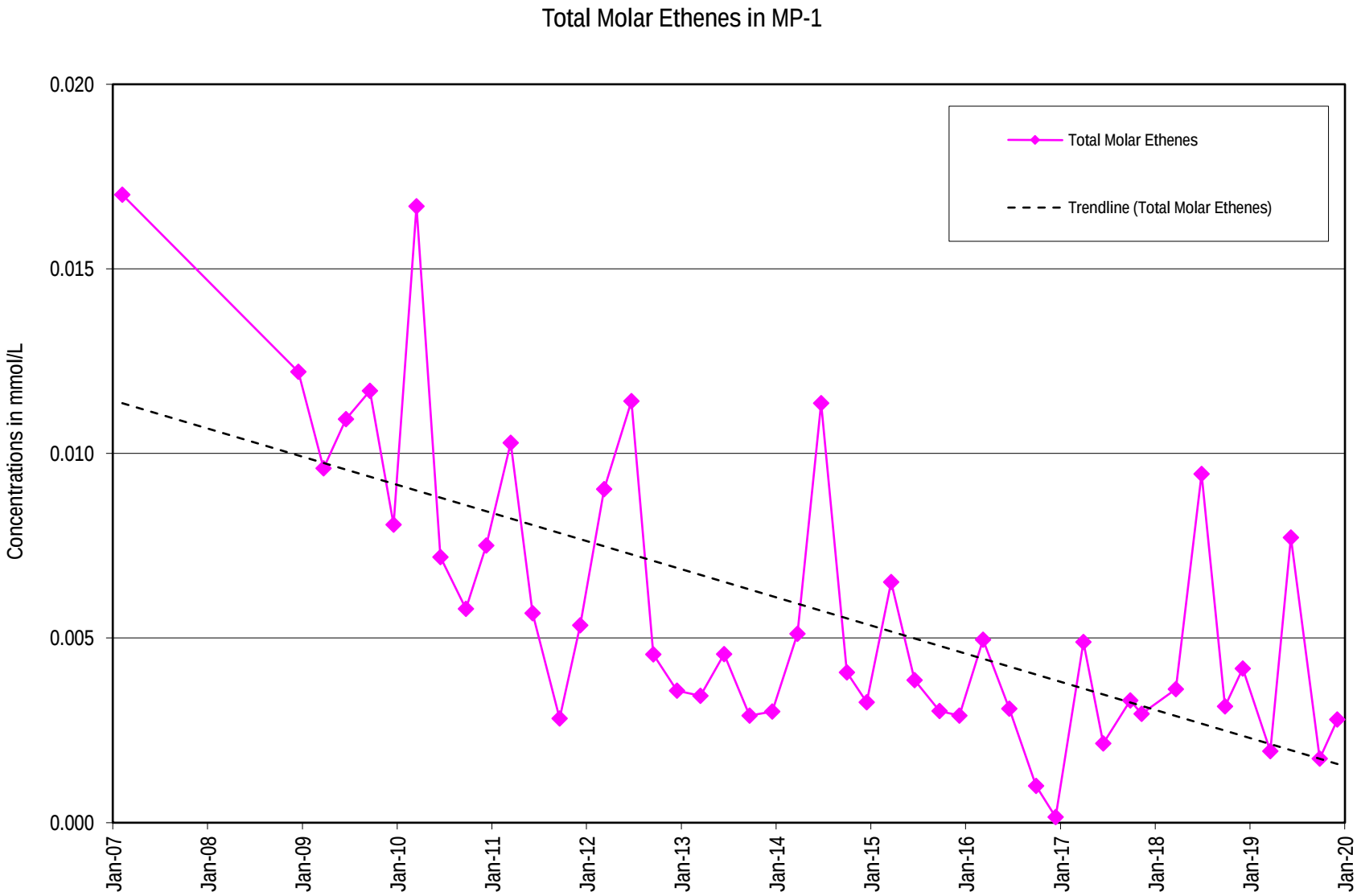
Notes: Not detected values plotted at 1/2 the reporting limit.

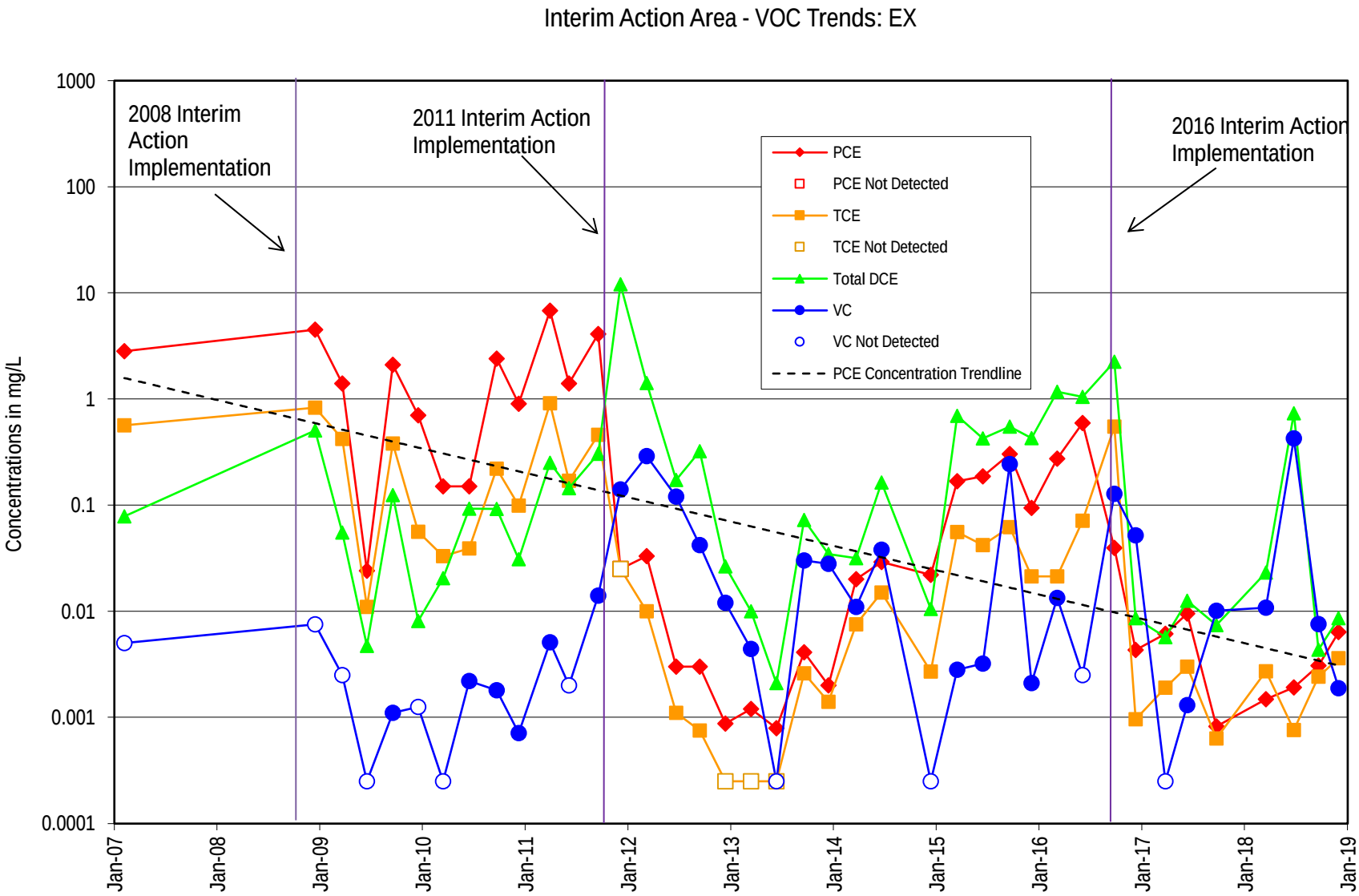

Total Molar Ethenes in MW-7
Concentrations in mmol/L
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)

Interim Action Area - VOC Trends: MP-1

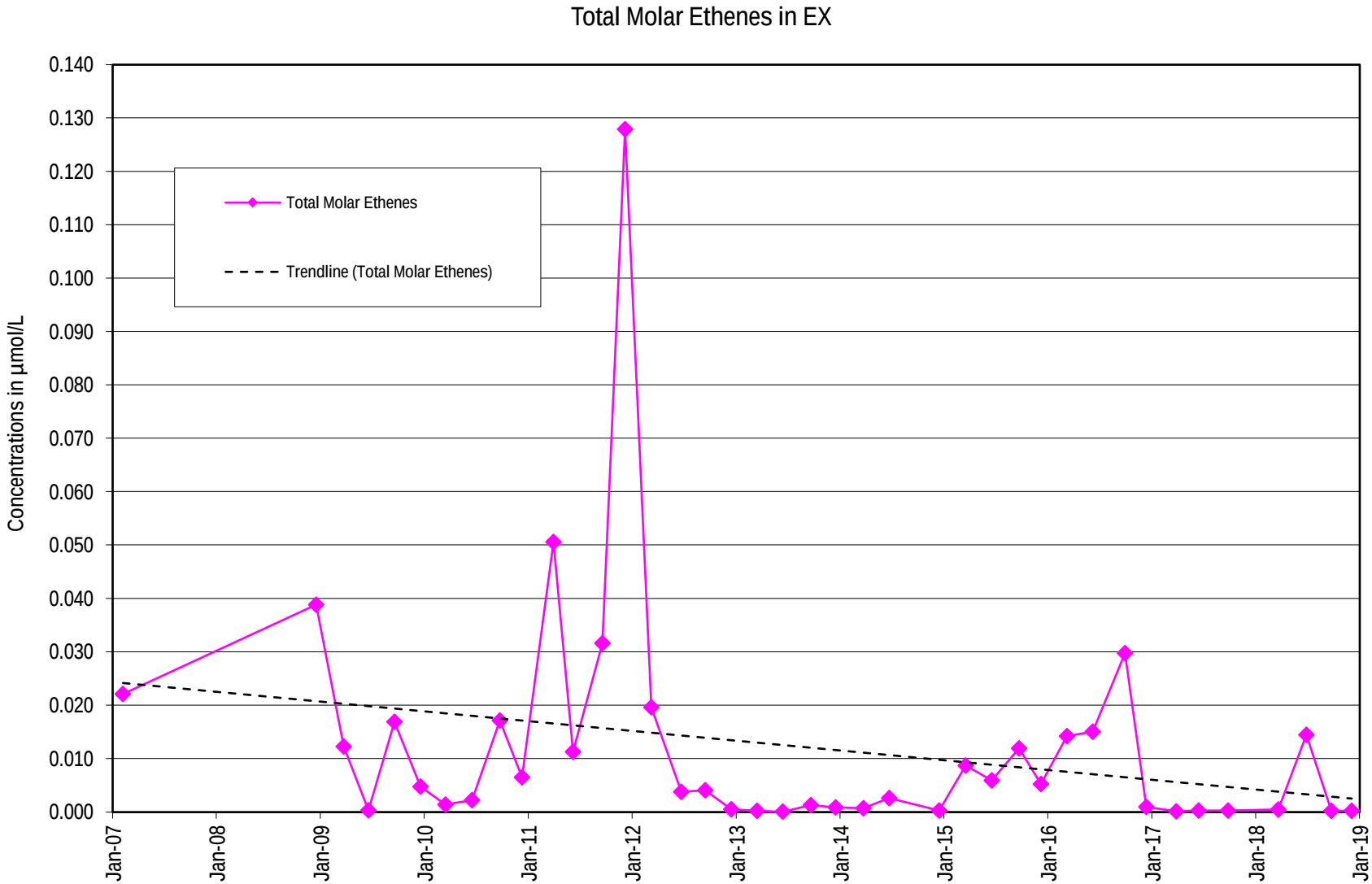


Note: Not detected values plotted at 1/2 the reporting limit.

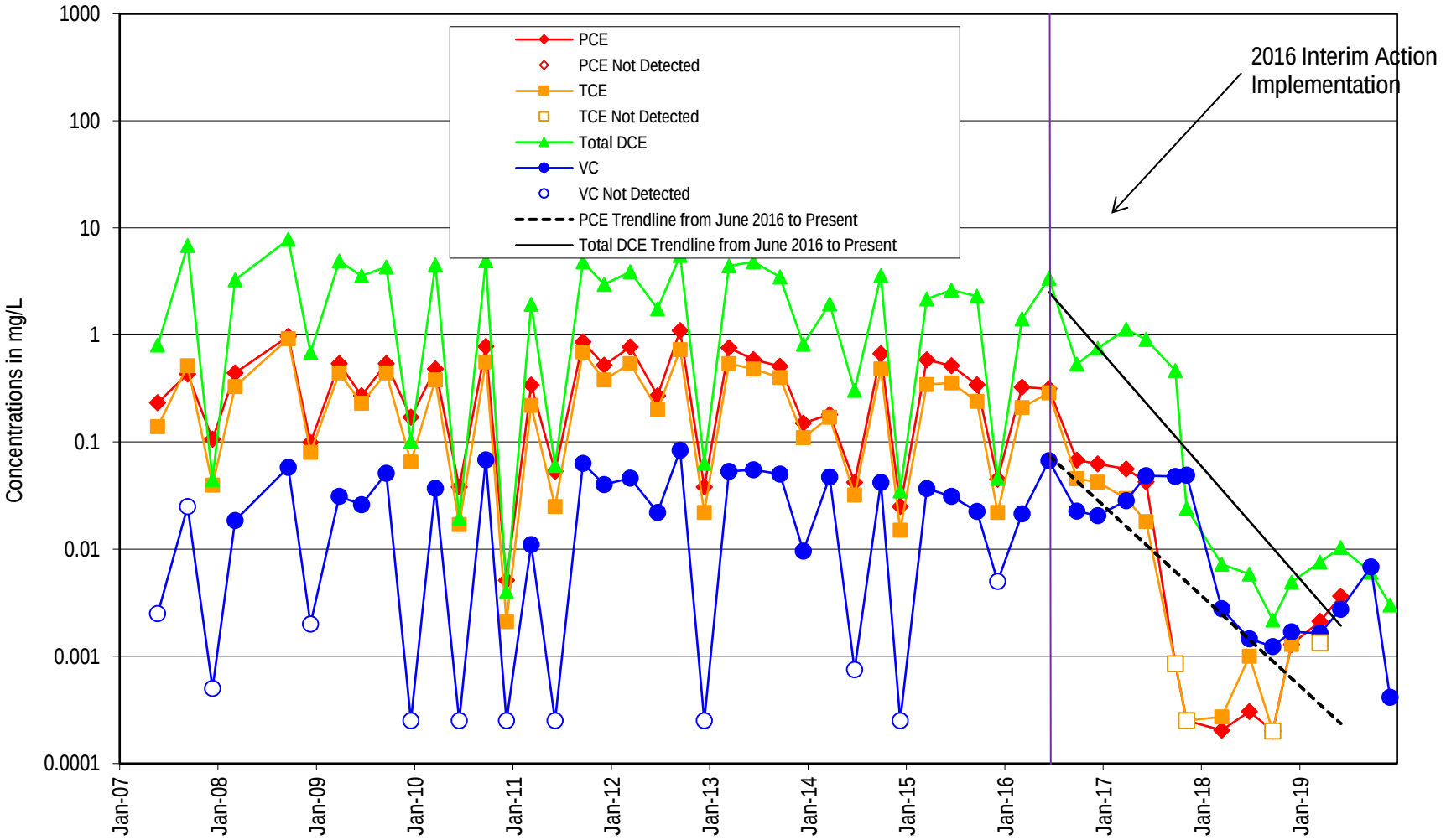

Total Molar Ethenes in MP-1
Concentrations in mmol/L
0.020
0.015
0.010
0.005
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)



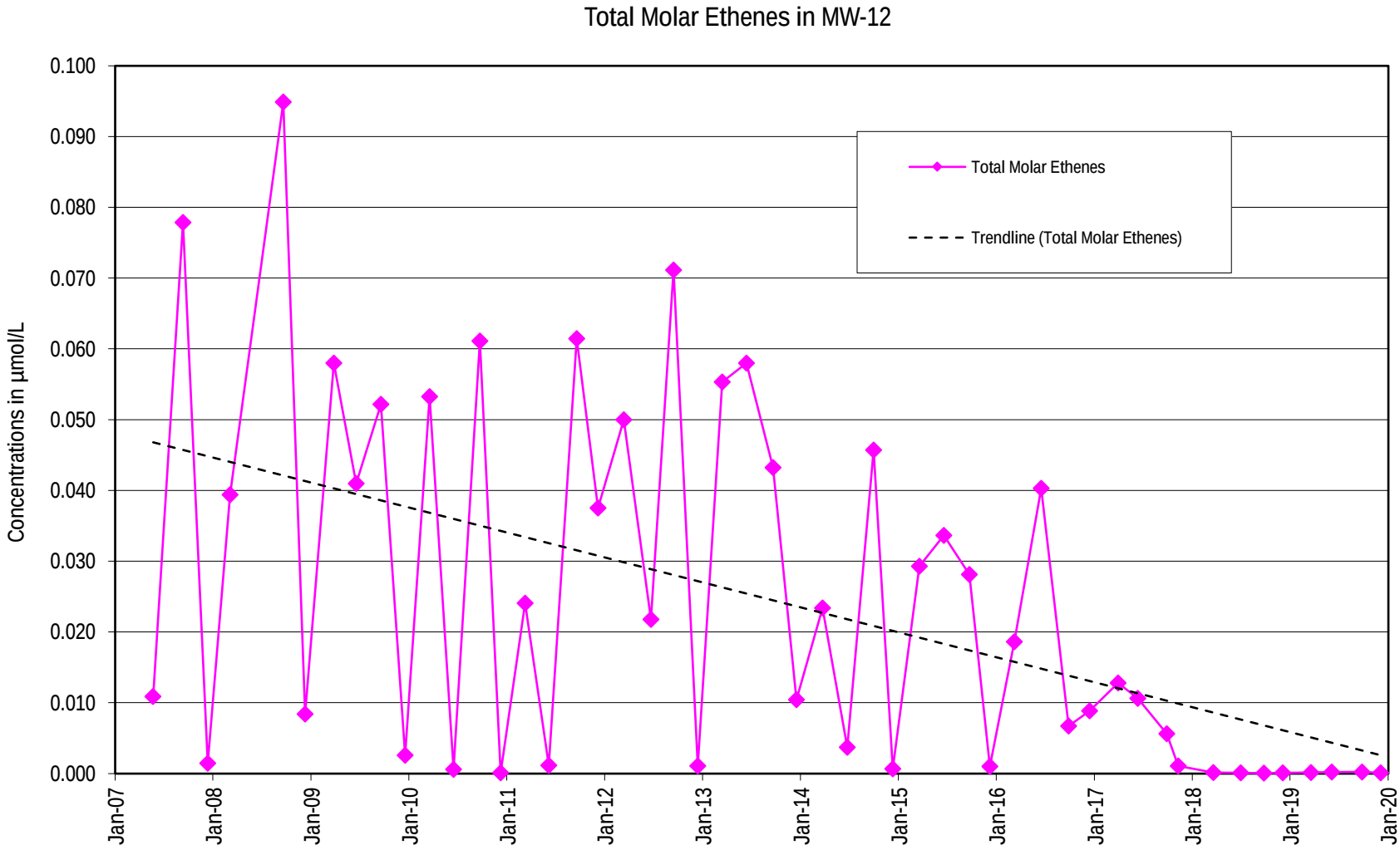
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in EX
Concentrations in µmol/L
0.140
0.130
0.120
0.110
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
Total Molar Ethenes
Trendline (Total Molar Ethenes)
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19

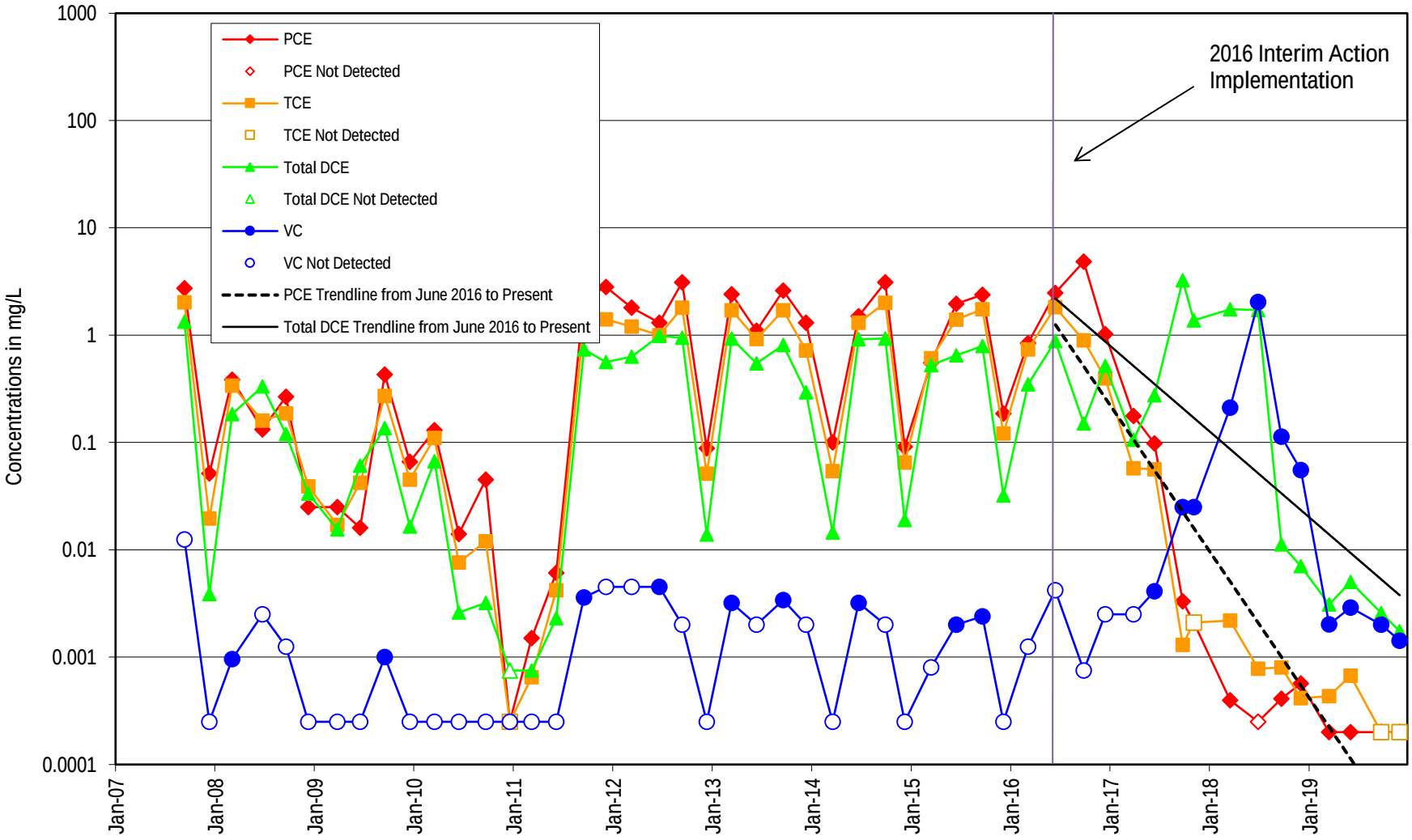
Interim Action Area - VOC Trends: MW-12



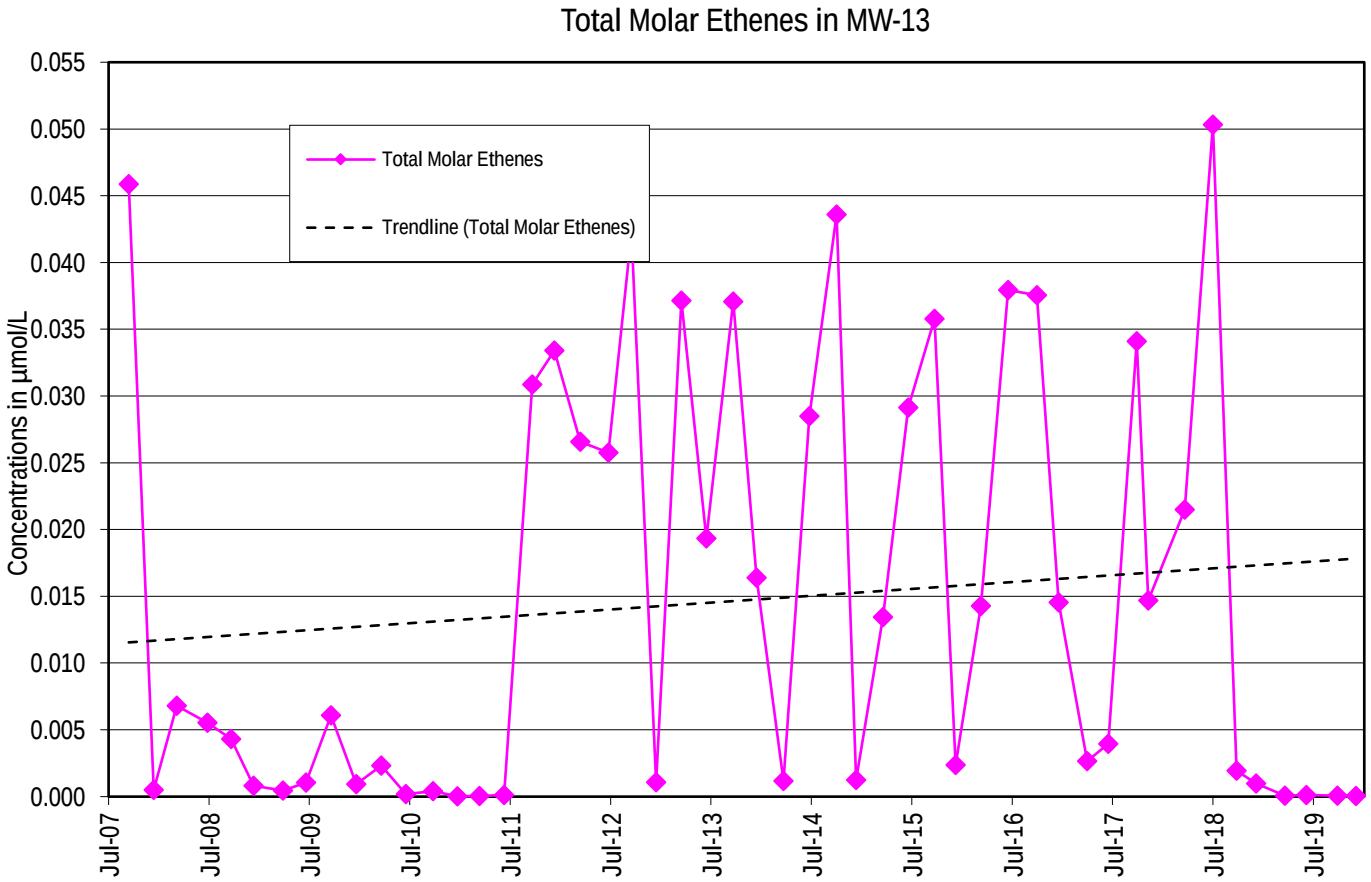
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MW-12
Concentrations in µmol/L
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)

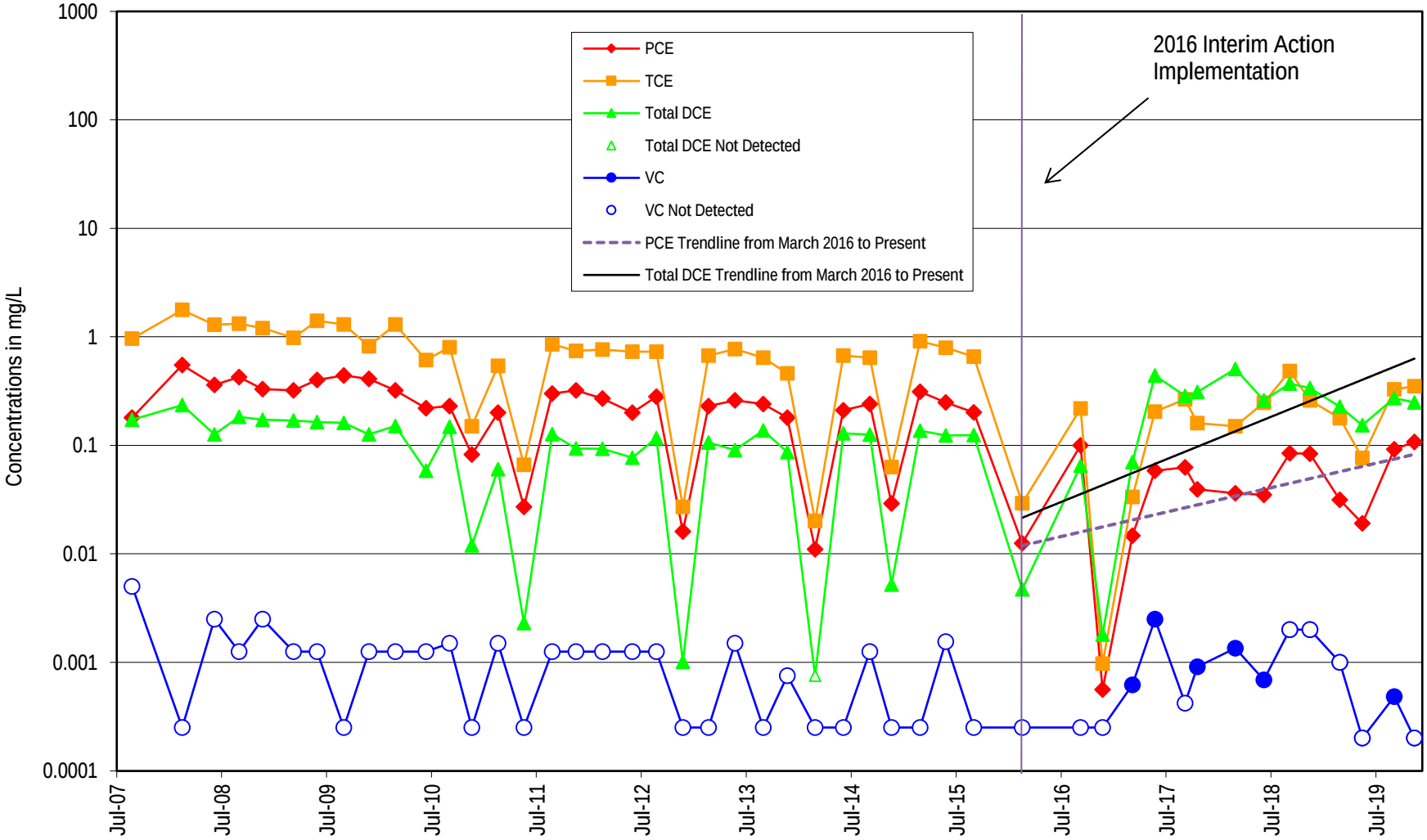
Interim Action Area - VOC Trends: MW-13



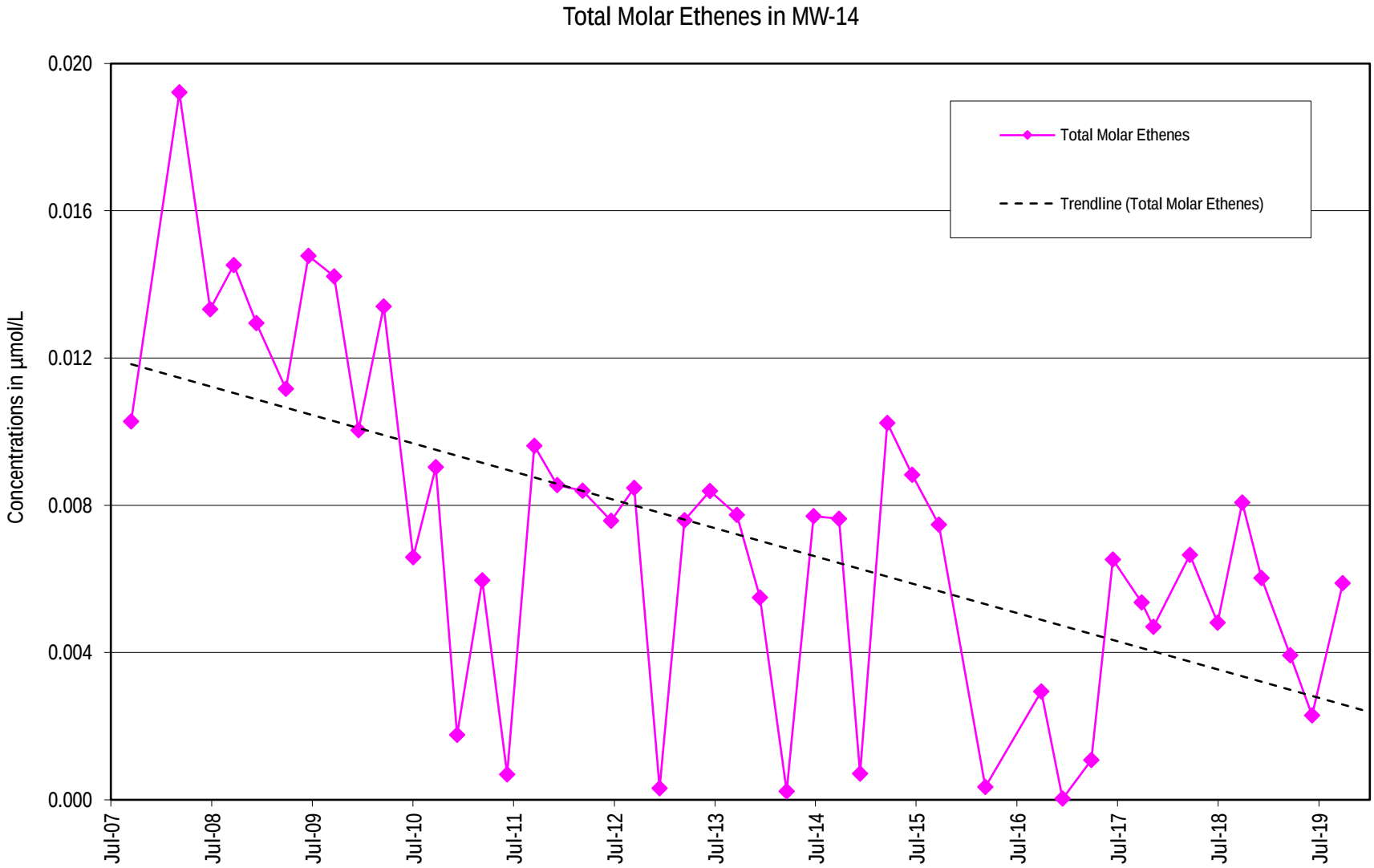
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MW-13
Concentrations in µmol/L
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Total Molar Ethenes
Trendline (Total Molar Ethenes)
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19

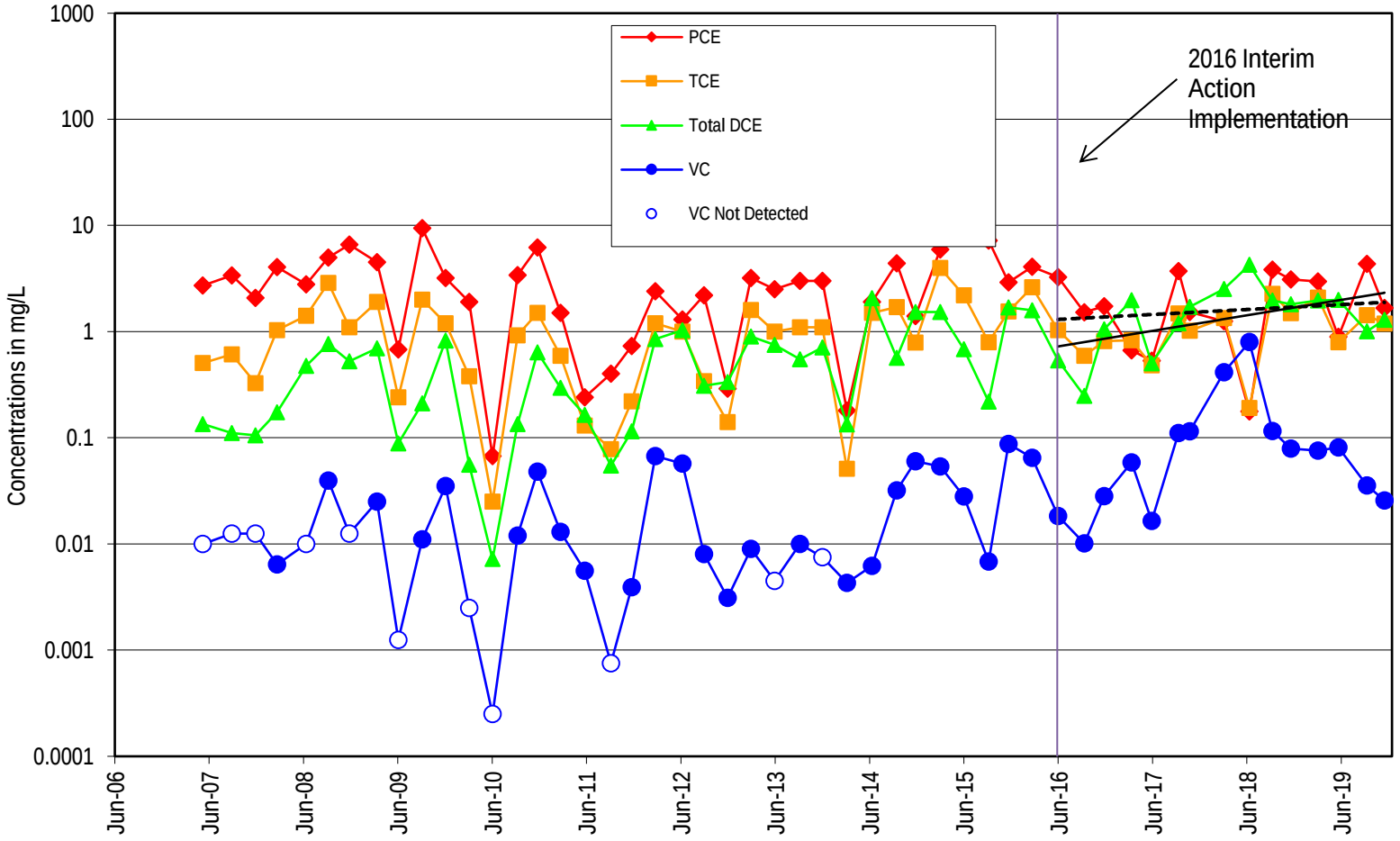
Interim Action Area - VOC Trends: MW-14



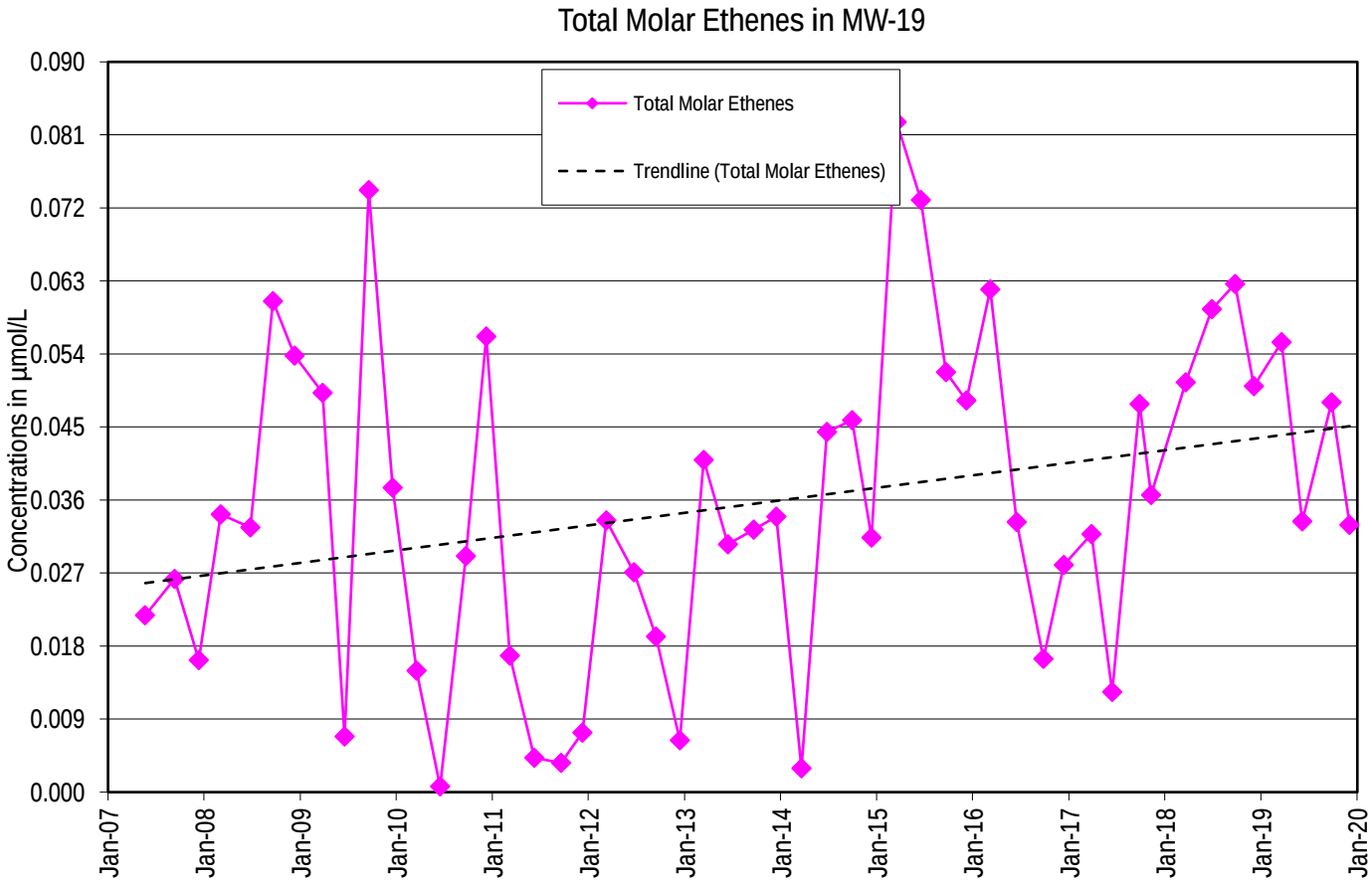
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MW-14
Concentrations in µmol/L
0.020
0.016
0.012
0.008
0.004
0.000
Jul-07
Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
Jul-15
Jul-16
Jul-17
Jul-18
Jul-19
Total Molar Ethenes
Trendline (Total Molar Ethenes)

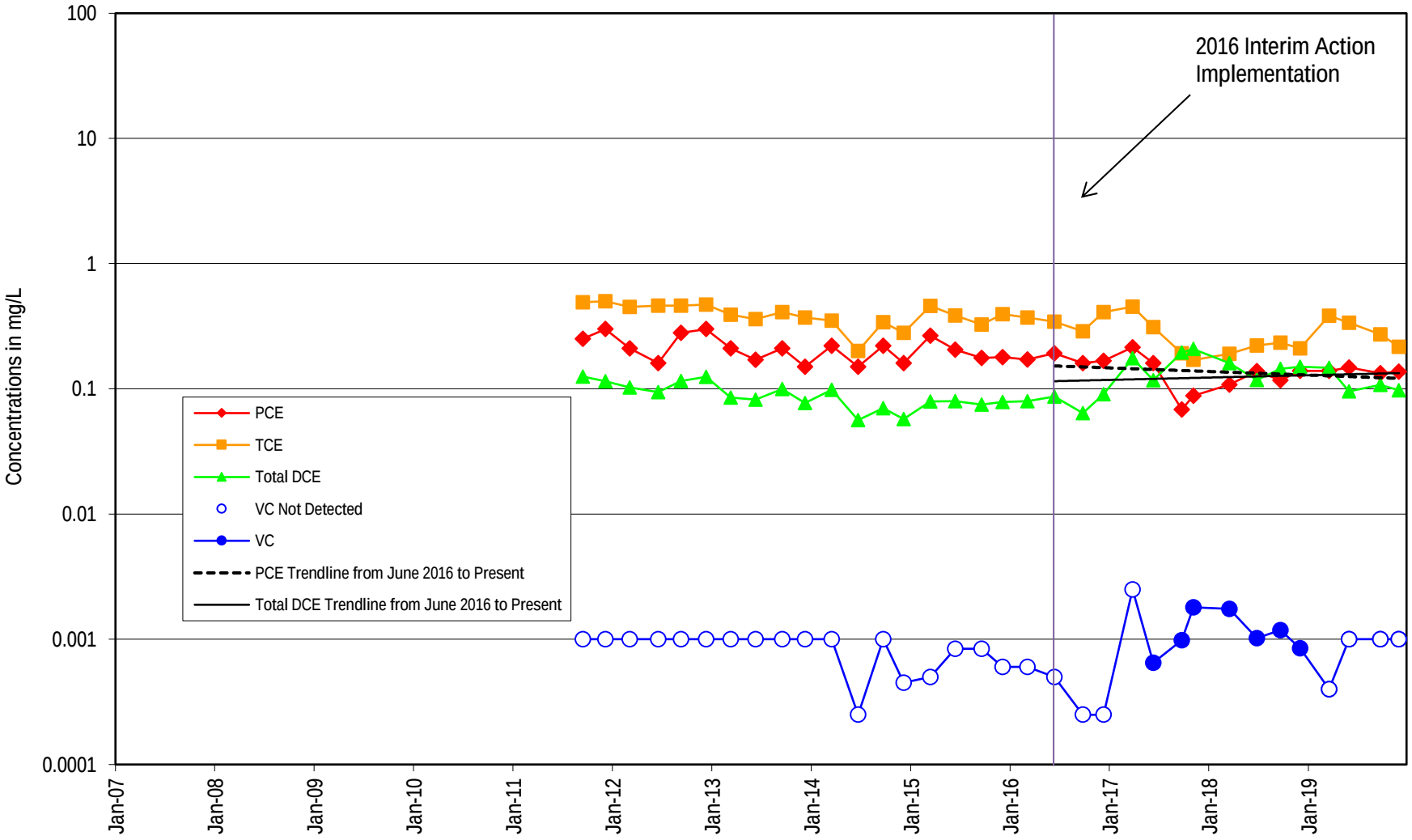
Interim Action Area - VOC Trends: MW-19



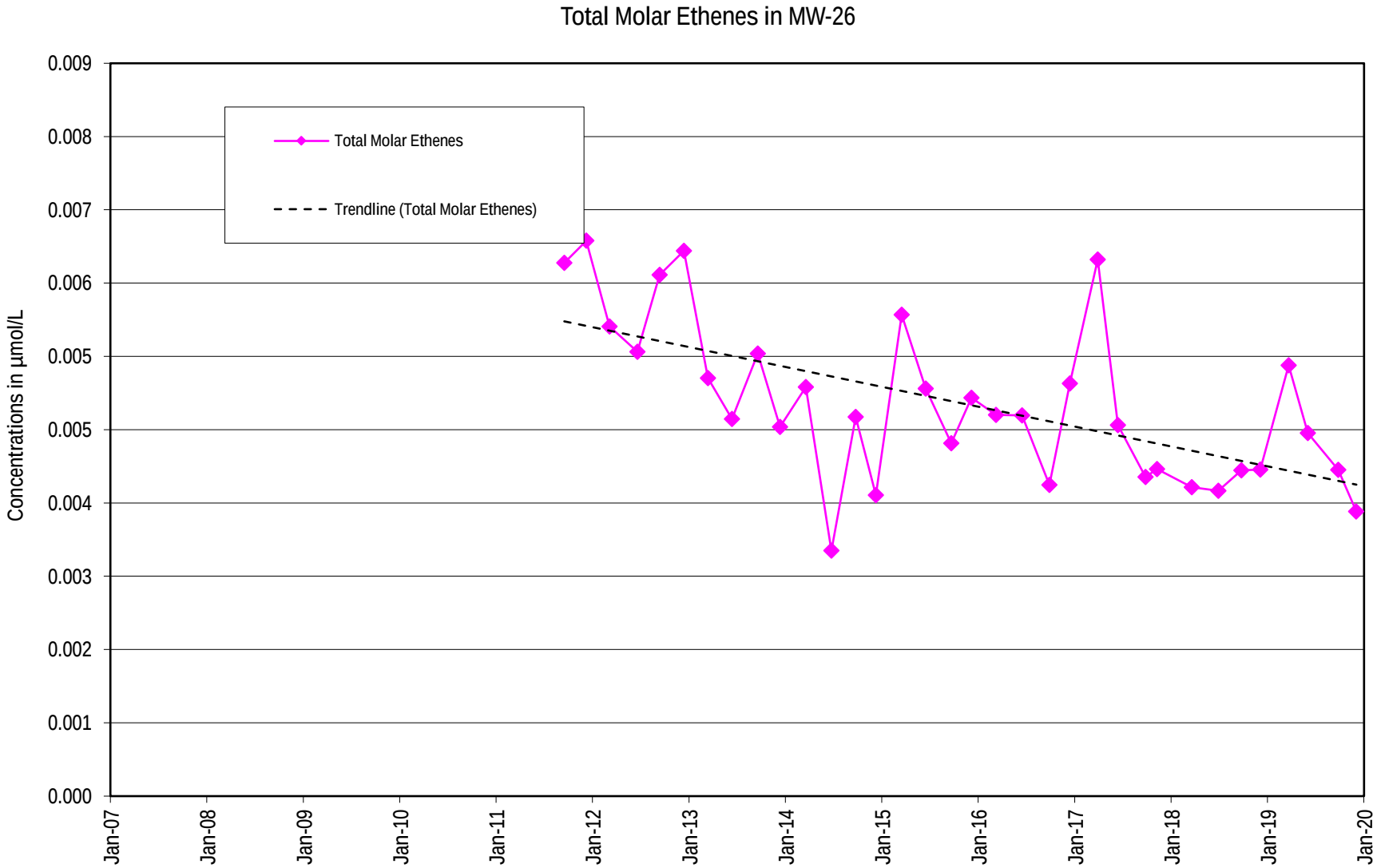
Note: Not detected values plotted at 1/2 the reporting limit.

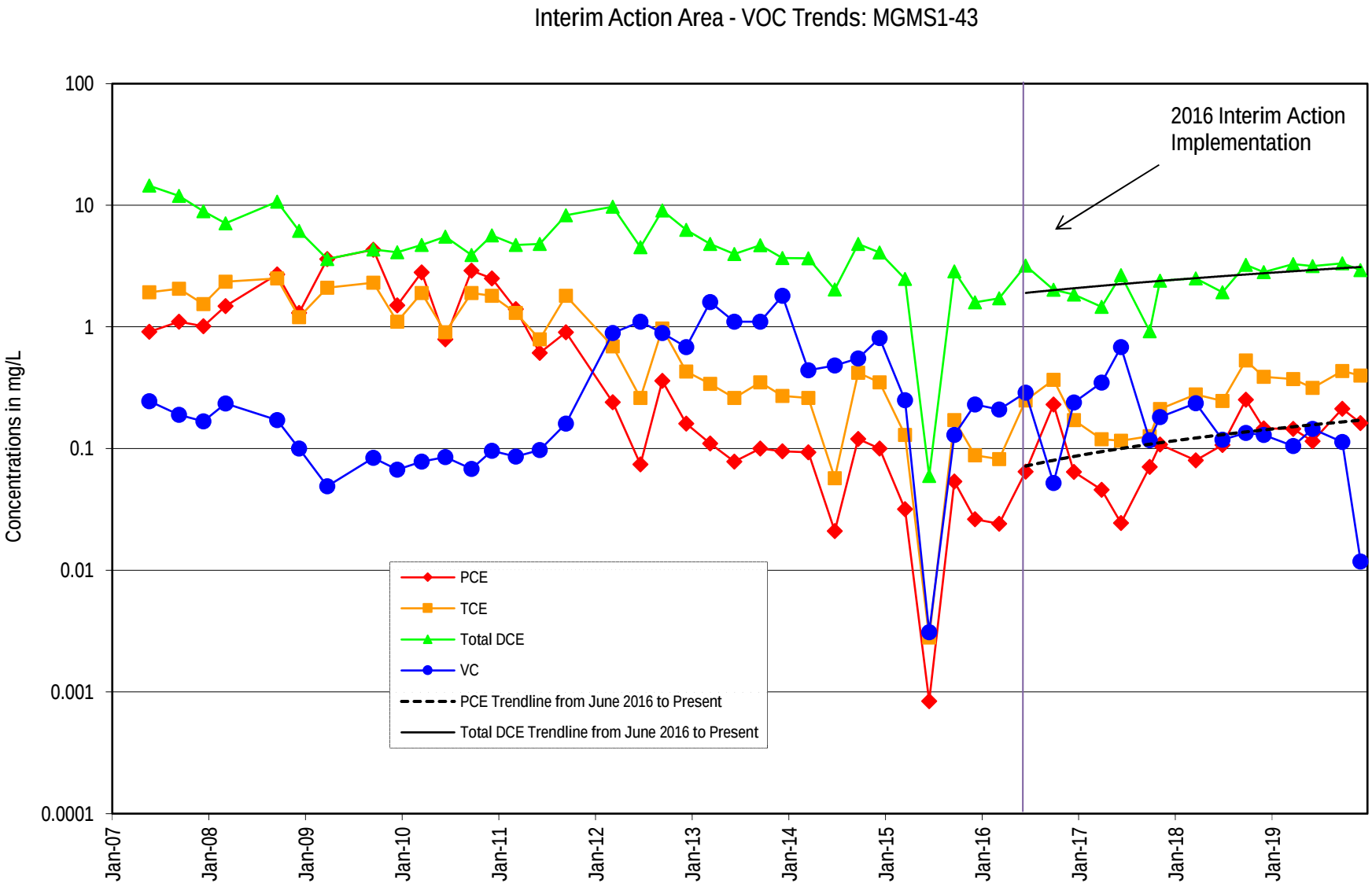

Total Molar Ethenes in MW-19
Total Molar Ethenes
Trendline (Total Molar Ethenes)
Concentrations in µmol/L
0.090
0.081
0.072
0.063
0.054
0.045
0.036
0.027
0.018
0.009
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20

Interim Action Area - VOC Trends: MW-26

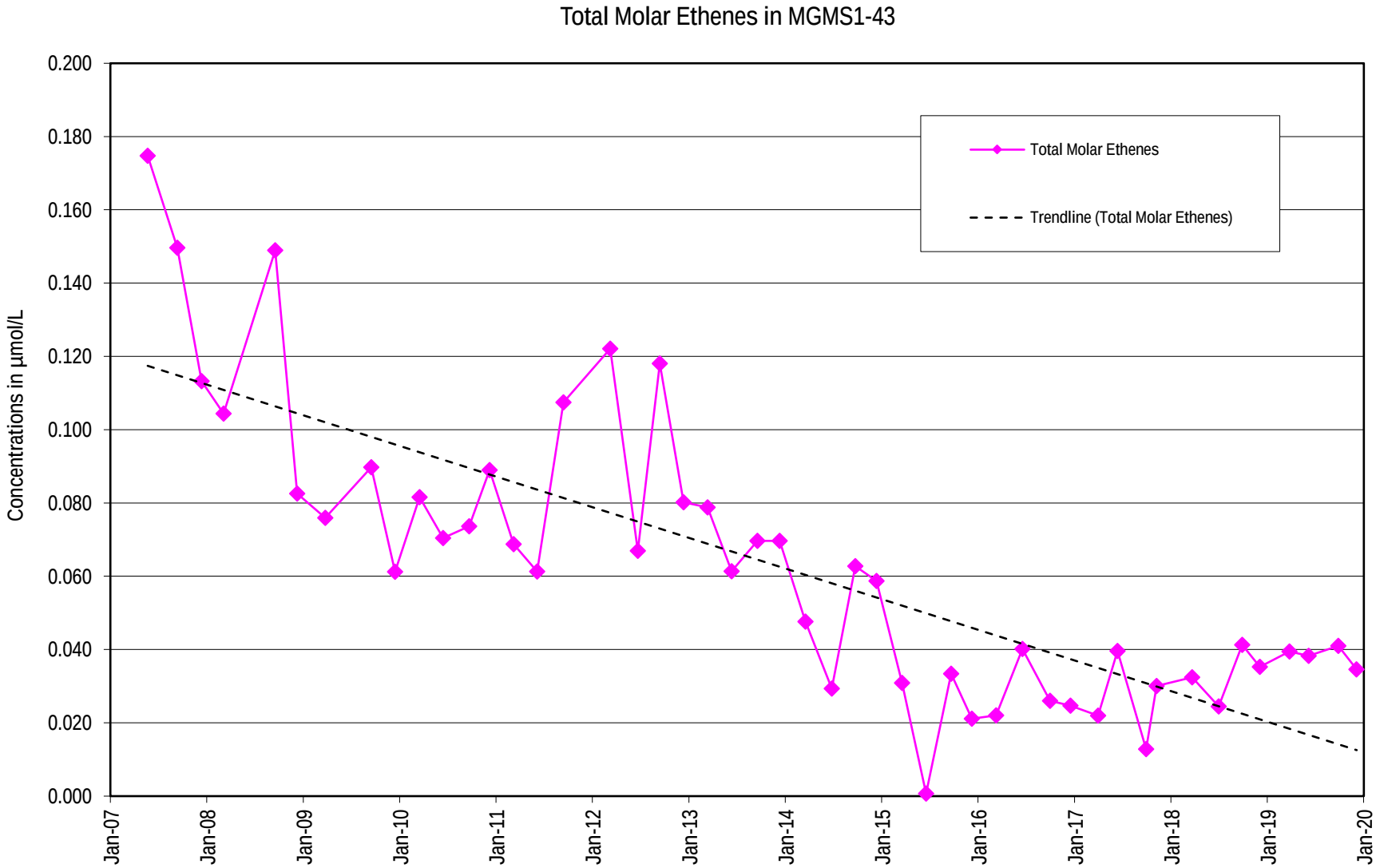


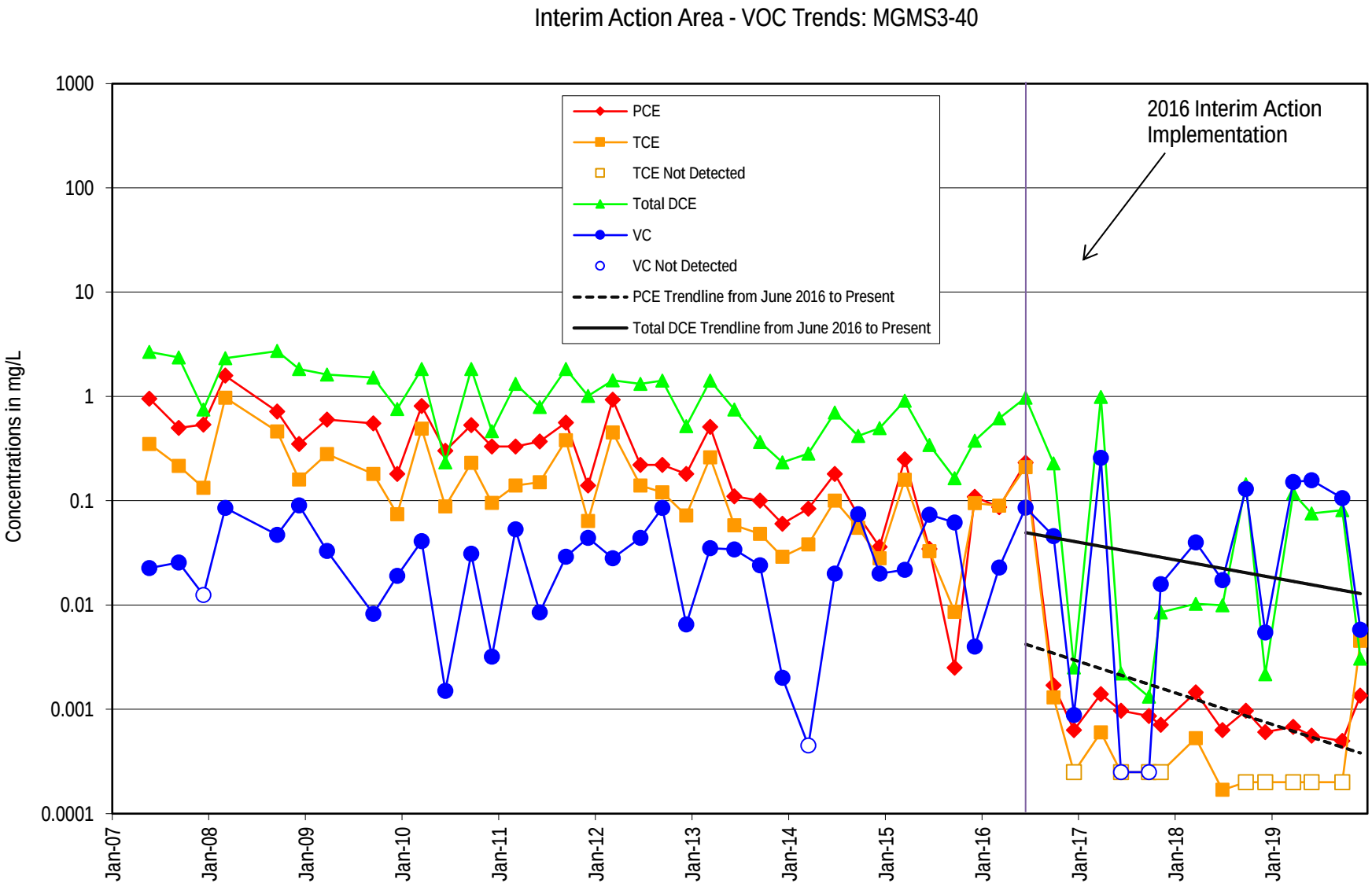
Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MW-26
Total Molar Ethenes
Trendline (Total Molar Ethenes)
Concentrations in µmol/L
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20

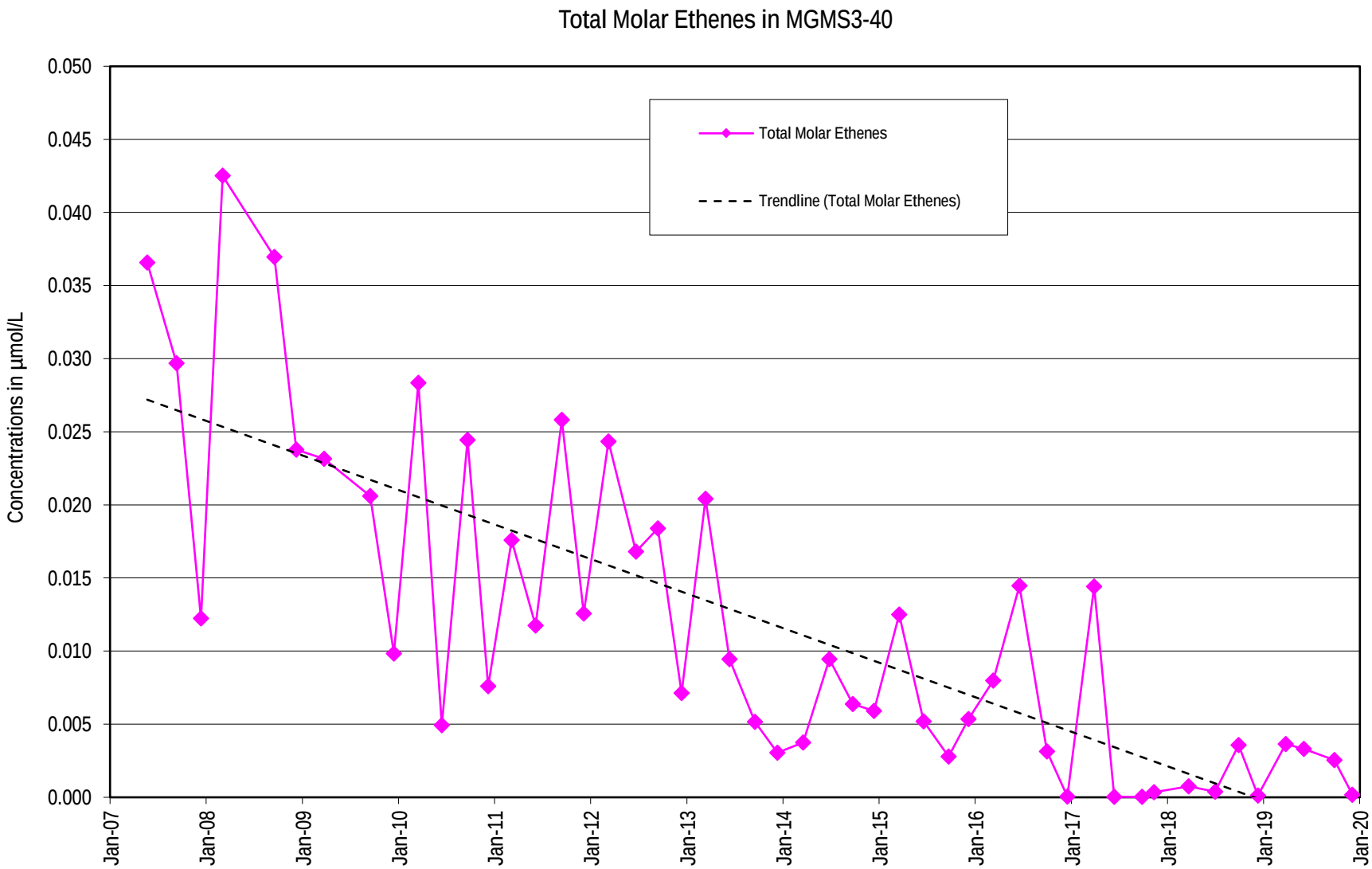


Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MGMS1-43
Concentrations in µmol/L
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)



Note: Not detected values plotted at 1/2 the reporting limit.


Total Molar Ethenes in MGMS3-40
Concentrations in µmol/L
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Total Molar Ethenes
Trendline (Total Molar Ethenes)


Cascadia
Associates, LLC