Transmittal

Stantec Consulting Services Inc.
1060 Andrew Drive Suite 140
West Chester PA 19380-5602
Phone: (610) 840-2500
Fax: (610) 840-2501

To: C. David Brown
Company: PADEP
Address: 2 East Main Street,
Norristown, PA 19401
Phone: 484-250-5796
Date: July 5, 2017
File: PHL PB 663 SCR
Delivery: FedEx

From: Jennifer Menges

- ☐ For Your Information
- ☐ For Your Approval
- ☑ For Your Review
- ☐ As Requested

Reference: Submittal of Philadelphia Refining Complex- PB 663 SCR

Attachment:

Hard Copies	CDs	Doc Date	Description
1	2	7/5/2017	Site Characterization Report for Aboveground Storage Tank PB 663, Philadelphia Energy Solutions Refining and Marketing LLC, Philadelphia Refining Complex, Point Breeze Refinery, Philadelphia, Pennsylvania, prepared for Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC

STANTEC CONSULTING SERVICES INC.

Jennifer Menges

Jennifer Menges
Principal Consultant, LRS
Phone: (610) 840-2500
Jennifer. Menges@stantec.com

c. Tiffani Doerr, Evergreen (1 hard copy, 1 CD)
Chuck Barksdale, PES (1 hard copy, 1 CD)
Colleen Costello, GHD (1 CD)
Kevin McKeever, Langan (1 CD)

SITE CHARACTERIZATION REPORT FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex
Point Breeze Refinery
3144 Passyunk Avenue
Philadelphia, Philadelphia County, Pennsylvania
Point Breeze Facility ID No. 51-19781
PADEP Incident No. 46786
PADEP Tank No. 187A

Stantec

Prepared for:
Philadelphia Refinery Operations,
a series of Evergreen Resources Group, LLC

Prepared by:
Stantec Consulting Services Inc.

A. Patel

Avani Naik Patel
Geologic Specialist

Reviewed by:

DeBoer

Jenny DeBoer
Pennsylvania Registered Geologist #PG005122

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JENNY KELL DeBOER
GEOLOGIST
No. PG005122

Jennifer Menges

Jennifer Menges
Principal Consultant, LRS

July 5, 2017

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Executive Summary

Stantec Consulting Services Inc. (Stantec) has prepared this Site Characterization Report (SCR) on behalf of Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen) regarding the Philadelphia Energy Solutions Refining and Marketing LLC (PES) Philadelphia Refining Complex (Complex) located at 3144 Passyunk Avenue, Philadelphia, Pennsylvania.

This SCR provides information related to one open incident (Incident No. 46786) associated with aboveground storage tank (AST) PB 663 located in Area of Interest (AOI) 8 of the Point Breeze Refinery North Yard at the PES Complex. This report will present background information, summary of the characterization investigation, selection of remediation standards for soil, delineation to selected remediation standards for soil, and conclusions.

Tank PB 663 has a diameter of 102 feet, was constructed in 1953, and has been used to store fractionator tower bottoms and gas oil. During a routine tank inspection on May 20, 2011, approximately 23 holes were found in the tank floor after tank cleaning and blasting activities. No visual evidence of leaks was observed during the inspection process. As part of the AOI 8 Remedial Investigation (RI) activities in 2016, soil sampling was conducted to characterize this suspected release. Soil samples were analyzed for the Evergreen Comprehensive List of constituents of concern (COCs) under the Act 2 /One Cleanup Program.

With the exception of lead and benzo(a)pyrene, none of the soil samples exceeded the statewide health standards (SHS) in PB 663 characterization samples. Exceedance of the non-residential direct contact medium-specific concentration (NRDC MSC) for benzo(a)pyrene was observed in one characterization soil sample, and exceedances to the lead site-specific standard (SSS) was found in two characterization soil samples. These exceedances were delineated within the containment berm by additional soil borings and characterization samples.

Based on the soil results and selected remediation standards described in this report, the site characterization is complete. Concentrations of COCs in soils have been delineated to the selected remediation standards. Remedial action to mitigate the direct contact exposure pathway in soil for benzo(a)pyrene and lead will be developed and submitted in a Cleanup Plan under Act 2. Evergreen requests approval of this SCR for the investigation associated with Tank PB 663 (Incident No. 46786).

1.0 Introduction

Stantec has prepared this SCR on behalf of Evergreen regarding the PES Complex located at 3144 Passyunk Avenue, Philadelphia, Philadelphia County, Pennsylvania (**Figure 1**). Sunoco, Inc. (R&M) (Sunoco) previously operated the former Philadelphia Refinery including the Schuylkill River Tank Farm and on September 8, 2012, Sunoco conveyed it to PES. As part of that transaction, Sunoco retained responsibility for remediation activities for environmental conditions existing at the time of the transfer. As of December 30, 2013, Evergreen assumed the responsibility for remediation liabilities occurring at the former Philadelphia Refinery and Schuylkill River Tank Farm on or before September 8, 2012.

This SCR addresses one open tank incident (No. 46786), at Tank PB 663 located within AOI 8. AOI 8 occupies approximately 250 acres of the PES Complex in the northern portion of the Point Breeze Refinery **(Figure 2)**. The No. 3 Tank Farm is located within AOI 8.

This SCR has been prepared in accordance with the Corrective Action Process (CAP) regulations in 25 PA Code Chapter 245, Subchapter D. This report documents the following activities at Tank PB 663 (Pennsylvania Department of Environmental Protections (PADEP) Tank ID 187A; PADEP Facility ID No. 51-19781) located within AOI 8 of the PES Complex:

- ecological evaluation;
- summary of the site characterization activities;
- selection of applicable cleanup standards; and
- delineation to the selected remediation standards.

1.1 SITE BACKGROUND AND OWNERSHIP HISTORY

The PES Complex has a long history of petroleum transportation, storage, and processing. The oldest portion of the PES Complex started petroleum related activities in the 1860's, when the Atlantic Refining Company was established as an oil distribution center. In the 1900's, crude oil processing began and full-scale gasoline production was initiated during World War II. In addition to refining crude oil, various chemicals, such as acids and ammonia, were also produced at the site for a period of time. Current operations at the PES Complex are limited to the production of fuels and basic petrochemicals for the chemical industry.

The previous owner of the PES Complex, Sunoco, and the PADEP entered into a Consent Order & Agreement (CO&A) in December 2003 with respect to the former Philadelphia Refinery and Schuylkill River Tank Farm. Since 2003, Sunoco has completed site characterization activities at all eleven AOIs in accordance with the 2003 CO&A. In October 2006, Sunoco submitted a Notice of Intent to Remediate (NIR) to the PADEP, entering the former Philadelphia Refinery into the Act 2 program. In November

2011, the former Philadelphia Refinery was formally entered into the PA One Cleanup Program between the Environmental Protection Agency (EPA) – Region III and PADEP. Sunoco submitted a revised Work Plan for Sitewide Approach Under the One Cleanup Program to document the sitewide remedial approach extending beyond the requirements of the 2003 CO&A.

On September 8, 2012, Sunoco conveyed the former Philadelphia Refinery and Schuylkill River Tank Farm, which became known as the PES Complex, to PES. Site remediation at the PES Complex is ongoing as part of previously established programs and a 2012 Buyer Seller Agreement signed among Sunoco, PES, and PADEP. As part of the agreement, Sunoco retained responsibility of remediation activities for environmental conditions existing at the time of the transfer, and PES is responsible for environmental conditions caused by events following the purchase agreement. Effective December 30, 2013, Evergreen assumed Sunoco's legacy remediation liabilities with respect to the former Philadelphia Refinery and Schuylkill River Tank Farm. All remediation of Sunoco's historic environmental liabilities at the PES Complex are managed by Evergreen.

1.2 LOCAL GEOLOGY

Stantec is currently preparing a Remedial Investigation Report (RIR) for AOI 8 that includes a detailed discussion of regional and site-specific geologic conditions. In the context of this SCR, the geologic framework present beneath the PES Complex can be summarized as follows:

- The PES Complex occurs within the up-dip limits of the Atlantic Coastal Plain, generally within two miles of the "Fall Line," where crystalline bedrock of the Appalachian foothills intersects the ground surface (outcrops) (Greenman et al., 1961). The Atlantic Coastal Plain is defined as having relatively flat topography and as being underlain by a characteristic wedge of unconsolidated sediments that thicken in a southeasterly direction atop a sloping and deepening bedrock surface.

- Depositional environments for the Coastal Plain strata observed were complex fluvial, estuarine, and marginal marine environments along the passive Atlantic Continental Margin (Trapp, 1992). The resulting sedimentary record is complicated, largely incomplete, and under-represented through time by only Cretaceous and Quaternary deposits, separated by a regional disconformity.

- Coastal Plain deposits and associated thicknesses observed beneath the PES Complex have been interpreted to include, with increasing depth and age, the following (note that correlations to published geologic units have been included for reference purposes only) (Low et al., 2002):

    1. *Anthropogenic Fill*: heterogeneous in nature and primarily composed of an admixture of sand and gravel, mud, and anthropogenic debris including cinders, slag, brick, crushed stone, and other construction materials; generally less than 5 feet thick and commonly only a thin veneer at ground surface however, can be over 20 feet thick along the axes of buried streams.
    2. *Recent (Holocene) alluvium*: fine-grained, brownish gray to dark gray silt/clay with occasional lenses of gray silty sand, gravel, and peat; silt/clay lithology commonly grades with depth to include some-to-and sand; thickness ranges from a few feet to more than 70 feet at locations proximal to the Schuylkill River.

3. *Pleistocene "Trenton gravel":* brownish yellow, yellowish brown, and reddish brown silty, clayey, poorly-sorted sand with gravel, including secondary sandy gravel and clay/silt lithologies in lenses; very heterogeneous and stratified unit; thickness ranges from approximately 0 feet to 25 feet; thin to absent along the axes of former stream channels where it was eroded.
4. *Cretaceous Potomac-Raritan-Magothy (PRM) aquifer system upper clay unit:* reddish yellow, pale brown, brownish gray, and white clay/silt (commonly sandy and finely-laminated); generally less than 5 feet thick and not everywhere present beneath the PES Complex.
5. *Cretaceous PRM upper sand unit:* light gray to pale yellow, fine to medium-grained quartz sand with a trace-to-little silt but including thick lenses of micaceous very fine silty sand in places; ranges in thickness from a few feet to approximately 30 feet; not everywhere present beneath the PES Complex and generally thickens to the south and east.
6. *Cretaceous PRM middle clay unit:* medium to high plasticity red, white, and dark gray micaceous clay/silt with intercalating lenses of muddy sand; thickness ranges from greater than approximately 20 feet to less than 5 feet.
7. *Cretaceous PRM middle sand unit:* brown and reddish yellow, silty, occasionally gravelly and muddy sand; up to 10 feet thick where interpreted to be present; difficult to distinguish from the lower sand where those units appear to be vertically continuous.
8. *Cretaceous PRM lower clay unit:* dark gray, brown, and red clay/silt with sandy lenses; commonly only a few feet thick and not everywhere present beneath the PES Complex;
9. *Cretaceous PRM lower sand unit:* pale gray, pale yellow, and brown and white quartz sand coarsening with depth to white and varicolored sandy gravel and gravelly sand; common lenses of clayey sand and gravel; thickness ranges from approximately 25 feet to more than 50 feet.

Bedrock is present beneath the Coastal Plain deposits in AOI 8 and consists predominantly of variably-weathered mica schist. The bedrock surface is irregular and contains troughs. Beneath AOI 8, bedrock elevations are approximately -20 feet to -70 feet referenced to the North American Vertical Datum of 1988 (NAVD 88).

1.3 LOCAL HYDROGEOLOGY AND WATER BODIES

Stantec is currently preparing a RIR for AOI 8 that includes a detailed discussion of the site-specific hydrogeologic conditions that characterize groundwater occurrence and flow beneath the area. Based on that investigation, the geologic framework present beneath and in close proximity to AOI 8 is interpreted to support the following general hydrogeologic conditions:

- Two discrete water-bearing zones have been identified beneath AOI 8 at the PES Complex. In general, these are the water-table (unconfined) and a lower (semi-confined) aquifer. Their properties are as follows:

    1. *Unconfined aquifer:* primarily composed of saturated portions of Quaternary alluvium (including the "Trenton gravel" and younger stream deposits) and underlying PRM upper sand unit; includes the upper clay unit aquitard where present; may include deeper portions

of Holocene alluvium, when saturated; on average, the saturated thickness of the unconfined aquifer ranges from a few feet to approximately 30 feet.

2. *Lower aquifer:* semi-confined, artesian aquifer primarily composed of the lower sand unit but as mapped also includes the middle sand unit and lower clay unit aquitard, where present; the lower aquifer saturated thickness generally ranges from 20 feet to 35 feet.

- The water-table surface appears to subtly mirror natural surface topography in AOI 8, and is generally characterized by convergence towards a former stream that bisected the AOI, and flow towards the Schuylkill River.

- The middle clay unit aquitard appears to be laterally continuous beneath AOI 8 and create overall hydraulic separation between the unconfined and lower aquifers.

Four stormwater basins are located within AOI 8 and represent the identified surface water features. The Schuylkill River represents a portion of the western and southern border of the AOI. A Philadelphia Gas Works facility also borders AOI 8 to the south, and a CSX rail facility also partially borders the AOI to the west. Private water wells are not present within the PES Complex and the complex is currently connected to a public water supply with sanitary wastewater from AOI 8 being discharged to a City of Philadelphia sewer.

1.4 ECOLOGICAL EVALUATION

The majority of AOI 8 is covered with soil, gravel, and impervious surfaces. The soil and gravel-covered portions of AOI 8 are not likely to serve as a breeding area, migratory stopover, or primary habitat for wildlife. On October 31, 2016, a survey of endangered, threatened, and special concern wildlife and habitat was conducted by submitting a search request through the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Tool. The results of the PNDI search identified no known impacts by the Pennsylvania Game Commission and the U.S. Fish and Wildlife Service.

The PNDI search identified potential endangered species impacts that required further review by the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) and the Pennsylvania Fish and Boat Commission (PA FBC). No effect letter requests were submitted to PA DCNR and PA FBC on October 31, 2016. A response was received from the PA DCNR on November 4, 2016, indicating that no impact is anticipated to the species of special concern. In a letter dated November 28, 2016, the PA FBC noted that certain areas of AOI 8 might serve as a potential habitat for the Eastern Redbelly Turtle (Pseudemys rubriventres), which is a threatened species. A wildlife salvage effort for the turtles was conducted in 2013 in the stormwater basin adjacent to the Schuylkill River. As the remedial investigation at Tank PB 663 does not include disturbance within 300 feet of the potential habitat at the Schuylkill River, no immediate action is warranted with regard to the species of concern. This threatened species will be further evaluated as an ecological receptor for impacts related to Evergreen's environmental liability in the Act 2/ One Cleanup Program.

All ecological assessment documentation is included in **Appendix A**.

1.5 TANK PB 663

PB 663 is a regulated AST located in northwestern AOI 8, which has been used to store fractionator tower bottoms and gas oil. This AST has a diameter of 102 feet, with a design capacity of 2,935,800 gallons, and was constructed in 1953. Tank PB 663 is within the same containment berm area as tanks PB 664, PB 666 and PB 668 as well as former tanks PB 661, PB 662, PB 665, and PB 667.

During a routine tank inspection at PB 663 on May 20, 2011, approximately 23 holes were found in the tank floor after tank cleaning and blasting activities. No visual evidence of leaks was observed during the inspection process. Incident No. 46786 was assigned to this suspected release.

A closed historic incident (No. 34422) exists for PB 663. On April 25, 2004, approximately 158 gallons of gas oil was released into the PB 663 containment area, from a leak in the 8-inch header at the tank field manifold. As part of interim remedial activities, the released material was recovered using vacuum trucks and absorbent pads, approximately 42.7 tons of impacted soils were disposed off-site, and the excavated area was covered with crushed stone. Post-excavation soil sampling activities were completed in June 2004. Three soil samples were collected within the release area, and one soil sample was collected from an area just beyond the extent of the release (663 Area-1 AOI8 through 663 Area-4 AOI8). All four samples were collected from a depth of approximately 6 inches below ground surface, and analyzed for the PADEP short list of parameters for fuel oil number 4, 5, and 6 in soil. Results are included on **Tables 1 and 2** for informational purposes. A stone cap was installed in the area of SHS and NRDC MSC exceedances. A release assessment report was submitted to the PADEP in 2004 and subsequently approved, with a contingency to include a post-remediation care plan (PRCP).

All available historical documentation is presented in **Appendix B**.

2.0 INVESTIGATION METHODOLOGY AND RESULTS

During the AOI 8 RI activities in 2016, three soil borings (AOI8-BH-16-059, AOI8-BH-16-060, and AOI8-BH-16-061) were completed around Tank PB 663 to characterize the historic open incident. Two samples (shallow and deep) were collected and analyzed for the Evergreen Comprehensive List of COCs.

SHS and lead SSS exceedances were noted in shallow samples at AOI8-BH-16-059 and AOI8-BH-16-060. To address the shallow exceedance at AOI8-BH-16-059, shallow samples were collected for lead analysis from delineation borings AOI8-BH-16-079 and AOI8-BH-16-080. The lead SSS exceedance at AOI8-BH-16-060 is delineated by the 666 PE Area samples (1 through 8) to the south, which do not exhibit lead SSS exceedances, and the presence of Tank PB 664 to the east. A sample collected from the monitoring well location, N-146 to the east also does not exhibit any exceedances of the lead SSS. Within the tank containment berm to the north, soil samples were collected during installation of monitoring well N-154 and from soil boring AOI8-BH-16-078, during AOI 8 RI activities. As the shallow samples from both locations exhibited lead SSS exceedances, an additional shallow sample was collected from soil boring AOI8-BH-16-082, located outside the tank containment berm and to the north of the Propane Terminal. The shallow sample at AOI8-BH-16-082 did not exceed the lead SSS.

SHS and NRDC MSC exceedances for benzo(a)pyrene were noted in the shallow sample at AOI8-BH-16-061. The benzo(a)pyrene in AOI8-BH-16-061 is delineated by borings AOI8BH-16-059, AOI8-BH-16-083, and 663 Area-3 AOI 8. It should be noted that exceedances to the NRDC MSCs for benzo(a)pyrene were observed in post-excavation soil samples related to a historic incident at PB 663; however, the area of these samples is currently under a crushed stone cap.

Soil sample locations are shown on **Figure 3,** and analytical data are presented in **Tables 1 and 2.** **Table 1** compares the soil analytical results to non-residential SHS and **Table 2** compares the analytical results to NRDC MSCs.

Fieldwork conducted as part of this additional investigation followed the Quality Assurance/Quality Control Plan and Field Procedures Manual (**Appendix C**) and the Site Specific Health and Safety Plan (**Appendix D**). Available soil boring logs for the sample locations are provided as **Appendix E**. Soil samples were analyzed for the Evergreen Comprehensive List of COCs (**Appendix F**). Laboratory analytical reports are included as **Appendix G**.

3.0 QUALITY ASSURANCE/QUALITY CONTROL

Methods established by Evergreen to examine data quality are outlined in **Appendix C**, Quality Assurance/Quality Control Plan and Field Procedures Manual. All fieldwork conducted as part of the site characterization activities was performed in accordance with the procedures outlined in the Evergreen Field Procedures Manual, **Appendix C**. The following sections describe specific aspects of quality assurance/quality control procedures that pertain to the activities outlined in this report.

3.1 EQUIPMENT DECONTAMINATION

All sampling equipment was either dedicated or decontaminated in accordance with the field sampling procedures to prevent cross-contamination. Prior to sampling, the equipment was decontaminated with successive rinses of detergent, potable water, and distilled water.

3.2 EQUIPMENT CALIBRATION

Air quality monitors used for both air monitoring and soil screening were calibrated prior to use. Both a zero calibration and a span calibration using gases of known concentration as recommended by the manufacturer (i.e. 100 parts per million by volume (ppm_v) isobutylene for the photoionization sensor) were performed.

3.3 SAMPLE PRESERVATION

Samples were placed directly into chemically preserved and/or non-preserved glassware provided by the analytical laboratory, as appropriate. All samples were preserved and shipped at a temperature of approximately 4° Celsius (C) or less by application of ice prior to shipment to the analytical laboratory. This temperature was maintained during shipment by placing ice in zip-top bags above, around, and below the sample containers.

3.4 DOCUMENTATION

Chain-of-custody forms were maintained throughout the sampling program to document sample acquisition, possession, and analysis. Chain-of-custody documentation accompanied all samples from the field to the laboratory. Each sample was assigned a unique identifier that was recorded in the field notes as well as on the chain-of-custody document.

4.0 SELECTION OF REMEDIATION STANDARDS

All soil results were screened using a multi-step process as described in this section. Soil sample analytical results were first screened against the PADEP non-residential, used aquifer (Total Dissolved Solids [TDS] less than or equal to 2,500 milligrams per liter [mg/L]) SHS. The following process was used to select the soil SHS for each COC:

- The highest value of either 100 times the groundwater MSC or the generic value MSC was selected to represent the soil to groundwater numeric value.

- The selected used aquifer, non-residential soil to groundwater numeric value was then compared to the NRDC MSC (0-2 or 2-15 feet below ground surface [ft bgs], as applicable).

- The more stringent of the soil to groundwater numeric value and the NRDC MSC was selected as the SHS for initial comparison of soil sample results.

To further evaluate the potential risk posed by the concentrations of COCs which were detected above their respective SHS, the next step in the screening process is to compare all of the soil analytical results to the NRDC MSCs.

An exception to this soil screening process exists for lead. On February 24, 2015, Evergreen submitted a Human Health Risk Assessment (HHRA) Report (Langan, 2015) to PADEP which presented the development of a risk-based numeric SSS for lead in soil. In a letter dated May 6, 2015, PADEP approved the HHRA, and a NRDC SSS for lead of 2,240 milligrams per kilogram (mg/kg) was established. This SSS is used in place of the default 0-2 ft bgs NRDC MSC for lead and is referred to as the lead SSS.

Remediation standards for soil will be selected and will apply specifically to impacted soils. The non-residential SHS is selected as the remediation standard for constituents that meet or are below the SHS.

For concentrations of COCs exceeding the SHS, a SSS via pathway elimination will be chosen as the remediation standard. In order for a pathway to be considered complete, it must have a source, a transport medium, a receptor, and exposure route. If concentrations are below the applicable NRDC MSCs, the direct contact exposure pathway is incomplete. The soil-to-groundwater pathway for exceedances of the SHS will be presented in the AOI 8 RIR.

4.1 STATEWIDE HEALTH STANDARD

All COCs were either not detected in soil or were detected at concentrations below the SHS, with the exception of benzo(a)pyrene and lead. The SHS is selected as the remediation standard for constituents that meet or are below the SHS.

4.2 SITE-SPECIFIC STANDARD – PATHWAY ELIMINATION

Although there were exceedances of the soil-to-groundwater MSC for benzene(a)pyrene and lead, the soil-to-groundwater pathway will be addressed in the AOI 8 characterization by the Act 2 remedial activities at the facility under the One Cleanup Program.

SSS via pathway elimination is selected as the remediation standard for benzene(a)pyrene and lead. The highest detected concentrations for these constituents during the PB 663 investigation were 37.9 mg/kg for benzo(a)pyrene and 95,000 mg/kg for lead.

Remedial action to mitigate the direct contact exposure pathway in soil for benzo(a)pyrene and lead will be developed and submitted in a Cleanup Plan under Act 2, as opposed to the deliverable structure outlined in CAP regulations of 25 PA Code Chapter 245, Subchapter D.

Currently, the vapor intrusion pathway is incomplete because of the lack of receptors (occupied buildings) in the PB 663 tank containment area. In addition, lead and benzo(a)pyrene are not compounds of vapor intrusion concern. A vapor intrusion assessment will be conducted in future Act 2 submittal. If necessary, an institutional/engineering control will be established for any future occupied buildings planned in the tank area in order to assure that this pathway remains incomplete. The engineering/institutional control described herein will be formalized in an environmental covenant for the PES Complex.

5.0 CONCLUSIONS

Through site characterization performed as part of AOI 8 RI, characterization and delineation of historic open incident (Incident No. 46786) is complete at Tank PB 663. Additional information about the AOI, including a comprehensive conceptual site model, will be submitted in the AOI 8 RIR under the Act 2/One Cleanup Program. The soil to groundwater pathway will be addressed in the AOI 8 characterization by the Act 2 remedial activities at the PES Complex under the One Cleanup Program.

With the exception of lead and benzo(a)pyrene, concentrations of COCs were below the respective SHS for PB 663 characterization samples. Therefore, the SHS are selected as the remediation standards for all COCs that meet or are below the SHS. SSS via pathway elimination is selected as the remediation standard for lead and benzo(a)pyrene. However, these constituents were detected above their respective lead SSS or NRDC MSC and will require additional remedial measures in order to attain a remediation standard. These remedial measures will be presented in a Cleanup Plan to be submitted under Act 2. Evergreen intends that the remainder of the deliverables for this incident will be submitted through the Act 2 process and reports specific to the Storage Tank CAP will not be submitted.

Based on the results for soils associated with Tank PB 663, site characterization is complete. Concentrations of COCs in soils have been delineated to the selected remediation standards. Evergreen requests approval of this SCR for the soil investigation associated with Tank PB 663.

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Department of Environmental Protection, Land Recycling Program (2016). Statewide Health Standards, Table 4b – Medium-Specific Concentrations (MSCs) for Inorganic Regulated Substances in Soil: Soil to Groundwater Numeric Values. http://files.dep.state.pa.us/EnvironmentalCleanupBrownfields/LandRecyclingProgram/LandRecyclingProgramPortalFiles/SWHTables-2016/Table%204b.pdf

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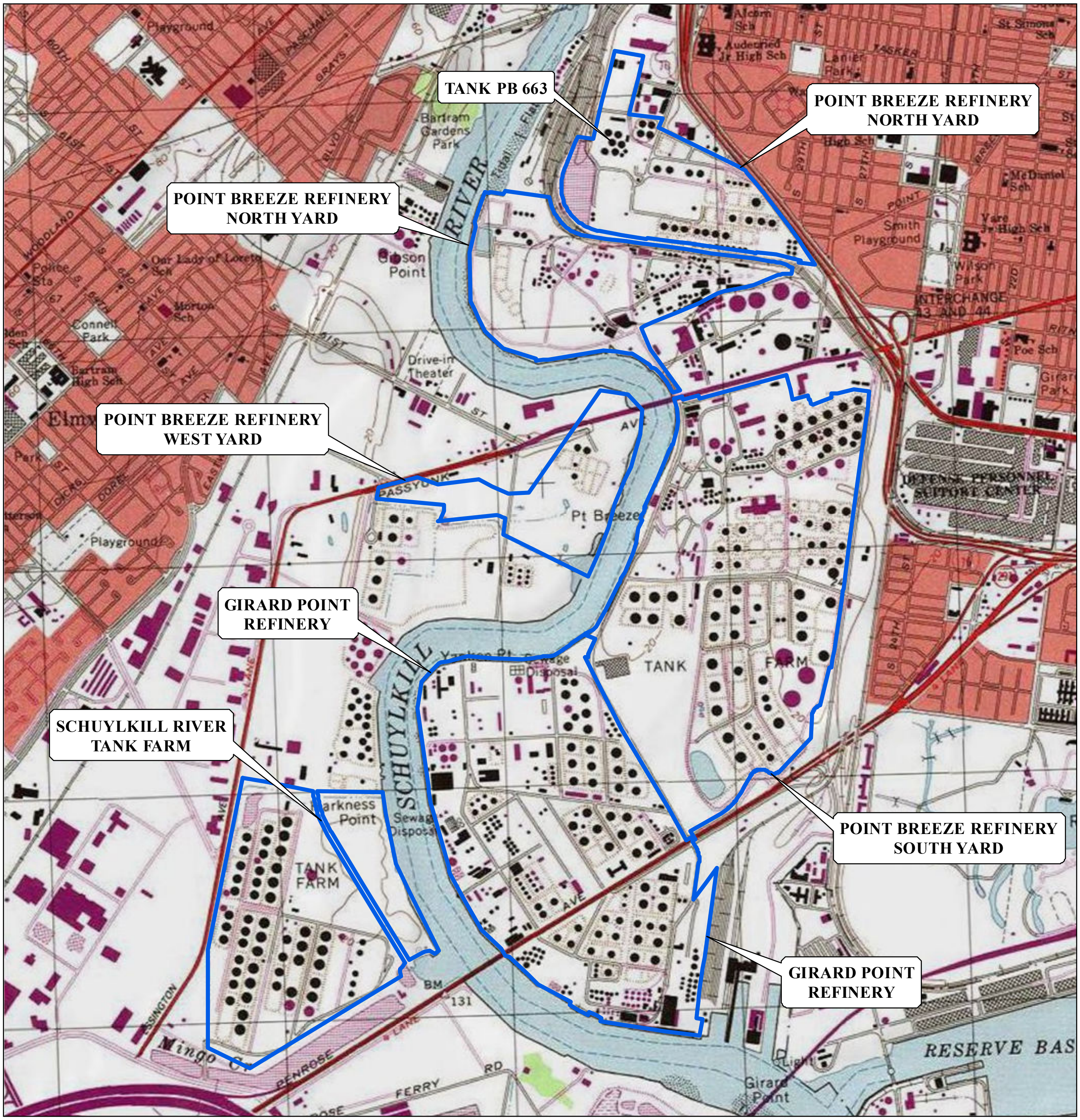
FIGURES

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania



Legend

PHILADELPHIA REFINING COMPLEX

0 1,100 2,200 Feet

1:26,400 (at original document size of 8.5x11)

N

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Source: Stantec
3. Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

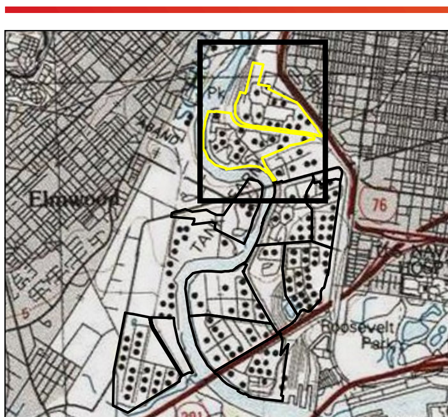
Project Location
City of Philadelphia,
Pennsylvania

213402435
Prepared by GWC on 6/13/2017
Technical Review by JLM on 6/17/2017
Independent Review by JKD on 6/22/2017

Client/Project
PHILADELPHIA REFINERY OPERATIONS, A SERIES OF
EVERGREEN RESOURCES GROUP, LLC
PHILADELPHIA REFINING COMPLEX
3144 PASSYUNK AVENUE
PHILADELPHIA, PA 19145

Figure No.
1

Title
PB 663 SITE LOCATION MAP



LEGEND

- MONITORING WELL
- PROPOSED MONITORING WELL
- DAMAGED MONITORING WELL
- DESTROYED MONITORING WELL
- RECOVERY WELL
- DAMAGED RECOVERY WELL
- WELL UNABLE TO BE LOCATED
- PIEZOMETER
- APPROXIMATE LOCATION OF PHILADELPHIA WATER DEPARTMENT SEWER
- TANK PB 663 (OPEN STORAGE TANK INCIDENT NO. 46786)
- AREA OF INTEREST (AOI)
- AOI 8
- BELMONT TERMINAL

0 550 1,100 Feet
1:6,600 (At Original document size of 11x17)

N

Stantec

EVERGREEN

Project Location
City of Philadelphia,
Philadelphia County,
Pennsylvania

213402435
Prepared by GWC on 6/13/2017
Technical Review by JLM on 6/17/2017
Independent Review by JKD on 6/22/2017

Client/Project
PHILADELPHIA REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC
PHILADELPHIA REFINING COMPLEX
3144 PASSYUNK AVENUE, PHILADELPHIA, PA 19145

Figure No.
2

Title
PB 663 SITE PLAN

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Sources: Stantec
3. Service Layer Credits: Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation
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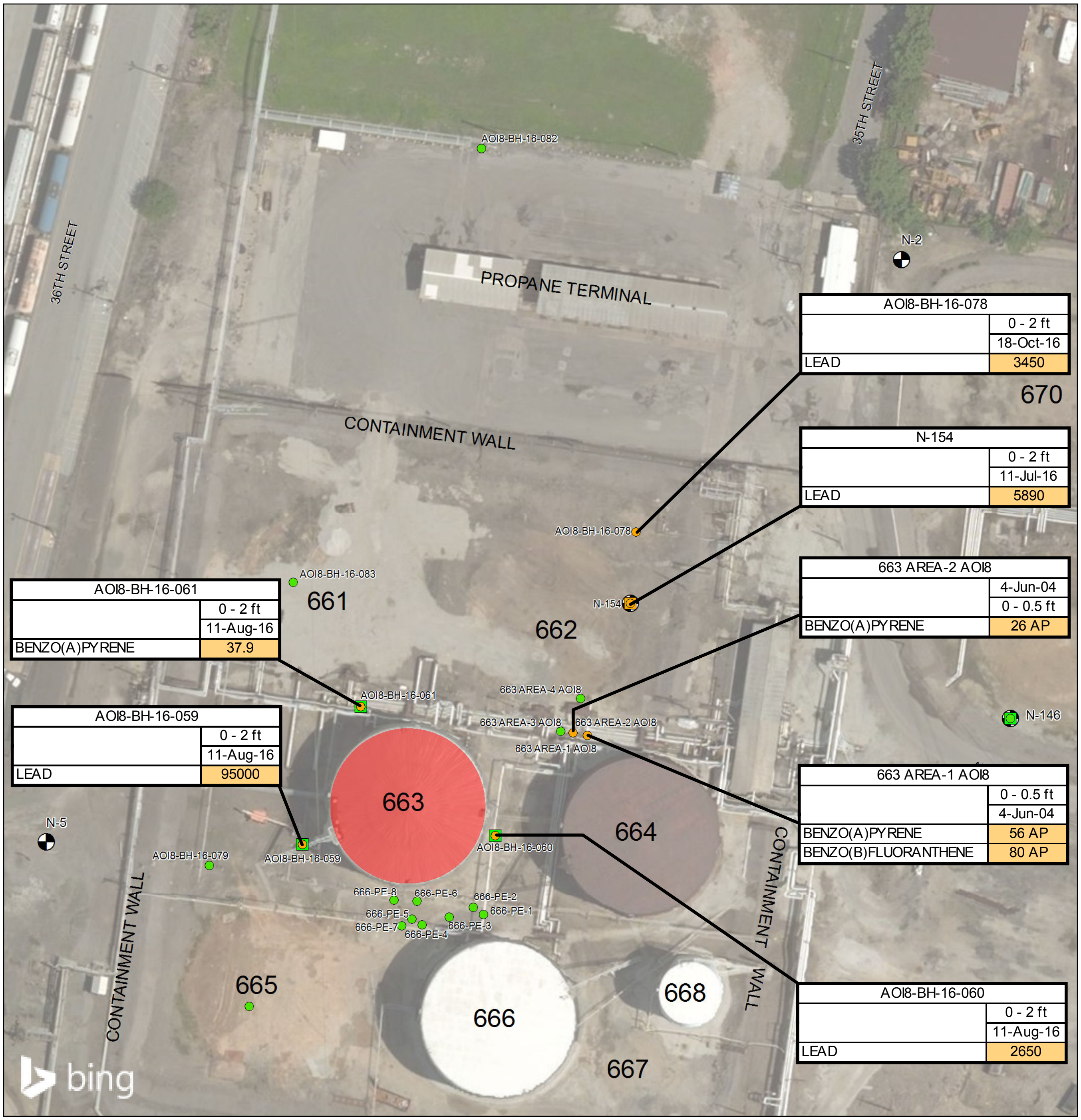


AOI8-BH-16-078	
	0 - 2 ft
	18-Oct-16
LEAD	3450

N-154	
	0 - 2 ft
	11-Jul-16
LEAD	5890

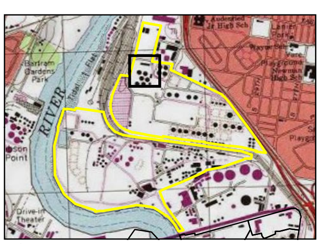
663 AREA-2 AOI8	
	4-Jun-04
	0 - 0.5 ft
BENZO(A)PYRENE	26 AP

AOI8-BH-16-061	
	0 - 2 ft
	11-Aug-16
BENZO(A)PYRENE	37.9

AOI8-BH-16-059	
	0 - 2 ft
	11-Aug-16
LEAD	95000

663 AREA-1 AOI8	
	0 - 0.5 ft
	4-Jun-04
BENZO(A)PYRENE	56 AP
BENZO(B)FLUORANTHENE	80 AP

AOI8-BH-16-060	
	0 - 2 ft
	11-Aug-16
LEAD	2650



LEGEND

- SHALLOW SOIL EXCEEDANCE OF THE PADEP NON-RESIDENTIAL, UNSATURATED STATEWIDE HEALTH STANDARD 0-2'
- NO SHALLOW SOIL EXCEEDANCE OF THE PADEP NON-RESIDENTIAL, UNSATURATED STATEWIDE HEALTH STANDARD 0-2' OR LEAD SITE SPECIFIC STANDARD
- DEEP SOIL EXCEEDANCE OF THE PADEP NON-RESIDENTIAL, UNSATURATED STATEWIDE HEALTH STANDARD GREATER THAN 2'
- NO DEEP SOIL EXCEEDANCE OF THE PADEP NON-RESIDENTIAL, UNSATURATED STATEWIDE HEALTH STANDARD GREATER THAN 2'
- MONITORING WELL
- TANK PB 663 (OPEN STORAGE TANK INCIDENT NO. 46786)
- 26 CONCENTRATION EXCEEDS THE NON-RESIDENTIAL DIRECT CONTACT MEDIUM SPECIFIC CONCENTRATION OR LEAD SITE SPECIFIC STANDARD (2,240 MG/KG)
- AP ATTAINMENT OF REMEDIATION STANDARD HAS BEEN DEMONSTRATED VIA PATHWAY ELIMINATION (I.E. ENGINEERING CONTROLS)

0 20 40 60 80 100 Feet
1:1,200 (at original document size of 8.5x11)

N

Stantec

EVERGREEN

Notes
1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Sources: Stantec
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Project Location 213402435
City of Philadelphia, Philadelphia County, Pennsylvania
Prepared by GWC on 6/13/2017
Technical Review by JLM on 6/17/2017
Independent Review by JKD on 6/22/2017

Client/Project
PHILADELPHIA REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC
PHILADELPHIA REFINING COMPLEX
3144 PASSYUNK AVENUE, PHILADELPHIA, PA 19145

Figure No.
3

Title
SOIL SAMPLE LOCATIONS AND RESULTS PB 663

TABLES

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

Table 1
Soil Analytical Results Summary - Non-Residential Statewide Health Standards
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Sample Location			663 AREA-1 AOI8	663 AREA-2 AOI8	663 AREA-3 AOI8	663 AREA-4 AOI8	AOI8-BH-16-059		AOI8-BH-16-060		AOI8-BH-16-061		AOI8-BH-16-078	AOI8-BH-16-079	AOI8-BH-16-080	AOI8-BH-16-082	AOI8-BH-16-083	N-146		N-154		666-PE-1	666-PE-2	666-PE-3	666-PE-4
Sample Date			4-Jun-04	4-Jun-04	4-Jun-04	4-Jun-04	11-Aug-16	15-Sep-16	11-Aug-16	16-Sep-16	11-Aug-16	16-Sep-16	18-Oct-16	18-Oct-16	18-Oct-16	28-Oct-16	3/28/17	6-Nov-13	7-Nov-13	11-Jul-16	8-Aug-16	14-May-13	14-May-13	14-May-13	14-May-13
Sample ID			663_AREA-1	663_AREA-2	663_AREA-3	663_AREA-4	AOI8-BH-16-059-0-2-20160811	AOI8-BH-16-059-6-8-20160915	AOI8-BH-16-060-0-2-20160811	AOI8-BH-16-060-4-6-20160916	AOI8-BH-16-061-0-2-20160811	AOI8-BH-16-061-6-8-20160916	AOI8-BH-16-078-0-2-20161018	AOI8-BH-16-079-0-2-20161018	AOI8-BH-16-080-0-2-20161018	AOI8-BH-16-082-0-2-20161028	AOI8-BH-16-083-0-2-20170328	AOI-8-N-146-0-2	AOI-8-N-146-17-18	AOI8-N-154-0-2-20160711	AOI8-N-154-10-12-20160808	666-PE-1(0.5-1.0)	666-PE-2(0.25-0.75)	666-PE-3(0.25-0.75)	666-PE-4(0.25-0.75)
Sample Depth			0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 2 ft	6 - 8 ft	0 - 2 ft	4 - 6 ft	0 - 2 ft	6 - 8 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	17 - 18 ft	0 - 2 ft	10 - 12 ft	0.5 - 1 ft	0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	STANTEC	STANTEC	AQUATERRA	AQUATERRA	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			LL	LL	LL	LL	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ACCUTEST	ACCUTEST	ESC	ESC	LL	LL	LL	LL
Laboratory Work Order		PADEP SHS	898750	898750	898750	898750	L853517	L860374	L853517	L860374	L853517	L860374	L866853	L866853	L866853	L869424	L898996	JB52301	JB52677	L846809	L852559	1390120	1390120	1390120	1390120
Laboratory Sample ID	Units	A B	4287056	4287057	4287058	4287059	L853517-01	L860374-05	L853517-02	L860374-06	L853517-03	L860374-07	L866853-01	L866853-02	L866853-03	L869424-01	L898996-01	JB52301-3	JB52677-4	L846809-01	L852559-09	7057322	7057323	7057324	7057325
Volatile Organic Compounds																									
BENZENE	mg/kg	0.5^{AB}	ND (0.057)	ND (0.10)	ND (0.057)	ND (0.0019)	ND (0.00183)	ND (0.00134)	ND (0.0387)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	0.001 J	ND (0.0005)	0.0005 J	ND (0.0005)
CYCLOHEXANE	mg/kg	6900^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.622	ND (0.0298)	ND (0.00126)	-	-	-	-
1,2-DIBROMOETHANE (EDB)	mg/kg	0.005^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	-	-	*ND (0.0102)*	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
1,2-DICHLOROETHANE (EDC)	mg/kg	0.5^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
ETHYLBENZENE	mg/kg	70^{AB}	-	-	-	-	ND (0.00183)	ND (0.00134)	ND (0.0387)	ND (0.00156)	ND (0.00298)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
ISOPROPYLBENZENE (CUMENE)	mg/kg	2500^{AB}	-	-	-	-	ND (0.0133)	ND (0.0134)	ND (0.0141)	ND (0.0156)	ND (0.0394)	ND (0.0131)	-	-	-	-	-	ND (0.0049)	0.562 J	ND (0.298)	ND (0.0126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
METHYL ETHYL KETONE (2-BUTANONE)	mg/kg	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.298)	-	-	-	-	-
METHYL TERTIARY BUTYL ETHER	mg/kg	2^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.0006)	ND (0.0005)	ND (0.0005)	ND (0.0005)
HEXANE	mg/kg	5600^{AB}	-	-	-	-	ND (0.0183)	ND (0.0134)	ND (0.387)	ND (0.0156)	ND (0.0394)	ND (0.0131)	-	-	-	-	-	ND (0.0049)	ND (0.570)	ND (0.298)	ND (0.0126)	-	-	-	-
NAPHTHALENE	mg/kg	25^{AB}	7.8	**31**^{A}	8.1	ND (0.11)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	0.004 J	ND (0.001)
BUTYLBENZENE, SEC-	mg/kg	2800^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.395 J	ND (0.0298)	ND (0.00126)	-	-	-	-
BUTYLBENZENE, TERT-	mg/kg	2200^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.312 J	ND (0.0298)	ND (0.00126)	-	-	-	-
TOLUENE	mg/kg	100^{AB}	-	-	-	-	ND (0.00914)	ND (0.00671)	0.986	ND (0.00781)	ND (0.0197)	ND (0.00653)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.149)	ND (0.00629)	0.008	ND (0.001)	0.003 J	ND (0.001)
1,2,4-TRIMETHYLBENZENE	mg/kg	35^{AB}	-	-	-	-	ND (0.00183)	0.00152	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.150 J	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	0.004 J	ND (0.001)
1,3,5-TRIMETHYLBENZENE	mg/kg	210^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	ND (0.570)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	0.002 J	ND (0.001)
XYLENES, TOTAL (DIMETHYLBENZENE)	mg/kg	1000^{AB}	-	-	-	-	ND (0.00548)	ND (0.00403)	ND (0.116)	ND (0.00469)	ND (0.00895)	ND (0.00392)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0893)	ND (0.00377)	ND (0.001)	ND (0.001)	0.003 J	ND (0.001)
Volatile Organic Compounds (SW8011)																									
1,2-DIBROMOETHANE (EDB)	mg/kg	0.005^{AB}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0028)	ND (0.0030)	-	-	-	-	-	-
Semi-Volatile Organic Compounds																									
ACENAPHTHENE	mg/kg	4700^{AB}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	0.954	-	-	-	-	-	ND (0.037)	0.294	ND (2.43)	ND (20.7)	-	-	-	-
ANTHRACENE	mg/kg	350^{AB}	38	15 J	ND (2.2)	ND (1.9)	ND (8.81)	0.0551	ND (0.464)	ND (0.0515)	19.7	15.5	-	-	-	-	-	0.0493	0.526	ND (2.43)	ND (20.7)	0.78	0.48	2.8	ND (0.069)
BENZO(A)ANTHRACENE	mg/kg	130^{A} 430^{B}	67	27	4.1 J	3.8 J	ND (8.81)	0.279	2.08	ND (0.0515)	47.2	31.5	-	-	-	-	-	0.192	0.640	ND (2.43)	26.9	3.0	1.6	8.6	0.25 J
BENZO(A)PYRENE	mg/kg	12^{A} 46^{B}	**56**^{A} AP	**26**^{A} AP	6.0 J	5.2 J	ND (8.81)	0.257	2.02	ND (0.0515)	**37.9**^{A}	23.8	-	-	-	-	0.123	0.286	0.487	3.55	22.3	2.2	1.6	4.5	0.55
BENZO(B)FLUORANTHENE	mg/kg	76^{A} 170^{B}	**80**^{A} AP	32	6.7 J	4.4 J	ND (8.81)	0.366	3.14	ND (0.0515)	56.6	31.5	-	-	-	-	-	0.330	0.523	2.85	32.0	3.2	1.8	4.9	0.44
BENZO(G,H,I)PERYLENE	mg/kg	180^{AB}	40	23 J	6.5 J	6.0 J	ND (8.81)	0.0995	ND (0.929)	ND (0.0515)	ND (16.7)	4.93	-	-	-	-	-	0.525	0.404	ND (2.43)	ND (20.7)	1.3	1.1	2.1	0.48
BENZO(K)FLUORANTHENE	mg/kg	76^{A} 610^{B}	-	-	-	-	ND (8.81)	0.145	1.01	ND (0.0515)	20.0	11.6	-	-	-	-	-	0.0987	0.108	ND (2.43)	ND (20.7)	-	-	-	-
1,1'-BIPHENYL	mg/kg	190^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (3.70)	-	-	-	-
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	130^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (6.07)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (7.54)	-	-	-	-
DI-N-BUTYL PHTHALATE	mg/kg	4900^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-
CHRYSENE	mg/kg	230^{AB}	52	24	5.6 J	10 J	ND (8.81)	0.233	1.77	ND (0.0515)	50.0	27.5	-	-	-	-	-	0.285	1.09	4.16	26.3	3.2	1.6	13	0.66
DIBENZ(A,H)ANTHRACENE	mg/kg	22^{A} 270^{B}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.929)	ND (0.0515)	ND (16.7)	2.01	-	-	-	-	-	0.0946	0.154	ND (2.43)	ND (20.7)	-	-	-	-
DIETHYL PHTHALATE	mg/kg	9300^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-
2,4-DIMETHYLPHENOL	mg/kg	230^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.180)	ND (0.180)	ND (24.5)	ND (209)	-	-	-	-
2,4-DINITROPHENOL	mg/kg	23^{AB}	-	-	-	-	*ND (26.2)*	ND (0.447)	ND (4.69)	ND (0.520)	*ND (49.5)*	ND (8.44)	-	-	-	-	-	ND (0.740)	ND (0.730)	ND (7.20)	*ND (61.6)*	-	-	-	-
FLUORANTHENE	mg/kg	3200^{AB}	-	-	-	-	ND (8.81)	0.456	3.71	ND (0.0515)	98.1	70.3	-	-	-	-	-	0.317	1.04	ND (2.43) OE	64.0	-	-	-	-
FLUORENE	mg/kg	3800^{AB}	26	29	5.9 J	ND (1.9)	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	3.03	-	-	-	-	-	ND (0.037)	1.05	ND (2.43)	ND (20.7)	0.20 J	0.11	0.86	ND (0.069)
INDENO(1,2,3-C,D)PYRENE	mg/kg	76^{A} 22000^{B}	-	-	-	-	ND (8.81)	0.103	ND (0.929)	ND (0.0515)	ND (16.7)	5.95	-	-	-	-	-	0.265	0.245	ND (2.43)	ND (20.7)	-	-	-	-
2-METHYLNAPHTHALENE	mg/kg	1900^{AB}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	ND (0.837)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (2.43)	ND (20.7)	-	-	-	-
CRESOL, M,P- (3&4-METHYLPHENOL)	mg/kg	58*^{AB}	-	-	-	-	ND (2.09)	ND (0.447)	ND (4.69)	ND (0.520)	ND (3.97)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (4.93)	-	-	-	-
CRESOL, O- (2-METHYLPHENOL)	mg/kg	580^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-
NAPHTHALENE	mg/kg	25^{AB}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	ND (0.837)	-	-	-	-	-	ND (0.037)	ND (0.036)	ND (2.43)	ND (20.7)	-	-	-	-
4-NITROPHENOL	mg/kg	6^{AB}	-	-	-	-	*ND (14.0)*	ND (0.447)	ND (4.69)	ND (0.520)	*ND (26.5)*	ND (1.33)	-	-	-	-	-	ND (0.370)	ND (0.360)	ND (3.85)	*ND (32.9)*	-	-	-	-
PHENANTHRENE	mg/kg	10000^{AB}	150	99	14 J	ND (1.9)	ND (8.81)	0.237	1.94	ND (0.0515)	77.5	51.3	-	-	-	-	-	0.134	3.21	ND (2.43)	56.4	3.3	1.6	12	0.27 J
PHENOL	mg/kg	200^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (4.38)	-	-	-	-
PYRENE	mg/kg	2200^{AB}	110	50	ND (2.2)	18 J	ND (8.81)	0.379	3.70	ND (0.0515)	68.5	55.5	-	-	-	-	-	0.256	1.21	ND (2.43)	51.7	4.7	2.3	12	0.64
PYRIDINE	mg/kg	12^{AB}	-	-	-	-	*ND (16.8)*	ND (0.447)	ND (4.69)	ND (0.520)	*ND (31.8)*	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (4.61)	*ND (39.5)*	-	-	-	-
QUINOLINE	mg/kg	0.37^{AB}	-	-	-	-	*ND (15.3)*	ND (0.0771) OE	*ND (1.62)*	ND (0.0897) OE	*ND (29.1)*	*ND (2.92) OE*	-	-	-	-	-	ND (0.180)	ND (0.180)	*ND (4.22) OE*	*ND (36.1)*	-	-	-	-
Metals																									
ARSENIC	mg/kg	29^{AB}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.29	-
COBALT	mg/kg	160^{AB}	-	-	-	-	20.3	2.05	9.73	7.84	ND (12.6)	8.23	-	-	-	-	-	6.8	13.3	ND (7.35)	8.65	-	-	-	-
LEAD	mg/kg	450^{AB}	-	-	-	-	**95000**^{A}	152	**2650**^{A}	245	**1320**^{A}	149	**3450**^{A}	**1030**^{A}	36.8	38.8	-	125	31.9	**5890**^{A}	327	**636**^{A}	**687**^{A}	198	107
NICKEL	mg/kg	650^{AB}	-	-	-	-	211	12.0	24.6	7.92	36.9	14.4	-	-	-	-	-	47.3	20.2	ND (14.7)	35.4	-	-	-	-
VANADIUM	mg/kg	220^{A} 820^{B}	-	-	-	-	47.5	6.45	36.6	15.6	30.4	44.8	-	-	-	-	-	41.4	24.5	24.1	47.0	-	-	-	-
ZINC	mg/kg	12000^{AB}	-	-	-	-	4510	288	2430	117	1550	423	-	-	-	-	-	190	75.0	2220	**12200**^{B}	-	-	-	-

See last page for notes.

Table 1
Soil Analytical Results Summary - Non-Residential Statewide Health Standards
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Sample Location			666-PE-5	666-PE-6	666-PE-7	666-PE-8
Sample Date			14-May-13	14-May-13	14-May-13	14-May-13
Sample ID			666-PE-5(0.25-0.75)	666-PE-6(0.25-0.75)	666-PE-7(0.25-0.75)	666-PE-8(0.25-0.75)
Sample Depth			0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			LL	LL	LL	LL
Laboratory Work Order		PADEP SHS	1390120	1390120	1390120	1390120
Laboratory Sample ID	Units	A B	7057326	7057327	7057328	7057329
Volatile Organic Compounds						
BENZENE	mg/kg	0.5^{AB}	0.001 J	0.023	0.0006 J	0.0005 J
CYCLOHEXANE	mg/kg	6900^{AB}	-	-	-	-
1,2-DIBROMOETHANE (EDB)	mg/kg	0.005^{AB}	ND (0.0009)	ND (0.001)	ND (0.0009)	ND (0.001)
1,2-DICHLOROETHANE (EDC)	mg/kg	0.5^{AB}	ND (0.0009)	ND (0.001)	ND (0.0009)	ND (0.001)
ETHYLBENZENE	mg/kg	70^{AB}	0.006	0.26	ND (0.0009)	ND (0.001)
ISOPROPYLBENZENE (CUMENE)	mg/kg	2500^{AB}	ND (0.0009)	0.021	ND (0.0009)	ND (0.001)
METHYL ETHYL KETONE (2-BUTANONE)	mg/kg	n/v	-	-	-	-
METHYL TERTIARY BUTYL ETHER	mg/kg	2^{AB}	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
HEXANE	mg/kg	5600^{AB}	-	-	-	-
NAPHTHALENE	mg/kg	25^{AB}	0.040	0.97	ND (0.0009)	ND (0.001)
BUTYLBENZENE, SEC-	mg/kg	2800^{AB}	-	-	-	-
BUTYLBENZENE, TERT-	mg/kg	2200^{AB}	-	-	-	-
TOLUENE	mg/kg	100^{AB}	0.013	0.21 J	0.003 J	ND (0.001)
1,2,4-TRIMETHYLBENZENE	mg/kg	35^{AB}	0.22	2.2	ND (0.0009)	ND (0.001)
1,3,5-TRIMETHYLBENZENE	mg/kg	210^{AB}	0.13	0.95	ND (0.0009)	ND (0.001)
XYLENES, TOTAL (DIMETHYLBENZENE)	mg/kg	1000^{AB}	0.048	1.8	ND (0.0009)	ND (0.001)
Volatile Organic Compounds (SW8011)						
1,2-DIBROMOETHANE (EDB)	mg/kg	0.005^{AB}	-	-	-	-
Semi-Volatile Organic Compounds						
ACENAPHTHENE	mg/kg	4700^{AB}	-	-	-	-
ANTHRACENE	mg/kg	350^{AB}	0.60	3.6	0.57	0.059
BENZO(A)ANTHRACENE	mg/kg	130^{A} 430^{B}	4.5	29	2.0	0.19
BENZO(A)PYRENE	mg/kg	12^{A} 46^{B}	2.1	12	2.0	0.20
BENZO(B)FLUORANTHENE	mg/kg	76^{A} 170^{B}	1.4	7.7	2.5	0.25
BENZO(G,H,I)PERYLENE	mg/kg	180^{AB}	0.94	3.5	1.3	0.14
BENZO(K)FLUORANTHENE	mg/kg	76^{A} 610^{B}	-	-	-	-
1,1'-BIPHENYL	mg/kg	190^{AB}	-	-	-	-
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	130^{AB}	-	-	-	-
DI-N-BUTYL PHTHALATE	mg/kg	4900^{AB}	-	-	-	-
CHRYSENE	mg/kg	230^{AB}	8.8	52	2.0	0.24
DIBENZ(A,H)ANTHRACENE	mg/kg	22^{A} 270^{B}	-	-	-	-
DIETHYL PHTHALATE	mg/kg	9300^{AB}	-	-	-	-
2,4-DIMETHYLPHENOL	mg/kg	230^{AB}	-	-	-	-
2,4-DINITROPHENOL	mg/kg	23^{AB}	-	-	-	-
FLUORANTHENE	mg/kg	3200^{AB}	-	-	-	-
FLUORENE	mg/kg	3800^{AB}	0.47	3.6	0.14 J	0.009 J
INDENO(1,2,3-C,D)PYRENE	mg/kg	76^{A} 22000^{B}	-	-	-	-
2-METHYLNAPHTHALENE	mg/kg	1900^{AB}	-	-	-	-
CRESOL, M,P- (3&4-METHYLPHENOL)	mg/kg	58^{*AB}	-	-	-	-
CRESOL, O- (2-METHYLPHENOL)	mg/kg	580^{AB}	-	-	-	-
NAPHTHALENE	mg/kg	25^{AB}	-	-	-	-
4-NITROPHENOL	mg/kg	6^{AB}	-	-	-	-
PHENANTHRENE	mg/kg	10000^{AB}	3.0	24	2.2	0.15
PHENOL	mg/kg	200^{AB}	-	-	-	-
PYRENE	mg/kg	2200^{AB}	4.8	25	2.9	0.29
PYRIDINE	mg/kg	12^{AB}	-	-	-	-
QUINOLINE	mg/kg	0.37^{AB}	-	-	-	-
Metals						
ARSENIC	mg/kg	29^{AB}	-	-	-	ND (1.65)
COBALT	mg/kg	160^{AB}	-	-	-	-
LEAD	mg/kg	450^{AB}	26.0	311	***2200*** ^{A}	110
NICKEL	mg/kg	650^{AB}	-	-	-	-
VANADIUM	mg/kg	220^{A} 820^{B}	-	-	-	-
ZINC	mg/kg	12000^{AB}	-	-	-	-

See last page for notes.

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Table 1
Soil Analytical Results Summary - Non-Residential Statewide Health Standards
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Notes:

PADEP SHS	Pennsylvania Department of Environmental Protection - Statewide Health Standards
A	PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil)
B	PADEP Non-Residential Statewide Health Standards (>2 ft bgs) (Unsaturated Soil)
6.5 A	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
ND (0.50)	Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available.
ND (0.03)	Indicates concentration not detected above the laboratory reporting limit (in parentheses) except when the reporting limit is greater than the standard in which case the method detection limit is listed in parentheses.
n/v	No standard/guideline value
-	Parameter not analyzed / not available
*	Cresol, m&p (3-Methylphenol & 4-Methylphenol) co-elute and are reported as the summation of the co-eluting compounds. Standards shown are the stricter of the two.
J	Indicates an estimated value
OE	The associated batch QC was outside the established quality control range for precision/accuracy.
AP	Attainment of remediation standard has been demonstrated via pathway elimination (i.e. engineering controls).
mg/kg	milligrams per kilogram
LL	Eurofins Lancaster Laboratories Environmental
ESC	ESC Lab Sciences

Table 2
Soil Analytical Results Summary - Non-Residential Direct Contact Medium-Specific Concentrations
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Sample Location			663 AREA-1 AOI8	663 AREA-2 AOI8	663 AREA-3 AOI8	663 AREA-4 AOI8	AOI8-BH-16-059		AOI8-BH-16-060		AOI8-BH-16-061		AOI8-BH-16-078	AOI8-BH-16-079	AOI8-BH-16-080	AOI8-BH-16-082	AOI8-BH-16-083	N-146		N-154		666-PE-1	666-PE-2	666-PE-3	666-PE-4	666-PE-5
Sample Date			4-Jun-04	4-Jun-04	4-Jun-04	4-Jun-04	11-Aug-16	15-Sep-16	11-Aug-16	16-Sep-16	11-Aug-16	16-Sep-16	18-Oct-16	18-Oct-16	18-Oct-16	28-Oct-16	3/28/17	6-Nov-13	7-Nov-13	11-Jul-16	8-Aug-16	14-May-13	14-May-13	14-May-13	14-May-13	14-May-13
Sample ID			663_AREA-1	663_AREA-2	663_AREA-3	663_AREA-4	AOI8-BH-16-059-0-2-20160811	AOI8-BH-16-059-6-8-20160915	AOI8-BH-16-060-0-2-20160811	AOI8-BH-16-060-4-6-20160916	AOI8-BH-16-061-0-2-20160811	AOI8-BH-16-061-6-8-20160916	AOI8-BH-16-078-0-2-20161018	AOI8-BH-16-079-0-2-20161018	AOI8-BH-16-080-0-2-20161018	AOI8-BH-16-082-0-2-20161028	AOI8-BH-16-083-0-2-20170328	AOI-8-N-146-0-2	AOI-8-N-146-17-18	AOI8-N-154-0-2-20160711	AOI8-N-154-10-12-20160808	666-PE-1(0.5-1.0)	666-PE-2(0.25-0.75)	666-PE-3(0.25-0.75)	666-PE-4(0.25-0.75)	666-PE-5(0.25-0.75)
Sample Depth			0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 2 ft	6 - 8 ft	0 - 2 ft	4 - 6 ft	0 - 2 ft	6 - 8 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	0 - 2 ft	17 - 18 ft	0 - 2 ft	10 - 12 ft	0.5 - 1 ft	0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	AQUATERRA	STANTEC	STANTEC	AQUATERRA	AQUATERRA	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			LL	LL	LL	LL	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ESC	ACCUTEST	ACCUTEST	ESC	ESC	LL	LL	LL	LL	LL
Laboratory Work Order		PADEP MSC	898750	898750	898750	898750	L853517	L860374	L853517	L860374	L853517	L860374	L866853	L866853	L866853	L869424	L898996	JB52301	JB52677	L846809	L852559	1390120	1390120	1390120	1390120	1390120
Laboratory Sample ID	Units	A B	4287056	4287057	4287058	4287059	L853517-01	L860374-05	L853517-02	L860374-06	L853517-03	L860374-07	L866853-01	L866853-02	L866853-03	L869424-01	L898996-01	JB52301-3	JB52677-4	L846809-01	L852559-09	7057322	7057323	7057324	7057325	7057326
Volatile Organic Compounds																										
BENZENE	mg/kg	290^{A} 330^{B}	ND (0.057)	ND (0.10)	ND (0.057)	ND (0.0019)	ND (0.00183)	ND (0.00134)	ND (0.0387)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	0.001 J	ND (0.0005)	0.0005 J	ND (0.0005)	0.001 J
CYCLOHEXANE	mg/kg	10000^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.622	ND (0.0298)	ND (0.00126)	-	-	-	-	-
1,2-DIBROMOETHANE (EDB)	mg/kg	3.7^{A} 4.3^{B}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	-	-	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0009)
1,2-DICHLOROETHANE (EDC)	mg/kg	86^{A} 98^{B}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0009)
ETHYLBENZENE	mg/kg	890^{A} 1000^{B}	-	-	-	-	ND (0.00183)	ND (0.00134)	ND (0.0387)	ND (0.00156)	ND (0.00298)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.006
ISOPROPYLBENZENE (CUMENE)	mg/kg	10000^{AB}	-	-	-	-	ND (0.0133)	ND (0.0134)	ND (0.0141)	ND (0.0156)	ND (0.0394)	ND (0.0131)	-	-	-	-	-	ND (0.0049)	0.562 J	ND (0.298)	ND (0.0126)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0009)
METHYL ETHYL KETONE (2-BUTANONE)	mg/kg	10000^{AB}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.298)	-	-	-	-	-	-
METHYL TERTIARY BUTYL ETHER	mg/kg	8600^{A} 9900^{B}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0298)	ND (0.00126)	ND (0.0006)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
HEXANE	mg/kg	10000^{AB}	-	-	-	-	ND (0.0183)	ND (0.0134)	ND (0.387)	ND (0.0156)	ND (0.0394)	ND (0.0131)	-	-	-	-	-	ND (0.0049)	ND (0.570)	ND (0.298)	ND (0.0126)	-	-	-	-	-
NAPHTHALENE	mg/kg	760^{A} 190000^{B}	7.8	31	8.1	ND (0.11)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	0.004 J	ND (0.001)	0.040
BUTYLBENZENE, SEC-	mg/kg	10000^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.395 J	ND (0.0298)	ND (0.00126)	-	-	-	-	-
BUTYLBENZENE, TERT-	mg/kg	10000^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.312 J	ND (0.0298)	ND (0.00126)	-	-	-	-	-
TOLUENE	mg/kg	10000^{AB}	-	-	-	-	ND (0.00914)	ND (0.00671)	0.986	ND (0.00781)	ND (0.0197)	ND (0.00653)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.149)	ND (0.00629)	0.008	ND (0.001)	0.003 J	ND (0.001)	0.013
1,2,4-TRIMETHYLBENZENE	mg/kg	560^{A} 640^{B}	-	-	-	-	ND (0.00183)	0.00152	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	0.150 J	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	0.004 J	ND (0.001)	0.22
1,3,5-TRIMETHYLBENZENE	mg/kg	10000^{AB}	-	-	-	-	ND (0.00133)	ND (0.00134)	ND (0.00141)	ND (0.00156)	ND (0.00394)	ND (0.00131)	-	-	-	-	-	ND (0.0049)	ND (0.570)	ND (0.0298)	ND (0.00126)	ND (0.001)	ND (0.001)	0.002 J	ND (0.001)	0.13
XYLENES, TOTAL (DIMETHYLBENZENE)	mg/kg	8000^{A} 9100^{B}	-	-	-	-	ND (0.00548)	ND (0.00403)	ND (0.116)	ND (0.00469)	ND (0.00895)	ND (0.00392)	-	-	-	-	-	ND (0.00098)	ND (0.110)	ND (0.0893)	ND (0.00377)	ND (0.001)	ND (0.001)	0.003 J	ND (0.001)	0.048
Volatile Organic Compounds (SW8011)																										
1,2-DIBROMOETHANE (EDB)	mg/kg	3.7^{A} 4.3^{B}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0028)	ND (0.0030)	-	-	-	-	-	-	-
Semi-Volatile Organic Compounds																										
ACENAPHTHENE	mg/kg	190000^{AB}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	0.954	-	-	-	-	-	ND (0.037)	0.294	ND (2.43)	ND (20.7)	-	-	-	-	-
ANTHRACENE	mg/kg	190000^{AB}	38	15 J	ND (2.2)	ND (1.9)	ND (8.81)	0.0551	ND (0.464)	ND (0.0515)	19.7	15.5	-	-	-	-	-	0.0493	0.526	ND (2.43)	ND (20.7)	0.78	0.48	2.8	ND (0.069)	0.60
BENZO(A)ANTHRACENE	mg/kg	130^{A} 190000^{B}	67	27	4.1 J	3.8 J	ND (8.81)	0.279	2.08	ND (0.0515)	47.2	31.5	-	-	-	-	-	0.192	0.640	ND (2.43)	26.9	3.0	1.6	8.6	0.25 J	4.5
BENZO(A)PYRENE	mg/kg	12^{A} 190000^{B}	***56*** ^{A} ***AP***	***26*** ^{A} ***AP***	6.0 J	5.2 J	ND (8.81)	0.257	2.02	ND (0.0515)	***37.9*** ^{A}	23.8	-	-	-	-	0.123	0.286	0.487	3.55	22.3	2.2	1.6	4.5	0.55	2.1
BENZO(B)FLUORANTHENE	mg/kg	76^{A} 190000^{B}	***80*** ^{A} ***AP***	32	6.7 J	4.4 J	ND (8.81)	0.366	3.14	ND (0.0515)	56.6	31.5	-	-	-	-	-	0.330	0.523	2.85	32.0	3.2	1.8	4.9	0.44	1.4
BENZO(G,H,I)PERYLENE	mg/kg	190000^{AB}	40	23 J	6.5 J	6.0 J	ND (8.81)	0.0995	ND (0.929)	ND (0.0515)	ND (16.7)	4.93	-	-	-	-	-	0.525	0.404	ND (2.43)	ND (20.7)	1.3	1.1	2.1	0.48	0.94
BENZO(K)FLUORANTHENE	mg/kg	76^{A} 190000^{B}	-	-	-	-	ND (8.81)	0.145	1.01	ND (0.0515)	20.0	11.6	-	-	-	-	-	0.0987	0.108	ND (2.43)	ND (20.7)	-	-	-	-	-
1,1'-BIPHENYL	mg/kg	11000^{A} 190000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	6500^{A} 10000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
DI-N-BUTYL PHTHALATE	mg/kg	10000^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
CHRYSENE	mg/kg	760^{A} 190000^{B}	52	24	5.6 J	10 J	ND (8.81)	0.233	1.77	ND (0.0515)	50.0	27.5	-	-	-	-	-	0.285	1.09	4.16	26.3	3.2	1.6	13	0.66	8.8
DIBENZ(A,H)ANTHRACENE	mg/kg	22^{A} 190000^{B}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.929)	ND (0.0515)	ND (16.7)	2.01	-	-	-	-	-	0.0946	0.154	ND (2.43)	ND (20.7)	-	-	-	-	-
DIETHYL PHTHALATE	mg/kg	10000^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
2,4-DIMETHYLPHENOL	mg/kg	10000^{AB}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.180)	ND (0.180)	ND (24.5)	ND (209)	-	-	-	-	-
2,4-DINITROPHENOL	mg/kg	6400^{A} 190000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.740)	ND (0.730)	ND (24.5)	ND (209)	-	-	-	-	-
FLUORANTHENE	mg/kg	130000^{A} 190000^{B}	-	-	-	-	ND (8.81)	0.456	3.71	ND (0.0515)	98.1	70.3	-	-	-	-	-	0.317	1.04	ND (2.43) OE	64.0	-	-	-	-	-
FLUORENE	mg/kg	130000^{A} 190000^{B}	26	29	5.9 J	ND (1.9)	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	3.03	-	-	-	-	-	ND (0.037)	1.05	ND (2.43)	ND (20.7)	0.20 J	0.11	0.86	ND (0.069)	0.47
INDENO(1,2,3-C,D)PYRENE	mg/kg	76^{A} 190000^{B}	-	-	-	-	ND (8.81)	0.103	ND (0.929)	ND (0.0515)	ND (16.7)	5.95	-	-	-	-	-	0.265	0.245	ND (2.43)	ND (20.7)	-	-	-	-	-
2-METHYLNAPHTHALENE	mg/kg	13000^{A} 190000^{B}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	ND (0.837)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (2.43)	ND (20.7)	-	-	-	-	-
CRESOL, M,P- (3&4-METHYLPHENOL)	mg/kg	$10000*^{AB}$	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
CRESOL, O- (2-METHYLPHENOL)	mg/kg	160000^{A} 190000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
NAPHTHALENE	mg/kg	760^{A} 190000^{B}	-	-	-	-	ND (8.81)	ND (0.0443)	ND (0.464)	ND (0.0515)	ND (16.7)	ND (0.837)	-	-	-	-	-	ND (0.037)	ND (0.036)	ND (2.43)	ND (20.7)	-	-	-	-	-
4-NITROPHENOL	mg/kg	26000^{A} 190000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.370)	ND (0.360)	ND (24.5)	ND (209)	-	-	-	-	-
PHENANTHRENE	mg/kg	190000^{AB}	150	99	14 J	ND (1.9)	ND (8.81)	0.237	1.94	ND (0.0515)	77.5	51.3	-	-	-	-	-	0.134	3.21	ND (2.43)	56.4	3.3	1.6	12	0.27 J	3.0
PHENOL	mg/kg	16000^{A} 18000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
PYRENE	mg/kg	96000^{A} 190000^{B}	110	50	ND (2.2)	18 J	ND (8.81)	0.379	3.70	ND (0.0515)	68.5	55.5	-	-	-	-	-	0.256	1.21	ND (2.43)	51.7	4.7	2.3	12	0.64	4.8
PYRIDINE	mg/kg	3200^{A} 10000^{B}	-	-	-	-	ND (88.9)	ND (0.447)	ND (4.69)	ND (0.520)	ND (168)	ND (8.44)	-	-	-	-	-	ND (0.074)	ND (0.073)	ND (24.5)	ND (209)	-	-	-	-	-
QUINOLINE	mg/kg	30^{A} 10000^{B}	-	-	-	-	ND (15.3)	ND (0.447) OE	ND (9.37)	ND (0.520) OE	ND (29.1)	ND (16.9) OE	-	-	-	-	-	ND (0.180)	ND (0.180)	ND (24.5) OE	*ND (36.1)*	-	-	-	-	-
Metals																										
ARSENIC	mg/kg	61^{A} 190000^{B}	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.29	-	-
COBALT	mg/kg	960^{A} 190000^{B}	-	-	-	-	20.3	2.05	9.73	7.84	ND (12.6)	8.23	-	-	-	-	-	6.8	13.3	ND (7.35)	8.65	-	-	-	-	-
LEAD	mg/kg	2240^{A} 190000^{B}	-	-	-	-	***95000*** ^{A}	152	***2650*** ^{A}	245	1320	149	***3450*** ^{A}	1030	36.8	38.8	-	125	31.9	***5890*** ^{A}	327	636	687	198	107	26.0
NICKEL	mg/kg	64000^{A} 190000^{B}	-	-	-	-	211	12.0	24.6	7.92	36.9	14.4	-	-	-	-	-	47.3	20.2	ND (14.7)	35.4	-	-	-	-	-
VANADIUM	mg/kg	220^{A} 190000^{B}	-	-	-	-	47.5	6.45	36.6	15.6	30.4	44.8	-	-	-	-	-	41.4	24.5	24.1	47.0	-	-	-	-	-
ZINC	mg/kg	190000^{AB}	-	-	-	-	4510	288	2430	117	1550	423	-	-	-	-	-	190	75.0	2220	12200	-	-	-	-	-

See notes on last page.

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Table 2
Soil Analytical Results Summary - Non-Residential Direct Contact Medium-Specific Concentrations
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Sample Location			666-PE-6	666-PE-7	666-PE-8
Sample Date			14-May-13	14-May-13	14-May-13
Sample ID			666-PE-6(0.25-0.75)	666-PE-7(0.25-0.75)	666-PE-8(0.25-0.75)
Sample Depth			0.25 - 0.75 ft	0.25 - 0.75 ft	0.25 - 0.75 ft
Sampling Company			STANTEC	STANTEC	STANTEC
Laboratory			LL	LL	LL
Laboratory Work Order		PADEP MSC	1390120	1390120	1390120
Laboratory Sample ID	Units	A B	7057327	7057328	7057329
Volatile Organic Compounds					
BENZENE	mg/kg	290[A] 330[B]	0.023	0.0006 J	0.0005 J
CYCLOHEXANE	mg/kg	10000[AB]	-	-	-
1,2-DIBROMOETHANE (EDB)	mg/kg	3.7[A] 4.3[B]	ND (0.001)	ND (0.0009)	ND (0.001)
1,2-DICHLOROETHANE (EDC)	mg/kg	86[A] 98[B]	ND (0.001)	ND (0.0009)	ND (0.001)
ETHYLBENZENE	mg/kg	890[A] 1000[B]	0.26	ND (0.0009)	ND (0.001)
ISOPROPYLBENZENE (CUMENE)	mg/kg	10000[AB]	0.021	ND (0.0009)	ND (0.001)
METHYL ETHYL KETONE (2-BUTANONE)	mg/kg	10000[AB]	-	-	-
METHYL TERTIARY BUTYL ETHER	mg/kg	8600[A] 9900[B]	ND (0.0005)	ND (0.0005)	ND (0.0005)
HEXANE	mg/kg	10000[AB]	-	-	-
NAPHTHALENE	mg/kg	760[A] 190000[B]	0.97	ND (0.0009)	ND (0.001)
BUTYLBENZENE, SEC-	mg/kg	10000[AB]	-	-	-
BUTYLBENZENE, TERT-	mg/kg	10000[AB]	-	-	-
TOLUENE	mg/kg	10000[AB]	0.21 J	0.003 J	ND (0.001)
1,2,4-TRIMETHYLBENZENE	mg/kg	560[A] 640[B]	2.2	ND (0.0009)	ND (0.001)
1,3,5-TRIMETHYLBENZENE	mg/kg	10000[AB]	0.95	ND (0.0009)	ND (0.001)
XYLENES, TOTAL (DIMETHYLBENZENE)	mg/kg	8000[A] 9100[B]	1.8	ND (0.0009)	ND (0.001)
Volatile Organic Compounds (SW8011)					
1,2-DIBROMOETHANE (EDB)	mg/kg	3.7[A] 4.3[B]	-	-	-
Semi-Volatile Organic Compounds					
ACENAPHTHENE	mg/kg	190000[AB]	-	-	-
ANTHRACENE	mg/kg	190000[AB]	3.6	0.57	0.059
BENZO(A)ANTHRACENE	mg/kg	130[A] 190000[B]	29	2.0	0.19
BENZO(A)PYRENE	mg/kg	12[A] 190000[B]	12	2.0	0.20
BENZO(B)FLUORANTHENE	mg/kg	76[A] 190000[B]	7.7	2.5	0.25
BENZO(G,H,I)PERYLENE	mg/kg	190000[AB]	3.5	1.3	0.14
BENZO(K)FLUORANTHENE	mg/kg	76[A] 190000[B]	-	-	-
1,1'-BIPHENYL	mg/kg	11000[A] 190000[B]	-	-	-
BIS(2-ETHYLHEXYL) PHTHALATE	mg/kg	6500[A] 10000[B]	-	-	-
DI-N-BUTYL PHTHALATE	mg/kg	10000[AB]	-	-	-
CHRYSENE	mg/kg	760[A] 190000[B]	52	2.0	0.24
DIBENZ(A,H)ANTHRACENE	mg/kg	22[A] 190000[B]	-	-	-
DIETHYL PHTHALATE	mg/kg	10000[AB]	-	-	-
2,4-DIMETHYLPHENOL	mg/kg	10000[AB]	-	-	-
2,4-DINITROPHENOL	mg/kg	6400[A] 190000[B]	-	-	-
FLUORANTHENE	mg/kg	130000[A] 190000[B]	-	-	-
FLUORENE	mg/kg	130000[A] 190000[B]	3.6	0.14 J	0.009 J
INDENO(1,2,3-C,D)PYRENE	mg/kg	76[A] 190000[B]	-	-	-
2-METHYLNAPHTHALENE	mg/kg	13000[A] 190000[B]	-	-	-
CRESOL, M,P- (3&4-METHYLPHENOL)	mg/kg	10000*[AB]	-	-	-
CRESOL, O- (2-METHYLPHENOL)	mg/kg	160000[A] 190000[B]	-	-	-
NAPHTHALENE	mg/kg	760[A] 190000[B]	-	-	-
4-NITROPHENOL	mg/kg	26000[A] 190000[B]	-	-	-
PHENANTHRENE	mg/kg	190000[AB]	24	2.2	0.15
PHENOL	mg/kg	16000[A] 18000[B]	-	-	-
PYRENE	mg/kg	96000[A] 190000[B]	25	2.9	0.29
PYRIDINE	mg/kg	3200[A] 10000[B]	-	-	-
QUINOLINE	mg/kg	30[A] 10000[B]	-	-	-
Metals					
ARSENIC	mg/kg	61[A] 190000[B]	-	-	ND (1.65)
COBALT	mg/kg	960[A] 190000[B]	-	-	-
LEAD	mg/kg	2240[A] 190000[B]	311	2200	110
NICKEL	mg/kg	64000[A] 190000[B]	-	-	-
VANADIUM	mg/kg	220[A] 190000[B]	-	-	-
ZINC	mg/kg	190000[AB]	-	-	-

See notes on last page.

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Table 2
Soil Analytical Results Summary - Non-Residential Direct Contact Medium-Specific Concentrations
Philadelphia Refining Complex - Tank PB 663
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

Notes:

PADEP MSC	Pennsylvania Department of Environmental Protection Medium-Specific Concentrations (MSCs)
A	Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard.
B	Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Subsurface Soil (2-15 ft)
6.5 A	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
ND (0.50)	Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available.
ND (0.03)	Indicates concentration not detected above the laboratory reporting limit (in parentheses) except when the reporting limit is greater than the standard in which case the method detection limit is listed in parentheses.
n/v	No standard/guideline value
-	Parameter not analyzed / not available
*	Cresol, m&p (3-Methylphenol & 4-Methylphenol) co-elute and are reported as the summation of the co-eluting compounds. Standards shown are the stricter of the two.
J	Indicates an estimated value
OE	The associated batch QC was outside the established quality control range for precision/accuracy.
AP	Attainment of remediation standard has been demonstrated via pathway elimination (i.e. engineering controls).
mg/kg	milligrams per kilogram
LL	Eurofins Lancaster Laboratories Environmental
ESC	ESC Lab Sciences

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APPENDIX A
ECOLOGICAL ASSESSMENT DOCUMENTATION

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

1. PROJECT INFORMATION

Project Name: **PHRO- AOI 8**
Date of Review: **10/31/2016 11:29:06 AM**
Project Category: **Hazardous Waste Clean-up, Site Remediation, and Reclamation, Spill (e.g., oil, chemical)**
Project Area: **246.51 acres**
County(s): **Philadelphia**
Township/Municipality(s): **PHILADELPHIA**
ZIP Code: **19145**
Quadrangle Name(s): **PHILADELPHIA**
Watersheds HUC 8: **Schuylkill**
Watersheds HUC 12: **City of Philadelphia-Schuylkill River**
Decimal Degrees: **39.926139, -75.203624**
Degrees Minutes Seconds: **39° 55' 34.1014" N, 75° 12' 13.456" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

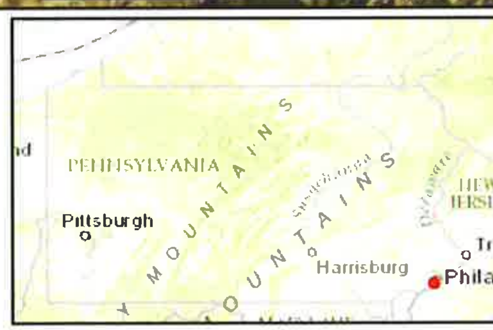
As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

PHRO- AOI 8

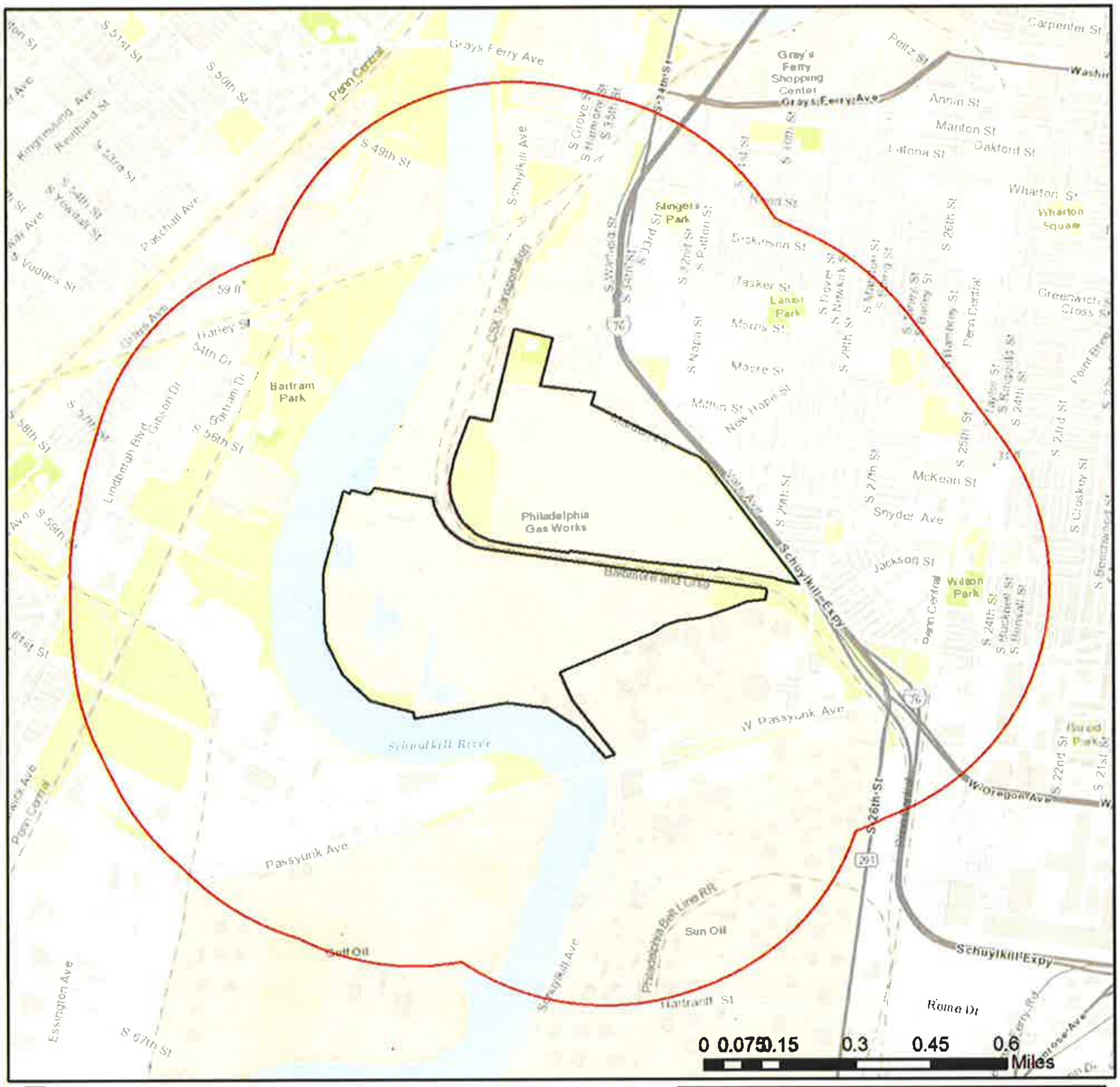
Project Boundary

Buffered Project Boundary



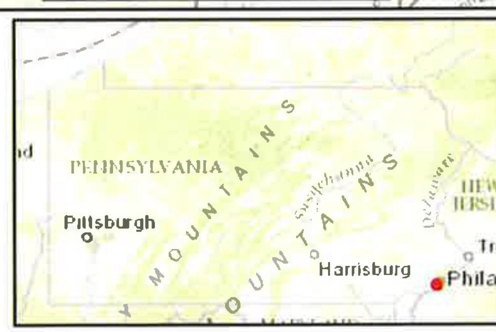
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user

PHRO- AOI 8



Project Boundary

Buffered Project Boundary



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

RESPONSE TO QUESTION(S) ASKED

Q1: Accurately describe what is known about wetland presence in the project area or on the land parcel by selecting ONE of the following. "Project" includes all features of the project (including buildings, roads, utility lines, outfall and intake structures, wells, stormwater retention/detention basins, parking lots, driveways, lawns, etc.), as well as all associated impacts (e.g., temporary staging areas, work areas, temporary road crossings, areas subject to grading or clearing, etc.). Include all areas that will be permanently or temporarily affected -- either directly or indirectly -- by any type of disturbance (e.g., land clearing, grading, tree removal, flooding, etc.). Land parcel = the lot(s) on which some type of project(s) or activity(s) are proposed to occur.
Your answer is: The project area (or land parcel) has not been investigated by someone qualified to identify and delineate wetlands, or it is currently unknown if the project or project activities will affect wetlands.

Q2: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats?
Your answer is: Unknown

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_DCNR.aspx.)

Scientific Name	Common Name	Current Status	Proposed Status	Survey Window
Amaranthus cannabinus	Waterhemp Ragweed	Special Concern Species*	Special Concern Species*	fl. July - Sept.
Schoenoplectus fluviatilis	River Bulrush	Special Concern Species*	Special Concern Species*	fruits June - August

PA Fish and Boat Commission
RESPONSE:
Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name	Common Name	Current Status
Sensitive Species**		Endangered
Sensitive Species**		Threatened

U.S. Fish and Wildlife Service
RESPONSE:
No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email* the following information to the agency(s). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies. Alternatively, applicants may email or mail their project materials (see AGENCY CONTACT INFORMATION).
***Note:** U.S.Fish and Wildlife Service requires applicants to mail project materials to the USFWS PA field office (see AGENCY CONTACT INFORMATION). USFWS will not accept project materials submitted electronically (by upload or email).

Check-list of Minimum Materials to be submitted:
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____A map with the project boundary and/or a basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
In addition to the materials listed above, USFWS REQUIRES the following
____**SIGNED** copy of a Final Project Environmental Review Receipt

The inclusion of the following information may expedite the review process.
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov
Fax:(717) 772-0271

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Andrew Klingbeil
Company/Business Name: Stantec Consulting Services
Address: 1060 Andrew drive, Suite 140
City, State, Zip: West Chester PA 19380
Phone:(610) 840-2525 Fax:( )
Email: andrew.klingbeil@stantec.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

10-31-16
date

Stantec

October 31, 2016

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street
P.O. Box 8552
Harrisburg, PA, 17105-8552

Reference: Potential PNDI Conflict
Philadelphia Refinery Complex – AOI 8
PNDI Search ID: PNDI 612649
City of Philadelphia, Philadelphia County, Pennsylvania

Dear Sir/Madam,

Stantec Consulting Services, Inc. (Stantec) is currently preparing Site Characterization Reports (SCRs) on behalf of Philadelphia Energy Solutions Refining and Marketing LLC (PES) and Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen) for select aboveground storage tanks located in the PES Philadelphia Refinery Complex (facility), located at 3144 Passyunk Avenue in the City of Philadelphia, Philadelphia County, Pennsylvania (**Figure 1**) in response to tank-related incidents. Additionally, the facility is part of the One Cleanup Program which provides a mechanism for properties participating in the Pennsylvania Land Recycling Program to also satisfy the requirements of the Environmental Protection Agency (EPA) Corrective Measures Program. As a part of this program, Stantec is currently preparing combined Site Characterization Reports/Remedial Investigation Reports (SCR/RIRs) to establish the current conditions of the site and investigate environmental impacts resulting from historical refining operations.

The storage tank Corrective Action Process (CAP) regulations in 25 PA Code Chapter 245, Subchapter D, specifically §245.310(a) (28) and §245.310(b) (4), and the Land Recycling Program regulations in 25 PA Code Chapter 250, specifically §250.311 and §250.402, require an evaluation of ecological receptors at the facility. According to the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Tool search (PNDI Search ID: 612649), potential impacts may exist within the facility under the jurisdiction of the State of Pennsylvania Department of Conservation and Natural Resources (PADCNR). The search identified Waterhemp Ragweed (Amaranthus cannabinus) and River Bulrush (Schoenoplectus fluviatilis) as special species of concern within the general project area. A copy of the PNDI Project Environmental Review Receipt is attached.

The facility is located on industrial property with access restricted by fencing and security measures. AOI 8 is bordered by Vare Avenue to the north and east, Philadelphia Gas Works (PGW) to the south, and by the Schuylkill River to the west. AOI 8 encompasses approximately 247 acres and is bisected by CSX railroad property. AOI 8 presently contains a railyard, propane

Reference: Potential PNDI Conflict
Philadelphia Refinery Complex – AOI 8
PNDI Search ID: PNDI 612649
City of Philadelphia, Philadelphia County, Pennsylvania

terminal, aboveground storage tanks (AST), and open space. An aerial photograph depicting site features is included as **Figure 2.** The current and intended future uses of AOI 8 are non-residential.

We request a determination from the PADCNR as to whether or not projects at this facility could affect Waterhemp Ragweed (Amaranthus cannabinus) and River Bulrush (Schoenoplectus fluviatilis), identified by the PNDI Environmental Project Review to be special species of concern in the area under PADCNR jurisdiction. If you have questions on the enclosed material or require any additional information to make your determination, please feel free to contact me at (610) 840-2525.

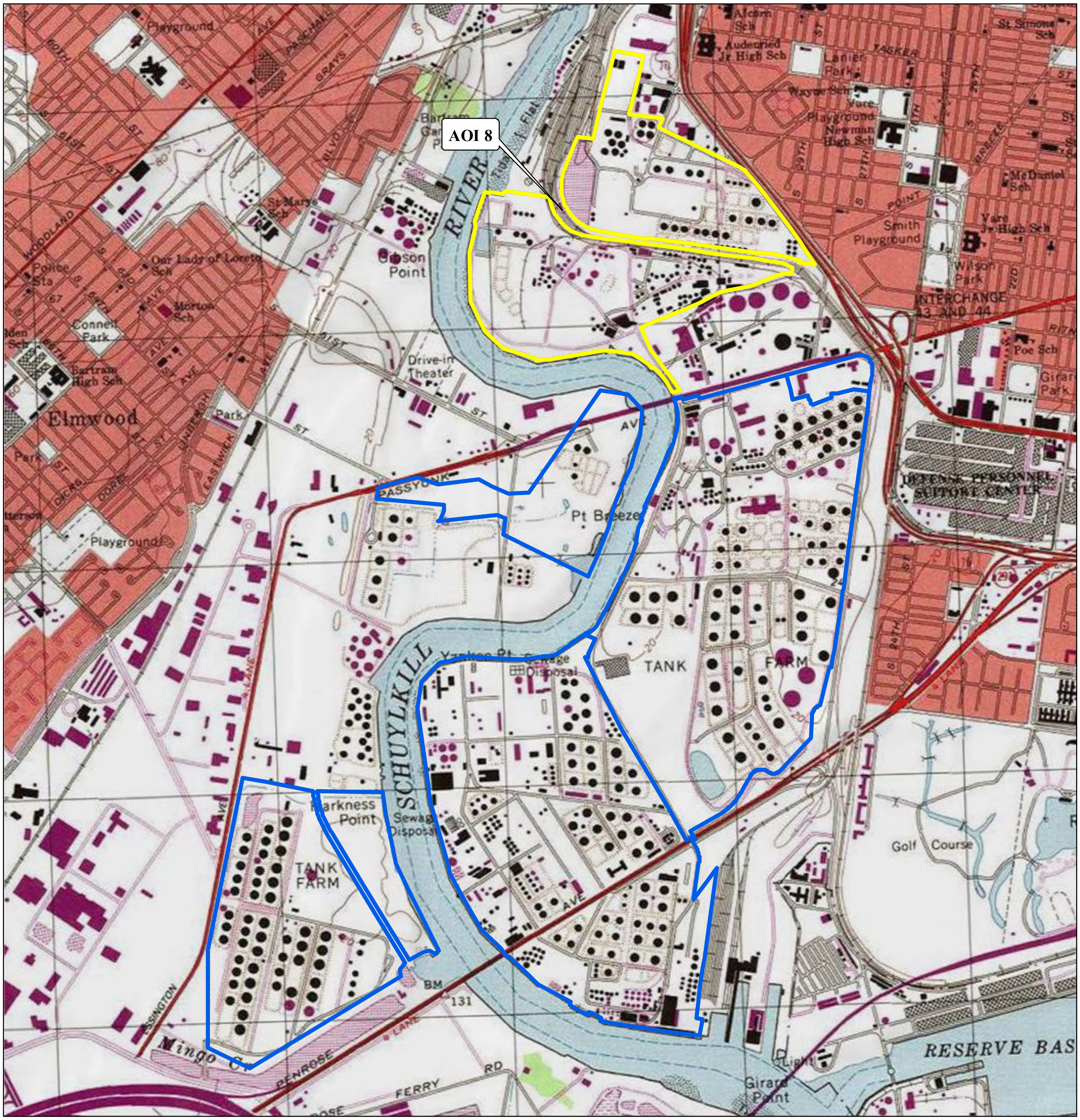
Regards,

Stantec Consulting Services, Inc.

Andrew D. Klingbeil, P.G.
Geologic Project Specialist
Phone: 610-840-2525
Fax: 610-840-2501
andrew.klingbeil@stantec.com

Attachment: PNDI Project Environmental Review Receipt
Figure 1 – Site Location Map
Figure 2 – Site Plan

c. Stantec Project File
Evergreen Project File



LEGEND

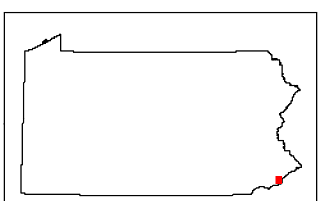
AOI 8

PHILADELPHIA REFINERY COMPLEX

0 550 1,100 2,200 Feet

1:26,400 (at original document size of 8.5x11)

N



PHILADELPHIA, PA-NJ
USGS 7.5' TOPOGRAPHIC QUADRANGLE

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Source: Stantec, Evergreen Resources Management
3. Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Stantec

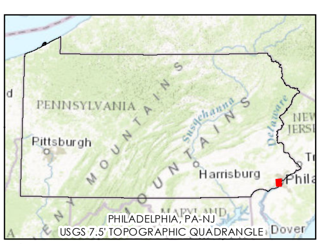
Project Location
City of Philadelphia, Pennsylvania

213402435
Prepared by GWC on 9/12/2016
Technical Review by ADK on 10/24/2016
Independent Review by MN on10/24/2016

Client/Project
EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY
3144 PASSYUNK AVENUE
PHILADELPHIA, PA 19145

Figure No.
1

Title
AOI 8 - SITE LOCATION MAP



LEGEND

- AOI 8
- PHILADELPHIA REFINERY COMPLEX

0 200 400 600 800 Feet

1:9,600 (at original document size of 8.5x11)

N

Stantec

EVERGREEN

Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
2. Source: Stantec, Evergreen Resources Management
3. Service Layer Credits: Image courtesy of USGS Earthstar Geographics SIO © 2016 Microsoft Corporation Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Project Location 213402435
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Client/Project
EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY
3144 PASSYUNK AVENUE
PHILADELPHIA, PA 19145

Figure No.
2

Title
AOI 8 - SITE PLAN

Stantec

October 31, 2016

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

Reference: Potential PNDI Conflict
Philadelphia Refinery Complex – AOI 8
PNDI Search ID: PNDI 612649
City of Philadelphia, Philadelphia County, Pennsylvania

Dear Sir/Madam,

Stantec Consulting Services, Inc. (Stantec) is currently preparing Site Characterization Reports (SCRs) on behalf of Philadelphia Energy Solutions Refining and Marketing LLC (PES) and Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen) for select aboveground storage tanks located in the PES Philadelphia Refinery Complex (facility), located at 3144 Passyunk Avenue in the City of Philadelphia, Philadelphia County, Pennsylvania (**Figure 1**) in response to tank-related incidents. Additionally, the facility is part of the One Cleanup Program which provides a mechanism for properties participating in the Pennsylvania Land Recycling Program to also satisfy the requirements of the Environmental Protection Agency (EPA) Corrective Measures program. As a part of this program, Stantec is currently preparing combined Site Characterization Reports/Remedial Investigation Reports (SCR/RIRs) to establish the current conditions of the site and investigate environmental impacts resulting from historical refining operations.

The storage tank Corrective Action Process (CAP) regulations in 25 PA Code Chapter 245, Subchapter D, specifically §245.310(a)(28) and §245.310(b)(4), and the Land Recycling Program regulations in 25 PA Code Chapter 250, specifically §250.311 and §250.402, require an evaluation of ecological receptors at the facility. According to the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Tool search (PNDI Search ID: 612649), potential impacts may exist within the facility under the jurisdiction of the State of Pennsylvania Fish and Boat Commission (PA FBC). The search identified two undisclosed sensitive species as endangered and/or threatened within the general project area. A copy of the PNDI Project Environmental Review Receipt is attached.

The facility is located on industrial property with access restricted by fencing and security measures. AOI 8 is bordered by Vare Avenue to the north and east, Philadelphia Gas Works (PGW) to the south, and by the Schuylkill River to the west. AOI 8 encompasses approximately 247 acres and is bisected by CSX railroad property. AOI 8 presently contains a railyard, propane

Reference: Potential PNDI Conflict
Philadelphia Refinery Complex – AOI 8
PNDI Search ID: PNDI 612649
City of Philadelphia, Philadelphia County, Pennsylvania

terminal, aboveground storage tanks (AST), and open space. An aerial photograph depicting site features is included as **Figure 2**. The current and intended future uses of AOI 8 are non-residential.

We request a determination from the PA FBC as to whether or not projects at this facility could affect the sensitive species identified by the PNDI Environmental Project Review to be endangered and/or threatened in the area under PA FBC jurisdiction. If you have questions on the enclosed material or require any additional information to make your determination, please feel free to contact me at (610) 840-2525.

Regards,

Stantec Consulting Services, Inc.

Andrew D. Klingbeil, P.G.
Geologic Project Specialist
Phone: 610-840-2525
Fax: 610-840-2501
andrew.klingbeil@stantec.com

Attachment: PNDI Project Environmental Review Receipt
Figure 1 – Site Location Map
Figure 2 – Site Plan

c. Stantec Project File
Evergreen Project File

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

November 4, 2016 **PNDI Number: 612649**

Avani Patel
Stantec Consulting
1060 Andrew Drive
Suite 140
West Chester, PA 19380
Email: avani.patel@stantec.com (hard copy will not follow)

Re: PHRO – AOI 8
Philadelphia, Philadelphia County, PA

Dear Avani Patel,

Thank you for the submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number **612649** for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

No Impact Anticipated

PNDI records indicate species or resources under DCNR's jurisdiction are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, DCNR has determined that no impact is likely. No further coordination with our agency is needed for this project.

This response represents the most up-to-date review of the PNDI data files and is valid for two (2) years only. If project plans change or more information on listed or proposed species becomes available, our determination may be reconsidered. Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). As a reminder, this finding applies to potential impacts under DCNR's jurisdiction only. Visit the PNHP website for directions on contacting the Commonwealth's other resource agencies for environmental review.

Should you have any questions or concerns, please contact Jaci Braund, Ecological Information Specialist, by phone (717-214-3813) or via email (c-jbraund@pa.gov).

Sincerely

Greg Podniesinski

Greg Podniesinski, Section Chief
Natural Heritage Section

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823
814-359-5237

November 28, 2016

IN REPLY REFER TO
SIR# 46874

Stantec Consulting
Avani Patel
1060 Andrew Drive
West Chester, Pennsylvania 19380

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 612649_1
PHRO - AOI 8
PHILADELPHIA County: Philadelphia City

Dear Avani Patel:

This responds to your inquiry about a Pennsylvania Natural Diversity Inventory (PNDI) Internet Database search "potential conflict" or a threatened and endangered species impact review. These projects are screened for potential conflicts with rare, candidate, threatened or endangered species under Pennsylvania Fish & Boat Commission jurisdiction (fish, reptiles, amphibians, aquatic invertebrates only) using the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files. These species of special concern are listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, and the Pennsylvania Fish & Boat Code (Chapter 75), or the Wildlife Code.

Eastern Redbelly Turtle (*Pseudemys rubriventris*, Threatened)

The project area was evaluated for potential habitat for Eastern Redbelly Turtles in 2013. The turtles were found in the stormwater basin adjacent to the river, and some accessible potential nesting habitat was located along the river shoreline. Turtles were salvaged from the stormwater basin prior to its maintenance in 2013, and we had recommended that fencing be installed to prevent their return. Additionally, nesting habitat was to have been created or enhanced as part of that project. Therefore, these areas identified as potentially occupied by Eastern Redbelly Turtles would need to be avoided by any future development plans at the site.

If wetlands, open water areas, streams, rivers, or ponds or the area within 300ft of these water features are to be disturbed from the project activity, we will need to conduct a more thorough evaluation of the potential adverse impacts to the species of concern. Items **such as:** basic project plans, project narrative, general habitat descriptions, and color photographs keyed to a site map or diagram of the project area, wetlands identification and delineation, stream characterization (flow velocity, width, depth, substrate type, pools and riffles, identification of basking areas, logs, woody debris, presence of aquatic vegetation) would expedite our review process. Pending the review of information, a habitat assessment or survey targeting the presence of the species of concern may be warranted.

However, if wetlands, vernal pools, or water bodies or the area within 300ft of these water features are not to be disturbed in any way by the proposed activity, and provided that best management practices are employed and strict erosion and sedimentation measures are maintained, I do not foresee any adverse impacts to the Eastern Redbelly Turtle (*Pseudemys rubriventris*) from the proposed project.

This response represents the most up-to-date summary of the PNDI data and our files and is valid for two (2) years from the date of this letter. An absence of recorded species information does not necessarily imply species absence. Our data files and the PNDI system are continuously being updated with species occurrence information. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered, and consultation shall be re-initiated.

If you have any questions regarding this review, please contact Kathy Gipe at 814-359-5186 and refer to the SIR # 46874. Thank you for your cooperation and attention to this important matter of species conservation and habitat protection.

Sincerely,

Christopher A. Urban

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/dn

CONESTOGA-ROVERS
& ASSOCIATES

410 Eagleview Boulevard, Suite 110
Exton, Pennsylvania 19341
Telephone: (610) 321-1800 Fax: (610) 321-2763
www.CRAworld.com

September 10, 2013 Reference No. 080309.02

Ms. Kathy Gipe
Natural Diversity Section
Pennsylvania Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823

Dear Ms. Gipe:

Re: **SIR# 40240**
Wildlife Salvage Summary Report
PES North Yard
City of Philadelphia, Philadelphia County, Pennsylvania

Conestoga-Rovers & Associates, Inc. (CRA) was retained by Philadelphia Energy Solutions Refining and Marketing LLC (PES) to conduct a wildlife salvage in the stormwater basin on the North Yard site (Site) located along the Schuylkill River in the City of Philadelphia. The wildlife salvage was conducted in accordance with the Wildlife Salvage Plan submitted to the Pennsylvania Fish & Boat Commission (PFBC) on March 1, 2013 as a result of the findings of CRA's Habitat Assessment Report (CRA Report January 30, 2013) and PFBC's Species Impact Review (SIR) #40240 dated February 26, 2013. This Summary Report presents the methods and results of the wildlife salvage.

1.0 SITE LOCATION & PROJECT DESCRIPTION

As shown on the USGS topographic map (Figure 1), the Site is approximately 137 acres and is generally located along the east bank of the Schuylkill River, north of Passyunk Avenue in the City of Philadelphia. As shown on the aerial photograph (Figure 2), the Site is industrial in nature and generally barren. The stormwater basin is located in the northwest portion of the Site and is approximately 60 feet from the Schuylkill River. The basin has two compartments, earthen sides and bottom, is approximately 5 feet deep, and is surrounded by a sandy berm. Water enters the basin from the north through an in-ground concrete oil-water separator.

2.0 WILDLIFE SALVAGE METHODOLOGY

Prior to the active season, PES installed a silt fence barrier along the non-bulkheaded sections of shoreline of the Schuylkill River and also around the stormwater basin to prevent turtles from accessing the active work zones on the Site and the basin. A CRA biologist met onsite with the project team on March 28, 2013 to mark out the location of the barrier fence along the River and around the basin. The barrier fence installation was completed by April 5, 2013.

As a first step in the wildlife salvage effort, PES temporarily partially dewatered the basin down to approximately 12 inches of water. CRA accessed the basin via boat and conducted a limited salvage with nets and by hand. CRA's team of biologists conducted oversight of dewatering and hand captures on June 18, 2013 (7.75 hours) and June 19, 2013 (6.5 hours). After two days of limited salvage using hand nets, CRA set traps to complete the salvage as approved in the Wildlife Salvage Plan.

CRA's Salvage Plan proposed the use of both basking traps and hoop net traps to complete the salvage. However; after observing conditions in the basin and the large fluctuations in water depth, we determined that fixed hoop nets might result in drowning mortality of trapped turtles and we restricted trapping to basking traps only.

On June 20, 2013, CRA deployed 9 basking traps in each compartment of the basin for a total of 18 basking traps. Daily trap checking commenced on June 21, 2013 and was continued until no redbelly turtles were captured for fifteen (15) consecutive trap days, as approved by PFBC in an e-mail communication on July 11, 2013. The traps were removed on July 22, 2013 after seventeen (17) consecutive trap days without a redbelly capture.

All oversight, salvage, and relocation efforts were conducted under the direction of Mr. Scott Bush, a PFBC-recognized biologist (SCP 63 Type 3). CRA assistants included Ms. Christine Miller and Ms. Melissa Kalb.

3.0 RESULTS OF WILDLIFE SALVAGE

During the initial two days of dewatering and limited hand capture salvage, CRA captured three (3) red-eared sliders (RES; *Trachemys scripta elegans*) and one (1) common snapping turtle (CST; *Chelydra serpentine*) in the basin. During the 31 days of trapping, CRA captured 4 eastern redbelly turtles (RBT; *Pseudemys rubriventris*), 38 RES, and 1 eastern painted turtle (EPT; *Chrysemys picta picta*) in the basking traps, and 3 turtles (2 RES and 1 CST) by hand or dip net. The percent capture by species was RES 86%, RBT 8%, CST 4%, and EPT 2%.

All captured turtles were documented in accordance with PFBC protocols (species identification, sex, carapace measurements, weight, condition, photographs, etc.). All eastern painted turtles, common snapping turtles, and 1 redbelly turtle were relocated to the Schuylkill

River. Three (3) of the captured redbelly turtles were retained for a radio telemetry study to be sponsored by PES in lieu of nesting habitat mitigation. Non-native species were not relocated in accordance with our Scientific Collection Permit and the conditions of PFBC's SIR #40240.

Table 1 below provides a summary of the redbelly turtles captured during CRA's wildlife salvage at the PES North Yard Site. A summary of CRA's daily trapping efforts is provided in Table 2.

TABLE 1
EASTERN REDBELLY TURTLE CAPTURE SUMMARY

DATE CAPTURED	SEX	MEASUREMENTS* (cm)	WEIGHT (grams)	RELOCATION
June 23, 2013	F	CL = 18.42 CW = 15.24 H = 6.35	907	Retained for telemetry study; released to Schuylkill River on July 29, 2013
June 27, 2013	F	CL = 30.48 CW = 21.27 H = 12.38	3,968	Retained for telemetry study; released to Schuylkill River on July 29, 2013
July 3, 2013	J**	CL = 6.67 CW = 6.35 H = 3.65	70	Retained for telemetry study; released to Schuylkill River on July 29, 2013
July 5, 2013	J**	CL = 6.35 CW = 6.35 H = 2.86	70	Immediately released to Schuylkill River adjacent to Site

*Carapace length (CL), Carapace width (CW), Height (H)
**Juvenile; Sex not apparent

TABLE 2
SUMMARY OF WILDLIFE SALVAGE EFFORT
PES - NORTH YARD
CITY OF PHILADELPHIA, PHILADELPHIA COUNTY, PA
June 18 - July 22, 2013

LOCATION	TRAP ID	DATE																																		TOTAL TRAP DAYS
		6/18/2013	6/19/2013	6/21/2013	6/22/2013	6/23/2013	6/24/2013	6/25/2013	6/26/2013	6/27/2013	6/28/2013	6/29/2013	6/30/2013	7/1/2013	7/2/2013	7/3/2013	7/4/2013	7/5/2013	7/6/2013	7/7/2013	7/8/2013	7/9/2013	7/10/2013	7/11/2013	7/12/2013	7/13/2013	7/14/2013	7/15/2013	7/16/2013	7/17/2013	7/18/2013	7/19/2013	7/20/2013	7/21/2013	7/22/2013	
West Side Basin	B-2	Dewatering & Attempted Salvage		Trap Set	--	--	--	--	1 RES	1 RES	1 RES	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 RES	--	Trap Removed	31
	B-7			Trap Set	--	3 RES	--	1 RES	--	1 RES	--	--	--	1 RES	--	1 RBT	--	--	--	--	--	1 RES	--	--	1 RES	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-8			Trap Set	--	1 EPT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-9			Trap Set	--	1 RBT	--	--	--	--	--	--	2 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-10			Trap Set	--	--	--	--	1 RES	1 RBT	--	--	--	2 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-11			Trap Set	--	1 RES	--	--	--	--	1 RES	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-16			Trap Set	1 RES hatchling	--	--	--	--	1 RES	--	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-17			Trap Set	--	--	--	1 RES	1 RES	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 RES	--	--	--	--	Trap Removed	31
	B-20			Trap Set	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
East Side Basin	B-1			Trap Set	--	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-3			Trap Set	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 RES	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-4			Trap Set	1 RES hatchling	--	--	--	--	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-12			Trap Set	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-13			Trap Set	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	1 RBT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 RES	Trap Removed	31
	B-14			Trap Set	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 RES / Trap Removed	31
	B-15			Trap Set	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-18			Trap Set	--	--	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
	B-19			Trap Set	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Trap Removed	31
Hand / Net Capture		1 CST, 3 RES	--	--	--	--	1 CST	--	--	--	--	--	--	--	--	--	--	--	--	1 RES	--	--	--	--	--	1 RES	--	--	--	--	--	--	--	--	--	33

NOTES:
B-1: Basking Trap
CST: Common snapping turtle
EPT: Eastern painted turtle
RBT: Redbelly turtle
RES: Red-eared slider

-- Trap empty

4.0 SUMMARY & CONCLUSIONS

During the combined wildlife salvage efforts in the stormwater basin on the PES North Yard Site, CRA captured 50 turtles (4 RBT, 1 EPT, 2 CST, and 43 RES). Three (3) of the redbelly turtles were retained by CRA for use in a PFBC-approved telemetry study. CRA attached transmitters and released the RBTs to the Schuylkill River on July 29, 2013. CRA began tracking the turtles via radio telemetry on July 30, 2013 and has continued the tracking in accordance with the schedule provided in the Telemetry Work Plan (dated July 3, 2013) as approved by PFBC. As discussed in the Telemetry Work Plan, the results of CRA's telemetry study will be submitted in a separate report at the conclusion of the study.

If you have any questions or require additional information, please do not hesitate to contact me at (610) 321-1800 ext. 12 or cmiller@craworld.com.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Christine J. Miller

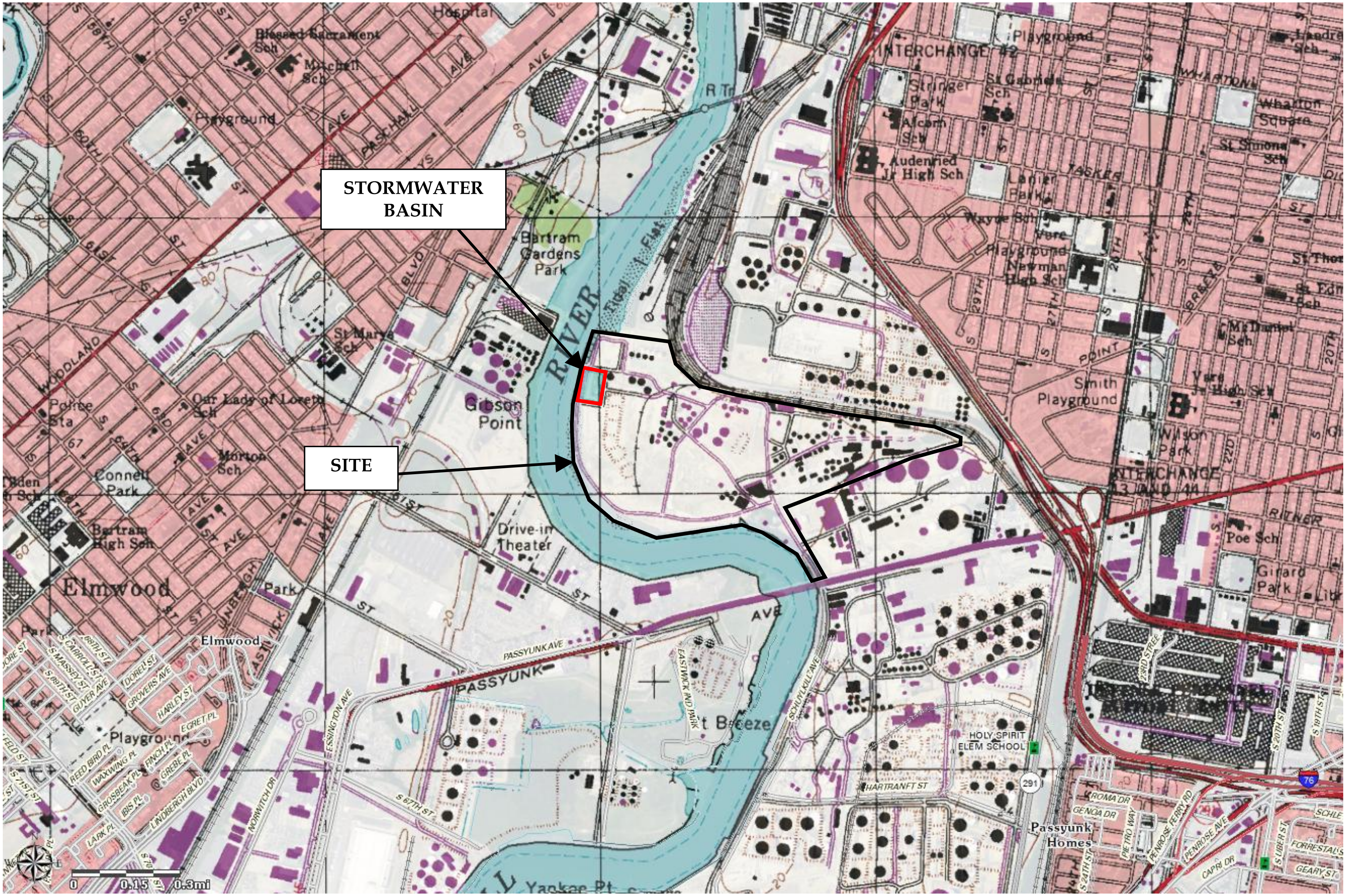
Christine J. Miller
Ecologist

CJM/smk/2
Encl.

cc: Joe Musil - Urban
Scott Bush - CRA

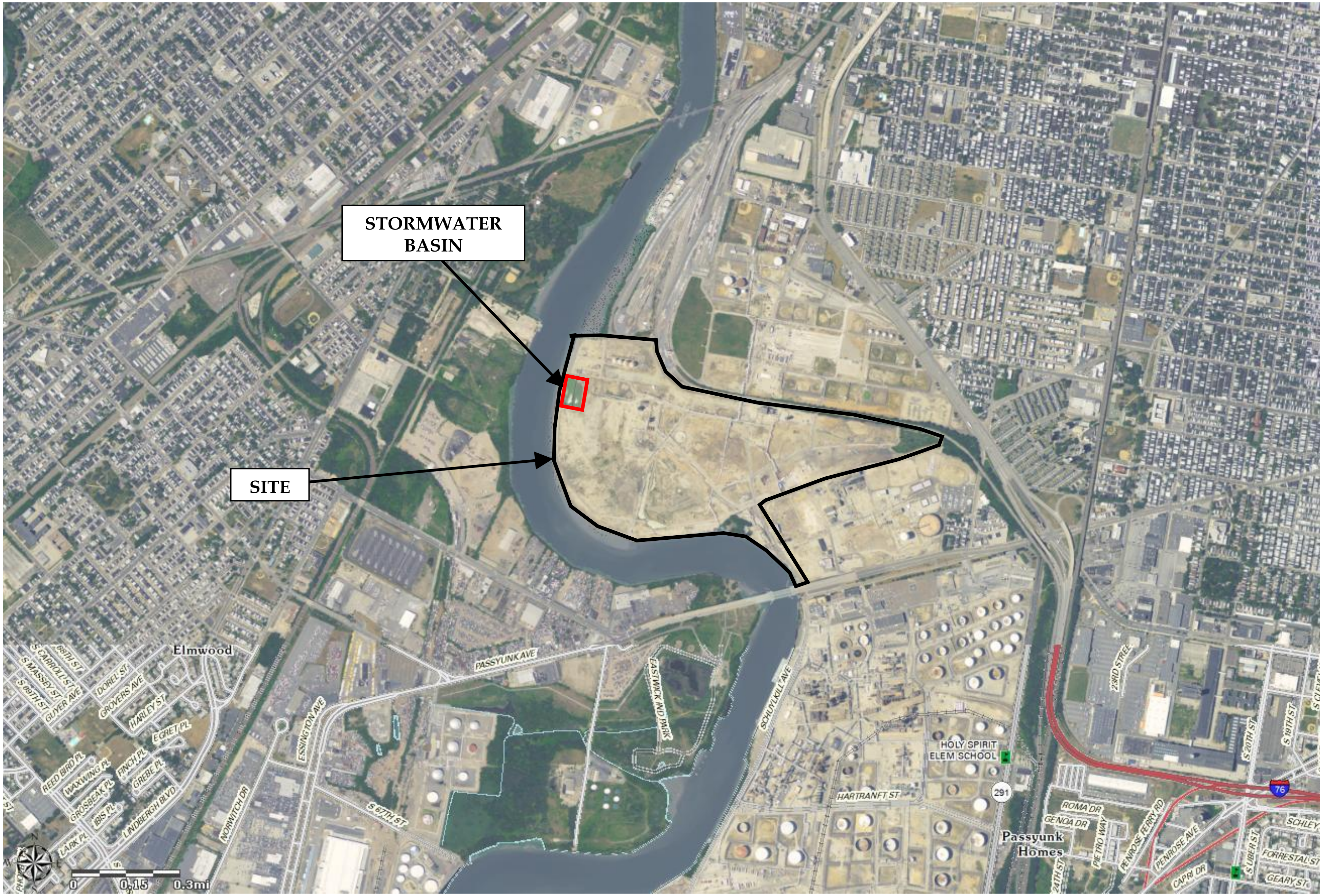
FIGURES

PES – NORTH YARD
City of Philadelphia, Philadelphia County, Pennsylvania



Source: U.S. Geological Survey, National Geospatial Program.

FIGURE 1
SITE LOCATION MAP



Source: U.S. Geological Survey, National Geospatial Program.

FIGURE 2
AERIAL PHOTOGRAPH

ATTACHMENT A

COLOR PHOTOGRAPHS

Photo 1. Looking northeast at the stormwater basin on the PES site.

Photo 2. Looking south at the stormwater basin on the PES site.

Photo 3. Looking north at basking traps in the west side of the stormwater basin.

Photo 4. Looking north at basking traps in the east side of the stormwater basin.

Photo 5. Common snapping turtle captured by hand during the attempted basin salvage on June 18, 2013; released to Schuylkill River adjacent to Site.

Photo 6. Female redbelly turtle captured during trapping on June 23, 2013; retained for telemetry study.

Photo 7. Looking at several red-eared sliders captured during trapping; not released.

Photo 8. Female redbelly turtle captured during trapping on June 27, 2013; retained for telemetry study.

Photo 9. Juvenile redbelly turtle captured during trapping on July 3, 2013; retained for telemetry study.

Photo 10. Juvenile redbelly turtle captured during trapping on July 5, 2013; released to Schuylkill River adjacent to Site.

Photos 11 and 12. Examples of juvenile red-eared sliders trapped during the salvage, not released.

Photos 13 and 14. Examples of adult red-eared sliders trapped during the salvage, not released.

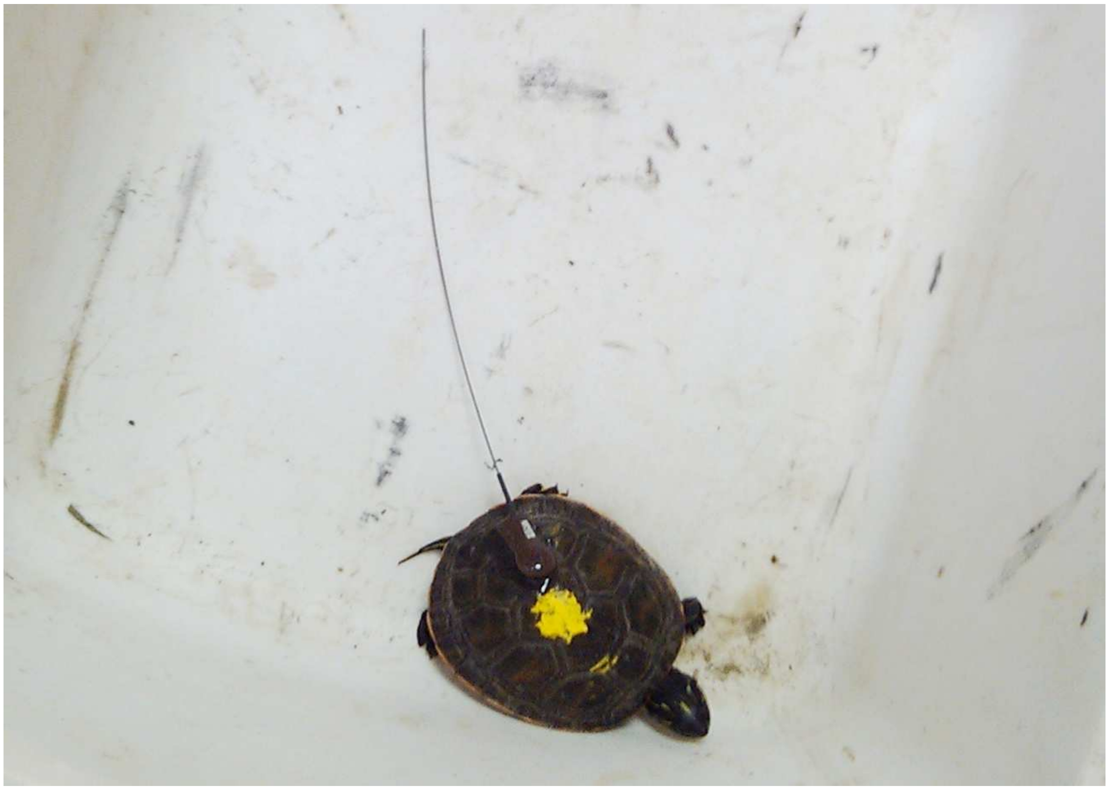


Photo 15. Juvenile redbelly turtle affixed with radio transmitter prior to release.

Photo 16. Adult female redbelly turtles affixed with radio transmitters prior to release.

Pennsylvania Fish & Boat Commission

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823

September 23, 2013

IN REPLY REFER TO
SIR# 40240

CONESTOGA-ROVERS & ASSOCIATES
CHRISTINE MILLER
410 EAGLEVIEW BOULEVARD, SUITE 110
EXTON, Pennsylvania 19341

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20121217383356
PES NORTH YARD
PHILADELPHIA County: Philadelphia City

Dear CHRISTINE MILLER:

This letter is to acknowledge our receipt of your report of salvage activities for the eastern redbelly turtle (*Pseudemys rubriventris*, PA threatened) prior to construction at the project site. The PFBC uses these reports to help guide our conservation and management efforts for the redbelly turtle. Please be sure to report any captures made under your scientific collector's permit for this project in our online collector's permit system.

Thank you for your cooperation and dedication to the protection of reptiles and amphibians of the Commonwealth. **If you have any questions regarding this review, please contact Kathy Gipe at 814-359-5186 and refer to the SIR # 40240.** Thank you for your cooperation and attention to this important matter of species conservation and habitat protection.

Sincerely,

Christopher A. Urban

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/dn

APPENDIX B
HISTORICAL TANK DOCUMENTATION
(electronic only)

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

Sunoco, Inc.
3144 Passyunk Avenue
Philadelphia PA 19145-5299
215 339 2000

FILE COPY

March 20, 2000

Mr. Larry Frey
Pennsylvania Department of Environmental Protection
Bureau of Watershed Conservation
Rachel Carson State Office Building
P.O. Box 8762
Harrisburg, PA 17105-8762

FILE COPY

Subject: Facility ID # 51-19781 (Point Breeze Process Area)
Sunoco Tank # 663 – State Registration # 187A

Dear Mr. Frey:

Enclosed please find the following documents for the registration of the above referenced existing aboveground storage tank:

- Storage Tank Registration/Permitting Form
- Aboveground Storage Tank Integrity Inspection Summary prepared by U.N.I. Engineering, Inc., together with a copy of the Certification of Tank Repairs by Mott Tank Inspection referenced in the Inspection Summary

This tank has been an exempt tank. During a recent evaluation of the tank and the material being stored it has been determined that based on its current characteristics the material is a regulated substance. Tank 663 currently stores fractionator tower bottoms.

Please contact me at 215-339-2120 if you have any questions or need additional information.

Sincerely,

Jim Tucker

Jim Tucker
Environmental Specialist

3930-FM-WC0014 Rev. 4/99

DEP

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED CONSERVATION

REGISTRATION / PERMITTING OF STORAGE TANKS

I. PURPOSE OF SUBMITTAL *(Check All Those That Apply)*

STATE USE ONLY

INITIAL

- [ ] Initial
- [ ] Registration for Removal of Unregistered Tank(s)
- [ ] Registration for Un-Registered Tank(s) Closed in Place

AMENDED

- [ ] Changed Previous Info
- [X] Added Tank(s)
- [ ] Tank(s) Temporarily Out of Use
- [ ] Removed / Closed Tank(s)
- [ ] Exempted Tank(s)
- [ ] Changed from Regulated to Unregulated Substance or Use
- [ ] Relocated Tank(s)

CHANGE OF OWNERSHIP

- [ ] Sold
- [ ] Purchased
- [ ] All Tanks (Will Remain at Same Facility)
- [ ] Some Tanks (Will Remain at Same Facility)
- [ ] Some Tanks (Relocated to Another Regulated Facility)
- [ ] Some Tanks (Relocated to a New Facility and the Tanks are to be Registered)

II.A. TANK OWNER / APPLICANT INFORMATION *(Type or Print Legibly in Ink)*

Storage Tank Client I.D. No. (State Use Only) DEP Client ID No.

Organization Name or Registered Fictitious Name: SUNOCO, INC. (R&M)
Employer ID No. (EIN): 231743283

Individual Last Name First Name MI Suffix SSN

Mailing Address Line 1: 3144 PASSYUNK AVE Mailing Address Line 2

Address Last Line – City: PHILADELPHIA State: PA ZIP+4: 19145+5299 Country: USA Phone No.: 215-339-2000

TYPE OF OWNER/BUSINESS *(Check Only One)*

- [ ] Vol. Fire Co./EMS Org.
- [ ] Federal Government
- [ ] State Government

Local Government

- [ ] County
- [ ] Municipality
- [ ] School District
- [ ] Authority

Corporate

- [X] Corporation/PA
- [ ] Corporation/Non-PA
- [ ] Assn./Organization

Private

- [ ] Partnership/General
- [ ] Partnership/Limited
- [ ] Sole Proprietorship
- [ ] Individual(s)
- [ ] Assn./Organization

II.B. CHANGE OF OWNERSHIP ***(The new owner is to complete all sections of this form including this section if some or all tanks have been purchased/transferred.)***

Previous Owner Name: Date of Purchase/Transfer

Mailing Address Line 1 Mailing Address Line 2

Address Last Line – City State ZIP+4 Country Phone No.

Previous Facility ID No. Previous Tank Nos.

III. FACILITY/SITE INFORMATION *(Type or Print Legibly in Ink)*

A. Storage Tank Facility ID No: 51-19781 Facility/Site Name: POINT BREEZE PROCESSING AREA DEP Site ID #

Site Location Line 1: 3144 PASSYUNK AVE Site Location Line 2

Site Location Last Line – City: PHILADELPHIA State: PA ZIP+4: 19145+5299 EPA ID#: PAD002289700

County Name: PHILADELPHIA Municipality
Check One: City [X] Boro [ ] Twp [ ] Phone No.: 215-339-2000

Type of Facility *(Check Only One)*

- [ ] 00 Unknown
- [ ] 01 Gas Station
- [ ] 02 Petroleum Distributor
- [ ] 03 Air Taxi
- [ ] 04 Aircraft Owner
- [ ] 05 Auto Dealership
- [ ] 06 Railroad
- [ ] 07 Local Government
- [ ] 08 State Government
- [ ] 09 Federal, Non-Military
- [ ] 10 Federal, Military
- [ ] 11 Commercial
- [X] 12 Industrial
- [ ] 13 Residential
- [ ] 14 Contractor
- [ ] 15 Trucking/Transport
- [ ] 16 Utility
- [ ] 17 Farm
- [ ] 18 Convenience Store
- [ ] 99 Other ______

B. Fire Safety Permit No. (if applicable)

C. Contact (check only one)

- [X] Send all mail to owner/applicant address
- [ ] Send all mail to contact address listed below
- [ ] Send all mail to facility/site location

Contact Last Name: TUCKER First Name: JIM MI: R Suffix:

Mailing Address Line 1: 3144 PASSYUNK AVE Mailing Address Line 2

Address Last Line – City: PHILADELPHIA State: PA ZIP+4: 19145+5299 Country: USA Phone No.: 215-339-2120

3930-FM-WC0014 Rev. 4/99

FACILITY ID NO. — 51-19781

Facility Name POINT BREEZE PROCESS AREA

IV. DESCRIPTION OF STORAGE TANKS (Type or print legibly each regulated storage tank at this facility under your ownership.)

A. ABOVEGROUND TANKS List all tanks. If amending information, identify the Amended Tank(s) with an asterisk (*) to the left of the tank number.

Tank Number	STATUS	TYPE	Install Date (Mo-Day-Yr)	Change of Status Date (Mo-Day-Yr)	Capacity (Gallons)	Substance Code (Currently or Last Stored)	CERCLA Name (If Hazardous Substance) Substance Name (If Other Petroleum Substance or Petroleum-Based Mixture)	CAS No. (If Hazardous Substance)	Exempt Reference Code (See Instruction
187 A	C	F	01-01-53	01-12-95	2,935,800	J	GAS OIL		
A									
A									
A									
A									
A									
A									
A									
A									
A									
A									
A									
A									
A									

Status Codes: C - Currently in Use T - Temporarily Out of Use E - Exempt R - Removed P - Closed in Place
Type Codes: M - Manufactured F - Field Constructed

B. UNDERGROUND TANKS List all tanks. If amending information, identify the Amended Tank(s) with an asterisk (*) to the left of the tank number.

Tank Number	STATUS	TYPE	Install Date (Mo-Day-Yr)	Change of Status Date (Mo-Day-Yr)	Capacity (Gallons)	Substance Code (Currently or Last Stored)	CERCLA Name (If Hazardous Substance) Substance Name (If Other Petroleum Substance or Petroleum-Based Mixture)	CAS No. (If Hazardous Substance)	Exempt Reference Code (See Instructions)

Status Codes: C - Currently in Use T - Temporarily Out of Use E - Exempt R - Removed P - Closed in Place
Type Codes: M - Manufactured F - Field Constructed

Detach this entire form and return with all appropriate signatures to the Division of Storage Tanks

3930-FM-WC0014 Rev. 4/99

FACILITY ID NO. — 51-19781

Facility Name POINT BREEZE PROCESS AREA

V. INFORMATION FOR ABOVEGROUND AND UNDERGROUND NEW TANK INSTALLATIONS

(Write the Tank Number(s) and place a check (√) in the appropriate box for each component that was installed.)

	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Numb
TANK CONSTRUCTION AND CORROSION PROTECTION (1)	187A										
(A) SINGLE WALL UNPROTECTED STEEL	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(B) CATHODICALLY PROTECTED STEEL (GALVANIC)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(C) CATHODICALLY PROTECTED STEEL (IMPRESSED CURRENT)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(D) DOUBLE WALL UNPROTECTED STEEL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) SINGLE WALL FIBERGLASS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(F) DOUBLE WALL FIBERGLASS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(G) JACKETED STEEL OR DOUBLE WALL ACT-100	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(H) STEEL WITH FRP COATING	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(I) STEEL WITH LINED INTERIOR	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(J) CONCRETE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(O) CATHODICALLY PROTECTED DOUBLE WALL STEEL (GALVANIC)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(P) CATHODICALLY PROTECTED STEEL WITH LINER	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(Q) DOUBLE BOTTOM (AST's ONLY)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(R) MOLDED PLASTIC FORM (AST's ONLY)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(99) OTHER (SPECIFY)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
UNDERGROUND PIPING CONSTRUCTION AND CORROSION PROTECTION (2)											
(A) BARE STEEL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(B) CATHODICALLY PROTECTED STEEL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(C) COPPER	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(D) FIBERGLASS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) FLEXIBLE (NON-METALLIC)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(G) NONE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(I) DOUBLE WALL METALLIC PRIMARY	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(J) DOUBLE WALL RIGID (FRP) PRIMARY	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(K) DOUBLE WALL FLEXIBLE PRIMARY	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(L) TRENCH LINER	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(M) JACKETED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(99) OTHER (SPECIFY)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
ABOVEGROUND PIPING CONSTRUCTION AND CORROSION PROTECTION (3)											
(A) BARE STEEL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(B) CATHODICALLY PROTECTED STEEL	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(C) COPPER	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(D) FIBERGLASS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) FLEXIBLE (NON-METALLIC)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(G) NONE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(99) OTHER (SPECIFY)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
PRODUCT DELIVERY (PIPING) SYSTEM (4)											
(A) SUCTION: CHECK VALVE AT PUMP	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(B) SUCTION: CHECK VALVE AT TANK	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(C) PRESSURE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(D) GRAVITY FED	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) NONE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Detach instructions and return this entire form with all appropriate signatures to the Division of Storage Tanks

3930-FM-WC0014 Rev. 4/99

FACILITY ID NO. —51-19781

Facility Name POINT BREEZE PROCESS AREA

V. INFORMATION FOR ABOVEGROUND AND UNDERGROUND NEW TANK INSTALLATIONS (cont.)

(Write the Tank Number(s) and place a check (√) in the appropriate box for each component that was installed.)

	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number
SPILL PREVENTION (6) USTs ONLY	187A										
(Y) YES	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(N) NO	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) FILL IN LESS THAN 25 GALLONS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
OVERFILL PREVENTION PRESENT (7)											
(Y) YES	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(N) NO	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(E) FILL IN LESS THAN 25 GALLONS	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VAPOR RECOVERY PRESENT (11)											
(A) STAGE I INSTALLED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(B) STAGE II INSTALLED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(C) STAGE I AND II INSTALLED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(D) NONE	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
EMERGENCY CONTAINMENT (16) ASTs ONLY											
(Y) YES	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(N) NO	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
SECONDARY CONTAINMENT (17) ASTs ONLY											
(Y) YES	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(N) NO	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

VI. ABOVEGROUND AND UNDERGROUND TANK INFORMATION FOR REMOVAL FROM SERVICE

(Write the Tank Number(s) and place a check (√) in the appropriate box for each tank that was removed or closed in place.)

	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number
TANK REMOVED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
TANK CLOSED IN PLACE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CONTAMINATION SUSPECTED OR OBSERVED AND NOTIFICATION OF CONTAMINATION FORM WAS SUBMITTED	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CLOSURE DOCUMENT SUBMITTED TO THE APPROPRIATE DEP REGIONAL OFFICE	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CLOSURE DOCUMENT KEPT ON FILE BY OWNER	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Detach this entire form and return with all appropriate signatures to the Division of Storage Tanks

2930-FM-WC0014 Rev. 4/99

FACILITY ID NO. — 51-19781 Facility Name POINT BREEZE PROCESS AREA

VII. OWNER CERTIFICATION (Read and sign after completing all applicable sections.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that base on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, an complete. This registration is conditioned upon compliance with provisions of the Storage Tank and Spill Prevention Act of 1989, all applicable regulations and with the requirements for obtaining and maintaining a permit required under this Act. I certify my responsibility for assuring the following permi requirements:

- Storage Tank systems are in compliance with applicable administrative, technical and operational requirements as specified in Subchapter E fo underground tanks or Subchapter F or G for aboveground tanks.
- Tank handling and inspection activities are performed by an individual possessing DEP certification in the appropriate category as required in Subchapters A and B.
- Underground storage tanks meet the applicable financial responsibility requirements of Subchapter H (relating to financial responsibility requirements).
- A Spill Prevention Response (SPR) Plan must be submitted to the appropriate DEP regional office for facilities that have aboveground storage tanks where the total capacity of all aboveground tanks is greater than 21,000 gallons.

My signature represents to the Department that I own the storage tank(s) and am aware of the responsibilities and potential liabilities as an "owner" arising under the Storage Tank and Spill Prevention Act of 1989 and all applicable regulations. I am also advised that this registration is made subject to the penalties of 18 PA. C.S. Section 4904 relating to unsworn falsification to authorities.

Name and Title of Owner	Signature	Date
JIM TUCKER ENVIRONMENTAL SPECIALIST	Jim Tucker	3/21/00

VIII. INSTALLER/REMOVER CERTIFICATION

This section must be completed by the certified tank handler(s) who is responsible for the installation or removal from service of the aboveground and underground storage tank systems listed in Sections V and VI. Do NOT enter the company certification number. Tank modification must be submitted on a "Tank Handling Activities Report" form. (Type or Print legibly)

As the certified tank handler responsible for the tank handling activities in the category or categories listed, I certify that all tank handling activities were conducted in compliance with the design, installation and operation standards of the Storage Tank and Spill Prevention Act of 1989 and all applicable regulations. I also certify, under penalty of law as provided in 18 PA C.S.A. 4904 (relating to unsworn falsification to authorities), that the information provided therein is true, accurate and complete to the best of my knowledge and belief.

Tank Number	Installer/Remover Name	Construction Standard	Individual Certification No.	Certification Category	Installer/Remover Signature	Date
					See ATTACHMENTS	

IX. INSPECTOR CERTIFICATION

This section must be completed by the certified tank inspector(s) who is responsible for verifying the installation standards for all field constructed tanks and all aboveground tanks greater than 21,000 gallons listed in Section V. (Type or Print legibly)

As the certified tank inspector responsible for verifying tank handling activities and construction standards, I certify that the tank(s) listed below are constructed to appropriate industry standards and, if applicable, to manufacturer's specifications; that the tank(s) have been tested as required by industry standards; and that the tank(s) meet or exceed applicable design and operating standards; and are in compliance with the requirements of the Storage Tank and Spill Prevention Act of 1989, and all applicable regulations. I also certify under penalty of law as provided in 18 PA C.S. A. 4904 (relating to unsworn falsification to authorities), that the information provided herein is true, accurate and complete to the best of my knowledge and belief.

Tank Number	Inspector Name	Construction Standard	Individual Certification No.	Certification Category	Inspector Signature	Date
					See ATTACHMENTS	

X. SITE SPECIFIC PERMIT NUMBER

(If a site specific permit was required for new tank installation, write the tank number(s) and permit number(s) in the appropriate box.)

Site Specific Permit No.	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number	Tank Number

Detach this entire form and return with all appropriate signatures to the Division of Storage Tanks

Instructions for
REGISTRATION / PERMITTING OF STORAGE TANKS FORM

PA DEP, DIVISION OF STORAGE TANKS, PO BOX 8762, HARRISBURG, PA 17105-8762 IN PA - 1-800-42-TANKS • 717-772-5599

OWNERS ARE REQUIRED TO REGISTER STORAGE TANKS

If you own regulated storage tanks that are not registered as required by law, you must immediately submit a registration/permitting form. The following are instructions for completing the attached registration/permitting form.

Please Note: ***It is unlawful to use, in any way, any regulated storage tank that has not been registered and permitted.***

REGULATED UNDERGROUND STORAGE TANKS (USTs)

Regulated USTs are defined as tanks used to contain regulated substances, with a capacity of more than 110 gallons, where 10 percent or more of the volume (including the volume contained in the underground piping) is below the surface of the ground.

The following tanks are exempt and NOT regulated USTs under the Storage Tank and Spill Prevention Act of 1989:

Reference Code

U1 Tanks with a capacity of 110 gallons or less.

U2 Farm or residential tanks with a capacity of 1,100 gallons or less which store motor fuel for non-commercial purposes (not for resale).

U3 Tanks which store heating oil used on the premises where stored. Diesel, kerosene, etc., are included as long as they are used exclusively for heating.

U4 Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which are intrastate pipeline facilities regulated under comparable state laws.

U5 Surface impoundments, pits, ponds or lagoons.

U6 Storm water or wastewater collection systems.

U7 Flow-through process tanks.

U8 Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations.

U9 DELETED This exemption is no longer used.

U10 Tanks regulated under the Solid Waste Management Act of 1980, including, but not limited to, piping, tanks, collection and treatment systems used for leachate, methane gas and methane gas condensate management, except if regulated under 40 CFR Part 280. Waste oil tanks are not included in this exemption.

U11 Septic tanks and other subsurface sewage treatment tanks.

U12 Tanks which store asphalt, propane, water, sand, liquid animal wastes, and any other unregulated substances.

U13 Tanks which store any substance defined as hazardous waste under Subtitle C of RCRA and not regulated under other CERCLA programs.

U14 Change in service from a regulated to a non-regulated substance or use. If the use or substance was changed to a non-regulated substance, the closure guidance requirements must be met.

U15 Sump tanks which are used as temporary storage for emergency spill or overflow containment and are expeditiously emptied after use.

U16 DELETED This exemption is no longer used.

U17 Tanks which have been "out-of-operation" and empty since Dec. 22, 1988.

U18 Tanks containing radioactive materials or coolants that are regulated under the Atomic Energy Act of 1954. Any UST system that is part of an emergency generator system at nuclear power generation facilities regulated by NRC.

U19 A wastewater treatment tank system such as an oil and water separator.

U20 Equipment or machinery that contains regulated substances for operational purposes such as hydraulic lift tanks (elevators) and electrical equipment tanks (electric transformers).

U21 A tank that contains a regulated substance of insufficient concentration to be required to appear on a Material Safety Data Sheet (MSDS).

REGULATED ABOVEGROUND STORAGE TANKS (ASTs)

Regulated ASTs are defined as stationary tanks used to contain regulated substances, with a capacity of more than 250 gallons, where more than 90 percent of the volume is upon or above the supporting surface of the ground and can be visually inspected. This includes tanks which can be visually inspected in an underground area or in a building.

The following tanks are exempt and NOT regulated ASTs under the Storage Tank and Spill Prevention Act of 1989:

Reference Code

A1 Tanks with a capacity of 250 gallons or less.

A2 Tanks which store heating oil used on the premises where stored. Diesel, kerosene, etc., are included as long as they are used exclusively for heating.

A3 Tanks with a capacity of 1,100 gallons or less which store motor fuel for non-commercial purposes (not for resale).

A4 Tanks located on a farm with a capacity of 1,100 gallons or less which store or contain substances that are used to facilitate the production of crops, livestock and livestock products on said farm.

A5 Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which are intrastate pipeline facilities regulated under comparable state laws.

A6 Surface impoundments, pits, ponds or lagoons.

A7 Storm water or wastewater collection systems.

A8 Flow-through process tanks, including but not limited to, pressure vessels or process vessels and oil and water separators.

A9 Non-stationary tank, liquid trap or associated gathering lines directly related to oil and gas production or gathering operations.

3930-FM-WC0010 7/98

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED CONSERVATION

ABOVEGROUND STORAGE TANK INTEGRITY INSPECTION SUMMARY

I. Type of Inspection

- [x] In-service
- [ ] Out-of-service
- [ ] Used tank
- [ ] Department request

II. Inspection Date(s)

Completion of this inspection 10/7/99

Last in-service inspection N/A

Last out-of-service inspection 7/27/94

FOR DEP USE ONLY

Reviewer ______

Date ______

Entered By ______

Date ______

III. Facility Information

Facility ID number 51 – 19781

Facility Name Sunoco – Point Breeze

Facility Address 3144 Passyunk Avenue

Philadelphia, PA 19134

Owner/representative providing information

Name Mario Cruz

Title Tank Eng. Manager Phone (215) 339-7125

IV. Inspector Information

Name Alexander J. Petras

DEP Inspector Certification Number 3250

API 653 number 0449

API 570 number ______

Phone (609) 448-4633

Employer U.N.I. Engineering, Inc.

DEP Company Certification Number 78

V. Tank Identification

Tank ID number New A

Capacity (gallons) 2,935,800

Size: diameter 102 (ft) length/height 48 (ft)

Substance stored Frac. Bottoms/Gas Oil

Original construction code API-12C

VI. Fire/Safety permit number N/A

Issuing Authority ______

Date Issued ______

VII. CERTIFIED INSPECTOR

I, the DEP Certified Inspector, have inspected the entire above referenced tank system. Based on my observation of the tank system, review of examination and tests results and information provided by the owner, I certify under penalty of law as provided in 18 Pa. C.S.A. Section 4904 (relating to unsworn falsification to authorities), that the information provided by me is true, accurate, and complete to the best of my knowledge and belief.

Alexander J Petras — Certified Inspector's Signature

2/14/2000 — Date

VIII. OWNER OR OWNER'S REPRESENTATIVE: I have reviewed the completed inspection report. I certify under penalty of law as provided in 18 PA C.S.A. Section 4904 (relating to unsworn falsification to authorities), the information provided by me is true, accurate, and complete to the best of my knowledge and belief.

Mario A. Cruz — Signature

Lead Tank Engineer — Title

2/14/2000 — Date

Facility ID 51 — 19781 **Tank ID** New **A** **Date** 2/14/00

IX. Evaluation of tank system. Indicate the condition of the following components by marking the appropriate columns. If unsatisfactory explain deficiency on comment section.

System component	Satisfactory	Unsatisfactory	Not Applicable
Containment area	☒	☐	☐
Foundation and tank supports	☒	☐	☐
Tank shell	☒	☐	☐
Tank roof	☒	☐	☐
Tank bottom/floor	☐	☐	☒
Appurtenances	☒	☐	☐
Ancillary equipment (including piping)	☒	☐	☐
Leak detection method	☐	☐	☒
Cathodic protection system, if installed	☐	☐	☒
Internal linings & coating, if installed	☐	☐	☒
External deterioration protection	☒	☐	☐
Tank test for tightness	☒	☐	☐

Method(s) used for testing tightness and nondestructive examination(s) Visual, Ultrasonic Thickness Testing of Shell

X. Calculated information:

1. Corrosion/deterioration rate: Tank Shell 0.0009 (in/yr)
   Tank Bottom N/A (in/yr)
   Piping 0 (in/yr)

3. Service life based on corrosion rate:
   Tank 20+ (years)
   Piping 20+ (years)

Corrosion rates were based on(substance stored) Frac. Bottoms/Gas Oil

Safe fill height: 48 (ft) at 1.0 (specific gravity)

2. Next inspection scheduled by:
   In-service 10/7/2004 (date)
   Out-of-service 2/20/2014 (date)

XI. Observations (provide comments in Section XIII)

1. Contamination observed/suspected: ☒ No ☐ Yes, Department notification form submitted on ______.
2. Written operations and maintenance plan available on site: ☒ Yes ☐ No
3. Spill Prevention Response Plan is current and available on site: ☒ Yes ☐ No ☐ Not required
4. Emergency Containment Area:
   ☐ meets permeability requirement
   ☒ verified by a Registered Professional Engineer
   ☐ containment present but does not meet requirements
   ☐ containment present but not required to meet standard at this time.
   ☐ no containment structure
5. Owner/Operator monthly maintenance inspection record is available for the past twelve months ☒ Yes ☐ No
6. Is tank system appropriately marked/labeled? ☒ Yes ☐ No
7. Tank system can be returned to service without additional evaluation or modifications: ☒ Yes ☐ No

Facility ID 51 — 19781 **Tank ID** New A **Date** 2/14/00

XII. Tank Information

(1) Tank Construction & Corrosion Protection
- [x] A Single wall steel
- [ ] B Cathodically protected steel (galvanic)
- [ ] C Cathodically protected steel (impressed current)
- [ ] D Double wall steel
- [ ] E Single wall fiberglass
- [ ] F Double wall fiberglass
- [ ] I Steel with lined interior
- [ ] J Concrete
- [ ] O Cathodically protected double wall steel
- [ ] P Cathodically protected steel with liner
- [ ] Q Double bottom
- [ ] R Molded Plastic
- [ ] 99 Other ______

(2) Underground Piping Construction and Corrosion Protection
- [ ] A Bare steel
- [ ] B Cathodically protected steel
- [ ] D Fiberglass
- [ ] E Flexible
- [x] G None
- [ ] I Double wall steel
- [ ] J Double wall fiberglass
- [ ] K Double wall plastic
- [ ] L Trench liner
- [ ] 99 Other ______

(3) Aboveground Piping Construction & Corrosion Protection
- [x] A Steel
- [ ] D Fiberglass
- [ ] E Flexible (non-metallic)
- [ ] G None
- [ ] 99 Other ______

(4) Pump (Piping) System
- [ ] A Suction: Check valve at pump
- [ ] B Suction: Check valve at tank
- [ ] C Pressurized
- [x] D Gravity Fed
- [ ] E None

(5) Pipe Release Detection Method
- [ ] A Automatic line leak detector
- [ ] B Line tightness testing
- [ ] D Interstitial monitoring
- [ ] F Vapor monitoring
- [x] G Visual inspection
- [ ] H None
- [ ] K Electronic line leak detector
- [ ] L Interstitial monitoring w/continuous alarm or shut off

(7) Overfill Prevention
- [x] Y Yes
- [ ] N No

(11) Vapor Recovery
- [ ] A Stage I installed
- [ ] B Stage II installed
- [ ] C Stage I & II installed
- [x] D None

(12) Tank Release Detection Method
- [x] A Monthly inventory control
- [ ] D Statistical inventory reconciliation (SIR)
- [x] E Automatic tank gauging
- [ ] H Interstitial monitoring (2 walls)
- [ ] I Interstitial monitoring (liner)
- [ ] K Vapor monitoring
- [ ] L Grooves made in the impermeable pad
- [ ] M Slotted pipe above the impermeable pad
- [ ] N None
- [x] P Visual Inspection
- [ ] 99 Other ______

(16) Emergency Containment
- [x] Y Yes
- [ ] N No

(17) Secondary Containment
- [ ] Y Yes
- [x] N No

XIII. Comments:

Describe any tank system deficiencies and note additional information discovered during the inspection. If additional comment sheets are needed, label each sheet with facility and tank identification numbers, inspection date and page number.

Note: This tank had a new annular ring installed in the end of 1994 through the first part of 1995. The work was performed by a certified installer, Mainserv, and inspected by a third party certified PADEP inspector James P. Mott, copies of certificates enclosed.

Mott Tank Inspection, Inc.

TANK # 663

PADER/API 653 THIRD PARTY INSPECTION

THE FOLLOWING ITEMS WILL BE SUPPLIED TO THE INSPECTOR AT THE START OF THE JOB BY THE INSTALLER.

1)	WELD PROCEDURES	11-1-94
2)	WELD QUALIFICATIONS	11-1-94
3)	WELDER QUALIFICATIONS	11-1-94
4)	COMPANY CERTS.(PADER)	11-10-94
5)	INSTALLER CERTS.(PADER	11-10-94
6)	MILL TEST REPORTS	12-10-94
7)	STRESS RELIEVING REPORTS	NA

THE FOLLOWING WILL BE SUPPLIED TO THE INSPECTOR BY THE NDT COMPANY.

1)	NDT CREDENTIALS	12-10-94
2)	RADIOGRAPH REPORTS	12-20-94
3)	MAGNETIC PARTICLE REPORTS	12-20-94
4)	LIQUID PENETRANT REPORTS	NA
5)	RADIOGRAPHS IF REQUESTED	NA

NDT WORK IS TO BE DONE BY CERTIFIED PERSONS ONLY.

INSPECTORS WILL CHECK THE FOLLOWING

1)	WELDING ELECTRODES	CONTINUOUS
2)	MATCH STEEL TO MILL TEST REPORTS	12-10-94
3)	INSPECT GRADES AND FOUNDATION	12-20-94
4)	CHECK BOTTOM FOR SLOPE	12-20-94
5)	CHECK SUMPS	NA
6)	CHECK UNDERCUT ON ALL WELDS	CONTINUOUS
7)	APPROVE ALL NDT REPORTS,CERTS & AMOUNT REQUIRED	CONTINUOUS
8)	INSURE THAT ALL API/PADER REQUIREMENTS ARE MET	CONTINUOUS

P. O. Box 164, Woodlyn, PA 19094 - (610) 544-8279 FAX (610) 544-8293
James P. Mott,

TANK # 663

THE INSPECTOR WILL BE NOTIFIED WHENEVER ANY OF THE FOLLOWING WORK IS TO BE DONE.

1)	CHECK FLATNESS OF THE FLOOR BEFORE SECONDARY CONTAINMENT IS INSTALLED	NA
2)	WITNESS TESTING & VACUUM TESTING OF SECONDARY CONTAINMENT	NA
3)	LEAK DETECTION INSTALLED	NA
4)	FLOOR PLATES ARE INSTALLED	12-14-94
5)	ANNULAR RING IS INSTALLED	11-20-94
6)	1ST PASS ON ALL WELDS	CONTINUOUS
7)	ALL BUTT WELDED JOINTS	CONTINUOUS
8)	TACK WELDS	CONTINUOUS
9)	FINAL WELDS	CONTINUOUS
10)	WITNESS VACUUM TESTING OF FLOOR	12-15-94
11)	WITNESS OIL TEST OF FLOOR TO SHELL WELD	12-14-94
12)	WITNESS TESTING OF REINFORCING PADS	NA
13)	ANY TIME A NEW RING IS INSTALLED	12-10-94
14)	WITNESS HYDROTEST	12-27-94
15)	TESTING OF ANY INTERNAL PIPING	12-18-94

SLOT CUT FOR ANNULAR RING 11-10-94

P. O. Box 164, Woodlyn, PA 19094 - (610) 544-8279 FAX (610) 544-8293
James P. Mott,

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 8763
Harrisburg, Pennsylvania 17105-8763

PENNSYLVANIA DER

February 1, 1994 (717) 772-5599

Bureau of Water Quality Management

MOTT TANK INSPECTION INC
PO BOX 164
WOODLYN, PA 19094

Re: Application No. 5423

Dear Applicant:

This document certifies that

MOTT TANK INSPECTION INC

meets the qualifications established under Section 107(d) of the Storage Tank and Spill Prevention Act and Sections 245.121 and 245.122 of the Department's regulations for company certification.

The company certification number is: 1034

This certification expires on February 1, 1997. To renew this certification a completed application must be submitted to the Department at least 120 days prior to the certification expiration date (25 Pa. Code 245.125(a)).

Company certification is conditioned upon compliance with the Storage Tank and Spill Prevention Act (35 P.S. Section 6021.101 et seq.), the Department's rules and regulations promulgated under the Act and the requirements for certification established under 25 Pa. Code 245.1 - 141. Failure to comply with the Act or rules and regulations promulgated under the Act constitutes unlawful conduct and could result in the assessment of fines or penalties, or in the suspension or revocation of certification.

This certification is not valid if obtained through fraud, deceit, or submission of inaccurate data or qualifications (25 Pa. Code Section 245.131).

If there is a change in information contained in the original application for company certification, the company shall notify the Department of the change, as required by 25 Pa. Code Section 245.125(b), by filing an application containing the amended information.

Sincerely,

Cedric H. Karper, Acting Chief
Division of Storage Tanks

CERTIFICATION FOR TANK
REPAIRED, ALTERED & INSPECTED

We hereby certify that the tank at SUN OIL COMPANY PHILADELPHIA REF.
Location

and described as follows:

Serial No.	Owners No.	Diameter	Height	Capacity	Floating or Fixed Roof
	T-663	102'	48'	70,000bbls	METALIC

was repaired, altered, inspected, and tested in accordance with all applicable requirements of API Standards/or UL Standards in accordance to PA storage tank & spill prevention law (ACT 32)

MOTT TANK INSPECTION
Contractor

James P. Mott
JAMES P MOTT PADER #2184 API #058
Authorized Representative

1/12/95
Date

Mott Tank Inspection, Inc.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF WATER QUALITY MANAGMENT, DIVISION OF STORAGE TANKS
P.O. BOX 8763, HARRISBURG, PENNSYLVANIA 17105-8763

PENNSYLVANIA DER

CERTIFICATION NUMBER 2184

THIS CERTIFICATION AUTHORIZES THE BELOW NAMED INDIVIDUAL TO CONDUCT TANK HANDLING OR INSPECTION ACTIVITIES PURSUANT TO THE STORAGE TANK AND SPILL PREVENTION ACT, AND DEPARTMENT REGULATIONS AT TITLE 25 PA CODE CHAPTER 245 IN THE CATEGORIES SHOWN.

CATEGORIES				ISSUE DATE	EXPIRATION DATE(S)
IAF	IAM	****	****	02/24/94	02/24/97
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********

ISSUE TO JAMES P MOTT
MOTT TANK INSPECTION INC
PO BOX 164
WOODLYN PA 19094

AUTHORIZING OFFICIAL'S SIGNATURE
RAYMOND S. POWERS JR.
CERTIFICATION UNIT CHIEF
DIVISION OF STORAGE TANKS
BWQ

THE COLOR AREA OF THIS DOCUMENT CHANGES TONE GRADUALLY AND EVENLY FROM DARK TO LIGHT

P. O. Box 164, Woodlyn, Pa 19094, Phone: 610-544-8279 Fax: 610-544-8293
James P. Mott, Owner

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF WATER QUALITY MANAGMENT, DIVISION OF STORAGE TANKS
P.O. BOX 8763, HARRISBURG, PENNSYLVANIA 17105-8763

PENNSYLVANIA DER

CERTIFICATION NUMBER 3895

THIS CERTIFICATION AUTHORIZES THE BELOW NAMED INDIVIDUAL TO CONDUCT TANK HANDLING OR INSPECTION ACTIVITIES PURSUANT TO THE STORAGE TANK AND SPILL PREVENTION ACT, AND DEPARTMENT REGULATIONS AT TITLE 25 PA CODE CHAPTER 245 IN THE CATEGORIES SHOWN.

CATEGORIES				ISSUE DATE	EXPIRATION DATE(S)
ACVL	AMEX	A_MM	****	09/06/94	09/06/97
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********
****	****	****	****	********	********

ISSUE TO ARID D MARTIN
MAINTENANCE SVCS INC
206 HANSEN CT
NEWARK DE 19713

AUTHORIZING OFFICIAL'S SIGNATURE
RAYMOND S. POWERS JR.
CERTIFICATION UNIT CHIEF
DIVISION OF STORAGE TANKS

ER-BWQ-42

THE COLOR AREA OF THIS DOCUMENT CHANGES TONE GRADUALLY AND EVENLY FROM DARK TO LIGHT

Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
Post Office Box 8762
Harrisburg, Pennsylvania 17105-8762

April 6, 2000

In PA: 1-800-42-TANKS
Local & Out of State: 717-772-5599

Sunoco Inc
3144 Passyunk Ave
Philadelphia PA 19145-5299

RE: Point Breeze Processing Area
3144 Passyunk Ave
Philadelphia PA 19145-5299

Facility No. 51-19781, Tank No(s). 187A

Dear Storage Tank Owner:

This letter verifies that our Department received your registration form for the new tank(s) noted above. The information is being processed, and you will receive an invoice for the registration fees due.

For the tank(s) noted above, this letter serves as a ninety (90) day proof of temporary registration and notification to your product distributor(s).

This temporary registration expires July, 06, 2000 or upon receipt of an official certificate of registration.

Post this letter in a protected area visible to the public at the facility where the tank(s) is located.

This temporary registration may be revoked if the owner or operator fails to make prompt payment of the registration fees. To assist in tank registration verification, please provide a photocopy of this letter to your product distributor(s).

In a few weeks you will receive an invoice for the registration fees due for the regulated tank(s) at your facility. The invoice will include prorated fees to get the new tank(s) into your facility's annual invoicing cycle. Payment is due upon receipt of your invoice.

Upon receipt of the invoice stub and payment, they will be processed and the appropriate registration certificate generated. This will allow the new tank(s) to be operated through the end of the annual invoicing cycle. Please allow 4 to 6 weeks for processing.

If you do not receive an invoice for registration fees within 60 days, you may have an outstanding indebtedness. This prevents our system from invoicing you until full payment is made. If you do not get an invoice in 60 days, call our Division's Customer Services staff immediately. Payment and/or invoicing problems must be resolved to prevent use of your storage tank(s) without proper registration, thus subjecting you to legal action and/or product delivery delays.

If you have any questions or need further assistance, please feel free to call our Division's Customer Services staff at the numbers noted above.

Thank you in advance for your cooperation,

Greg Lazorcik

Greg Lazorcik
Division of Storage Tanks
Bureau of Watershed Conservation

Enclosures
cc: Facility File

Sent By Telefax 05/07/2004

Certified Mail Return Receipt
7002 0460 0003 1935 2291

Sunoco Inc.
3144 Passyunk Avenue
Philadelphia PA 19145-5299
215 339 2000

May 7, 2004

FILE COPY

Mr. Stephan Sinding
PaDEP – S.E. Regional Office
Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428

Storage Tank PB-663 (PA Registration #187A)
Sunoco, Inc. (R&M) – Point Breeze Process Area
Facility ID #51-19781

Dear Mr. Sinding:

This letter complies with PA Tank Regulations 245.305 reporting releases. On Wednesday, April 25, 2004, PaDEP was notified of a Gas Oil release from piping in the tank dike area of PB 663 Tank.

At 08:00 PM on April 25th 2004, a Sunoco Operator noticed a line leak from the 8" header at the tank field manifold north of PB 663 tank. The line was immediately isolated. An estimated 158 gallons of heavy gas oil was released. The material was recovered by utilizing vacuum trucks and absorbent pads and contaminated soil was excavated and removed.

A site characterization is to be performed on the site within the required time frame.

Should you have any questions or comments in reference to this matter please contact me at 215 339-2074.

Very truly yours,

Robert C Mark for GAK

George Keegan
Supervisor Environmental Department

Attachment
GAK/pac

File: AST Releases - 2004

Cc: Philadelphia Local Emergency Planning Committee
240 Spring Garden Street
Philadelphia, PA 19123

FILE COPY

bcc: H. Buchmann – 14 SB MAP
G.A. Keegan – PB/MOB
P.A. Chabeda – PB/MOB

FILE COPY

Certified Mail Receipt #: 7002 0460 0003 1935 2291
File: AST Releases – 2004

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

☒ Initial
☐ Follow-Up

NOTIFICATION OF CONTAMINATION *(Certified Installers and Inspectors)*

FILE COPY

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

The Storage Tank Program's Corrective Action Process (CAP) regulations establish release reporting requirements for owners and operators of storage tanks and storage tank facilities.

Subsection 245.305(a) of the regulations requires owners or operators to notify the appropriate regional office of the Department as soon as practicable, but no later than 24 hours, after the confirmation of a reportable release.

Subsection 245.305(d) requires owners or operators to provide an initial written notification to the Department, each municipality in which the reportable release occurred, and each municipality where that release has impacted environmental media or water supplies, buildings, or sewer or other utility lines, within 15 days of the notice required by Subsection 245.305(a).

Subsection 245.305(e) requires owners or operators to provide follow-up written notification to the Department and to each impacted municipality of new impacts to environmental media or water supplies, buildings, or sewer or other utility lines discovered after the initial written notification required by subsection 245.305(d). Written notification is to be made within 15 days of the discovery of the new impact.

This form may be used to comply with Subsection 245.305(d) and (e).

OWNERS AND OPERATORS (O/O)
INDICATE IF THIS IS AN INITIAL OR FOLLOW-UP NOTIFICATION BY MARKING THE APPROPRIATE BOX FOUND IN THE TOP RIGHT-HAND CORNER OF THIS FORM. PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIB, IV, V, VII and VIII.

NOTIFICATION OF CONTAMINATION
(Certified Installers and Inspectors)

The Storage Tank Program's Certification regulations establish standards of performance for certified installers and inspectors of storage tanks and storage tank facilities.

Subsection 245.132(a)(4) of the regulations requires certified installers and inspectors to report to the Department a release of a regulated substance or confirmed or suspected contamination of soil, surface or groundwater from regulated substances observed while performing services as a certified installer or inspector.

This form may be used to comply with Subsection 245.132(a)(4). Subsection 245.132(a)(4) requires submission of the form within 48 hours of observing suspected or confirmed contamination. Where there is a reportable release, the form may be submitted jointly by the owner, operator, certified installer and certified inspector. In this instance, the form must be received by the appropriate regional office within 15 days of the notice required by Subsection 245.305(a).

CERTIFIED INSTALLERS AND INSPECTORS (I/I)
PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIC, VI, VII and VIII.

INSTRUCTIONS

I. **FACILITY INFORMATION -** Record the name, I.D. number and physical location (not P.O. Box) of the facility at which a reportable release has been confirmed or at which suspected or confirmed contamination has been observed. Include the name and phone number of a person to contact at the facility.

II. **OWNER/OPERATOR INFORMATION -** Record the name, business address and phone number of the owner of the facility identified in Section I. Also, record the name and phone number of the operator of the facility.

III. **REGULATED SUBSTANCE INFORMATION -** Indicate to the best of your knowledge: A) the type of product or products involved; B) the quantity of product or products released; and C) whether the contamination is suspected or confirmed.

IV. **REPORTABLE RELEASE INFORMATION -** Record the date of confirmation of the reportable release, e.g., "9/18/01"; the date and regional office notified; and the date the local municipality(ies) [provide name of municipality(ies)] was/were sent a copy of this form. Indicate to the best of your knowledge the source/cause of the release, how the release was discovered and the environmental media affected and impacts.

V. **INTERIM REMEDIALACTIONS -** Indicate the interim remedial actions planned, initiated or completed.

VI. **SUSPECTED/CONFIRMED CONTAMINATION INFORMATION -** Record the date of observation of the suspected or confirmed contamination, e.g., "11/24/01". Indicate to the best of your knowledge the indications of a suspected release or extent of confirmed contamination resulting from the release of the regulated substance.

VII. **ADDITIONAL INFORMATION -** Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include in this section specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Use additional 8½" x 11" sheets of paper, if necessary.

VIII. **CERTIFICATION -** Please print your name, and provide your signature and date of signature. If a certified installer/inspector, provide certification number and company certification number.

IX. **ATTACHMENT -** If a certified installer/inspector, provide a copy of failed valid tightness test(s), if applicable.

PLEASE SEND COMPLETED ORIGINAL FORM TO:
PA Department of Environmental Protection
Environmental Cleanup Program
Storage Tank Section
(and the appropriate address below,
depending on where the FACILITY is located)

IF A REPORTABLE RELEASE, ALSO SEND A COPY OF THE FORM TO:
PA Department of Environmental Protection
Land Recycling and Cleanup Program
Attn: Storage Tank Corrective Action
P.O. Box 8471
Harrisburg, PA 17105-8471 FAX: 717-787-0884

Southeast Region	Northeast Region	Southcentral Region	Northcentral Region	Southwest Region	Northwest Region
Lee Park, Suite 6010 555 North Lane Conshohocken, PA 19428 PHONE: 610-832-5950/6000 FAX: 610-832-6143	2 Public Square Wilkes-Barre, PA 18711-0790 PHONE: 570-826-2511 FAX: 570-820-4907	909 Elmerton Avenue Harrisburg, PA 17110 PHONE: 877-333-1904 FAX: 717-705-4830	208 W. Third Street, Suite 101 Williamsport, PA 17701 PHONE: 570-321-6525/327-3696 FAX: 570-327-3420	400 Waterfront Drive Pittsburgh, PA 15222 PHONE: 412-442-4091/4000 FAX: 412-442-4328	230 Chestnut Street Meadville, PA 16335-3481 PHONE: 814-332-6945 800-373-3398 FAX: 814-332-6121
Counties Bucks, Chester, Delaware, Montgomery, Philadelphia	**Counties** Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne, Wyoming	**Counties** Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, York	**Counties** Bradford, Cameron, Centre, Clinton, Clearfield, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga, Union	**Counties** Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland	**Counties** Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren

I. FACILITY INFORMATION (Both O/O and I/I)

Facility Name: Sunoco, Inc. - Point Breeze Process Area
Facility I.D. Number: 51-19781
Street Address (P.O. Box not acceptable): 3144 Passyunk Ave.
City: Philadelphia State: PA Zip Code: 19145-5299
County: Philadelphia Municipality: Philadelphia
Contact Person: Patrick Chabeda Phone Number: (215) 339 - 2528

II. OWNER/OPERATOR INFORMATION (Both O/O and I/I)

Owner Name: Sunoco Inc.
Address: 3144 Passyunk Ave
City: Philadelphia State: PA Zip Code: 19145 - 5299
Phone Number: (215) 339 - 2528
Operator Name: Patrick Chabeda Phone Number: (215) 339 - 2528

FILE COPY

III. REGULATED SUBSTANCE INFORMATION

A. Type of Product(s) Involved (Mark All That Apply ☒): Both O/O and I/I		B. Quantity (Gallons) of Product(s) Released: O/O Only	C. Contamination Suspected [S] or Confirmed [C] (Mark All That Apply): I/I Only	
Leaded Gasoline	☐	__ __, __ __ __, __ __ __	[S]	[C]
Unleaded Gasoline	☐	__ __, __ __ __, __ __ __	[S]	[C]
Aviation Gasoline	☐	__ __, __ __ __, __ __ __	[S]	[C]
Kerosene	☐	__ __, __ __ __, __ __ __	[S]	[C]
Jet Fuel	☐	__ __, __ __ __, __ __ __	[S]	[C]
Diesel Fuel	☐	__ __, __ __ __, __ __ __	[S]	[C]
New Motor Oil	☐	__ __, __ __ __, __ __ __	[S]	[C]
Used Motor Oil	☐	__ __, __ __ __, __ __ __	[S]	[C]
Fuel Oil No. 1	☐	__ __, __ __ __, __ __ __	[S]	[C]
Fuel Oil No. 2	☐	__ __, __ __ __, __ __ __	[S]	[C]
Fuel Oil No. 4	☐	__ __, __ __ __, __ __ __	[S]	[C]
Fuel Oil No. 5	☐	__ __, __ __ __, __ __ __	[S]	[C]
Fuel Oil No. 6	☐	__ __, __ __ __, __ __ __	[S]	[C]
Other (Specify) GAS OIL	☒	__ __, __ __ __, 1 5 8	[S]	[C]
Unknown	☐	__ __, __ __ __, __ __ __	[S]	[C]

IV. REPORTABLE RELEASE INFORMATION (O/O Only)

Date Reportable Release was Confirmed: 04 / 25 / 2004 (m / d / y)

Date Owner/Operator Verbally Notified Appropriate Regional Office of Reportable Release and Office Notified:
Date: 04 / 25 / 2004 (m / d / y) Office: S.E. Region

Date Owner/Operator Sent Copy of this Written Notification to Local Municipality(ies) and Name of Municipality(ies) Notified:
Date: 05 / 07 / 2004 (m / d / y) Municipality: Philadelphia
Date: ___ / ___ / ___ (m / d / y) Municipality: ___

Source/Cause (Mark All That Apply ☒):		How Discovered (Mark All That Apply ☒):		Environmental Media Affected and Impacts (Mark All That Apply ☒):	
Tank (DEP Assigned Nos. 187A)	☒	During Closure	☐	Soil	☒
Piping System (Aboveground Regulated)	☒	Lining Installation	☐	Sediment	☐
Piping System (Underground Regulated)	☐	Routine Leak Detection	☐	Surface Water	☐
Piping System (Non-Regulated)	☐	Third Party Inspection	☐	Ground Water	☐
Dispenser/Dispensing Equipment	☐	Tightness Testing Activities	☐	Bedrock	☐
Spill Catchment Basin	☐	Visible Product or Odor Reports	☒	Water Supplies	☐
Accident/Act of God	☐	Water in Tank	☐	Vapors/Product in Buildings	☐
Containment/Sump Failure	☐	Construction	☐	Vapors/Product in Sewer/Utility Lines	☐
Faulty Installation	☐	Upgrade/Repair	☐	Ecological Receptors	☐
Corrosion	☐	Supply Well Sample Results	☐		
Mechanical Failure	☐	Monitoring Well Sample Results	☐		
Spill During Delivery	☐	Property Transfer	☐		
Overfill at Delivery	☐	Other (Specify) ___	☐		
Vehicle Gas Tank Overfill	☐	Unknown	☐		
Product Delivery Hose Rupture	☐				
Other (Specify) ___	☐				
Unknown	☐				

V. INTERIM REMEDIAL ACTIONS (O/O Only)

(Mark All That Apply ☒):

	Planned	Initiated	Completed	Not Applicable
Regulated Substance Removed from Storage Tanks	☐	☐	☐	☒
Fire, Explosion and Safety Hazards Mitigated	☐	☐	☒	☐
Contaminated Soil Excavated	☐	☒	☐	☐
Free Product Recovered	☐	☐	☒	☐
Water Supplies Identified and Sampled	☐	☐	☐	☒
Temporary Water Supplies Provided	☐	☐	☐	☒
Other (Specify)	☐	☐	☐	☒

VI. SUSPECTED / CONFIRMED CONTAMINATION INFORMATION (I/I Only)

Date of Observation of Suspected/Confirmed Contamination: 04 / 25 / 2004 (m d y)

Indication of Suspected Contamination (Mark All That Apply ☒):

- Unusual Level of Vapors ☐
- Erratic Behavior of Product Dispensing Equipment ☐
- Release Detection Results Indicate a Release ☐
- Discovery of Holes in the Storage Tank ☐
- Other (Specify) ____ ☐

Extent of Confirmed Contamination (Mark All That Apply ☒):

- Product Stained or Product Saturated Soil or Backfill ☐
- Ponded Product ☐
- Free Product or Sheen on Ponded Water ☐
- Free Product or Sheen on the Ground Water Surface ☐
- Free Product or Sheen on Surface Water ☐
- Other (Specify) ____ ☐

FILE COPY

VII. ADDITIONAL INFORMATION (Both O/O and I/I)

Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Provide DEP assigned and owner/operator assigned tank number(s), where applicable. Use additional 8½" x 11" sheets of paper, if necessary.

SUNOCO TANK # PB-663

PA DEP # 187A

Please see attached letter.

VIII. CERTIFICATION (Both O/O and I/I)

I, Patrick A. Chabeda, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the owner or operator of the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Owner or Operator

05 / 07 / 2004
Date

I, ______________________, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified installer who performed tank handling activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Installer

/ /
Date

Installer Certification Number

FILE COPY

Company Certification Number

I, ______________________, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified inspector who performed inspection activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Inspector

/ /
Date

Inspector Certification Number

Company Certification Number

Transmission Report

Date/Time	5- 7-04; 3:49PM
Local ID	1234567
Local Name	
Company Logo	

This document was confirmed.
(reduced sample and details below)
Document Size Letter-S

SUNOCO

SUNOCO, INC.

Philadelphia Refinery
Environmental Engineering
3144 Passyunk Ave.
Philadelphia, PA 19145
(215) 339-2050
Fax: (215) 339-2657

Fax

To:	STEVE SINDING	From:	RA. Chabeda
Fax:	484-250-5961	Pages:	6 (including Cover)
Phone:	484-250-5960	Date:	5/7/2004
Re:	AST Release	CC:	

☐ Urgent ☒ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

• Comments: If any of these fax copies are illegible, or you do not receive the same number of pages as stated above, please contact us immediately.

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1	479	914842505961	5- 7-04; 3:46PM	2'53"	6/ 6	EC		CP 14.4

Notes :

EC: Error Correct
BC: Broadcast Send
CP: Completed
HS: Host Scan
HF: Host Fax
RE: Resend
MP: Multi-Poll
RM: Receive to Memory
HP: Host Print
HR: Host Receive
PD: Polled by Remote
PG: Polling a Remote
DR: Document Removed
FO: Forced Output
FM: Forward Mailbox Doc.
MB: Receive to Mailbox
PI: Power Interruption
TM: Terminated by user
WT: Waiting Transfer
WS: Waiting Send

SECOR
SECOR INTERNATIONAL INCORPORATED
www.secor.com

November 24, 2004

Mr. Stephan Sinding
Chief, Storage Tank Section
Environmental Cleanup Program
Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

Subject: **Storage Tank PB-663 (PA Registration #187A) Site Assessment Report**
Sunoco, Inc. (R&M) – Point Breeze Process Area, Philadelphia Refinery
Philadelphia, Pennsylvania
Facility ID #51-19781

Dear Mr. Sinding:

This report summarizes the site assessment activities that were conducted in the vicinity of aboveground storage tank (AST) PB-663 at the Sunoco, Inc. (Sunoco) Point Breeze Process Area, Philadelphia Refinery, located in Philadelphia, Pennsylvania (**Figure 1**). Site assessment activities consisted of confirmation surface soil sampling after remedial activities were completed.

On April 25, 2004, approximately 158 gallons of heavy gas oil were released to the ground surface within the AST 663 tank dike area. The heavy gas oil was released from a leak in the 8-inch header at the tank field manifold. The line was immediately isolated and the heavy gas oil was recovered using a vacuum truck and sorbent pads. Approximately 42.7 tons of impacted soil was excavated and disposed of as residual waste by Waste Management, Inc. The excavated area was filled with crushed stone. Sunoco notified the Pennsylvania Department of Environmental Protection (PADEP) of the release and subsequent remedial activities in a letter dated May 7, 2004. The approximate extent of the heavy gas oil release is depicted on **Figure 2**. As indicated on **Figure 2** and noted above, the heavy gas oil that was released was confined to within the tank berm.

Soil Sampling Activities

On June 4, 2004, a SECOR International Incorporated (SECOR) Professional Geologist certified in Pennsylvania collected 4 soil samples in order to verify that remedial activities were successful. Soil samples designated 663 Area-1 through 663 Area-3 were collected within the release area at a depth of approximately 6 inches below ground surface. Soil sample 663 Area-4 was collected at a depth of approximately 6 inches from an area just beyond the extent of the release area. Soil sampling locations are depicted on **Figure 2**. Each soil sample was analyzed for PADEP Pennsylvania Land Recycling Program (Act 2) short list of parameters for Fuel Oil numbers 4, 5 & 6 in soils. The list includes the analyses of benzene and naphthalene by EPA Method 5035/8260B and anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluorene, phenanthrene and pyrene by EPA Method 8270C. Additional soil was also collected at each sample location to be analyzed using the Synthetic Precipitation Leaching Procedure (SPLP), if needed.

As will be described in the following section, Nonresidential Used Aquifer Soil-to-Groundwater Medium Specific Concentrations (MSCs) were exceeded for benzo(a)pyrene (663 Area-1) and naphthalene (663 Area-2). Those soil samples were released for SPLP analysis for each analyte that exceeded a Nonresidential Used Aquifer Soil-to-Groundwater MSC. However, because EPA Method 8270C was utilized, the benzo(a)pyrene detection limit from the SPLP analysis was above the PADEP Nonresidential Used Aquifer MSC for groundwater. As a result, an additional soil sample was collected on July 22, 2004 at soil sample location 663 Area-1 at a depth of approximately 6 inches below ground surface. This soil sample was analyzed for benzo(a)pyrene using the SPLP and EPA Method 8310.

Soil Sampling Results

The soil analytical data is summarized on **Table 1.** Copies of the laboratory analytical results are included in **Appendix A.** The analytical results for the soil samples were compared to the cleanup criteria established by PADEP under Act 2. Under the regulations implementing Act 2, MSCs for soils include two components. PADEP has developed MSCs for soils are based on direct contact exposure scenarios and PADEP has developed procedures for selecting MSCs for soils that are designed to protect groundwater from the potential impacts that could be caused by the migration of regulated substances from soils into the groundwater. Soil sample results were compared to Nonresidential Surface Soil and Subsurface Soil Direct Contact MSCs and Nonresidential Used Aquifer Soil-to-Groundwater MSCs. These MSCs are listed in Appendix A, Tables 3A and 3B (revised November 24, 2001) of the Act 2 Rules and Regulations.

Soil samples 663 Area-3 and 663 Area-4 did not exceed the Nonresidential Surface Soil and Subsurface Soil Direct Contact MSCs or the Nonresidential Used Aquifer Soil-to-Groundwater MSCs.

Soil samples 663 Area-1 and 663 Area-2 exceeded the Direct Contact, Nonresidential, 0-2 feet Surface Soil MSC of 11,000 micrograms per kilogram (ug/kg) for benzo(a)pyrene with concentrations of 56,000 ug/kg and 26,000 ug/kg, respectively. Soil sample 663 Area-1 exceeded the Nonresidential Used Aquifer Soil-to-Groundwater MSC of 46,000 ug/kg for benzo(a)pyrene with a concentration of 56,000 ug/kg. Soil sample 663 Area-2 exceeded the Nonresidential Used Aquifer Soil-to-Groundwater MSC of 25,000 ug/kg for naphthalene with a concentration of 31,000 ug/kg.

The SPLP analytical data is summarized on **Table 2.** Copies of the laboratory analytical results are included in **Appendix B.** Soil sample 663 Area-2 was analyzed for SPLP naphthalene by EPA Method 8260B. Soil sample 663 Area-1 was analyzed for SPLP benzo(a)pyrene by EPA Method 8270C. SPLP analytical results were compared to PADEP Nonresidential Used Aquifer MSC's for groundwater. Soil sample 663 Area-2 did not exceed the Nonresidential Used Aquifer MSC's for naphthalene in groundwater. As stated previously, the detection limit for soil sample 663 Area-1 for benzo(a)pyrene (1 microgram per liter (ug/l)) was higher than the PADEP Nonresidential Used Aquifer MSC (0.2 ug/l). A soil sample was recollected at the 663 Area-1 location and reanalyzed for SPLP benzo(a)pyrene using EPA Method 8310. 663 Area-1 did not exceed the Nonresidential Used Aquifer MSC for benzo(a)pyrene in groundwater.

Conclusions

Four soil samples were collected in order to verify that remedial activities in the area of AST PB-663 were successful. Two soil samples (663 Area-1 and 663 Area-2) exceeded the Direct Contact, Nonresidential, 0-2 feet Surface Soil MSC for benzo(a)pyrene. Soil sample 663 Area-1 had a Nonresidential Used Aquifer Soil-to-Groundwater MSC exceedence for benzo(a)pyrene and soil sample 663 Area-2 had a Nonresidential Used Aquifer Soil-to-Groundwater MSC exceedence for naphthalene. Soil samples 663 Area-1 and 663 Area-2 were released for SPLP analysis of parameters that were above Nonresidential Used Aquifer Soil-to-Groundwater MSCs. Neither soil sample had a Nonresidential Used Aquifer Groundwater MSC exceedence.

Direct contact MSCs were exceeded for soil at two locations (663 Area-1 and 663 Area-2). As depicted on **Figure 2** these locations are now covered with crushed stone and are located under a pipe catwalk, making the possibility of direct contact with the soil improbable. While groundwater protection MSCs were exceeded for benzo(a)pyrene and naphthalene in soil, SPLP analysis indicate that the soil exceedences will not impact groundwater above PADEP Nonresidential Used Aquifer Groundwater MSCs. Since Sunoco is not seeking a release of liability and the release was contained within the AST 663 dike area, no further action is required or recommended.

Should you have any questions or comments, please feel free to contact either of us at (484) 875-3075.

Sincerely,
SECOR International Incorporated

Steve Baggett for

Sergio Morescalchi, P.G.
Project Geologist

Steve Baggett

Steve Baggett, P.G.
Principal Hydrogeologist

c: Patrick Chabeda (Sunoco)
James Oppenheim (Sunoco)
Project File

TABLES

Table 1
Soil Analytical Results
AST 663 Area - Line Leak
SUNOCO Philadelphia Refinery
Philadelphia, Pennsylvania

Sample Identification	663 Area-1	663 Area-2	663 Area-3	663 Area-4	MSCs		
Sample Collection Date	6/4/2004	6/4/2004	6/4/2004	6/4/2004	Direct Contact, Non-residential, 0-2 feet (1)	Direct Contact, Non-residential, 2-15 feet (1)	Soil to Groundwater, Used Aquifer, Non-Residential (2)
VOCs							
Benzene	ND (57)	ND (100)	ND (57)	ND (1.9)	210,000	240,000	500
Naphthalene	7,800	**31,000**	8,100	ND (110)	56,000,000	190,000,000	25,000
SVOCs							
Anthracene	38,000	15,000 J	ND (2,200)	ND (1,900)	190,000,000	190,000,000	350,000
Benzo(a)anthracene	67,000	27,000	4,100 J	3,800 J	110,000	190,000,000	320,000
Benzo(a)pyrene	**56,000**	**26,000**	6,000 J	5,200 J	11,000	190,000,000	46,000
Benzo(b)fluoranthene	80,000	32,000	6,700 J	4,400 J	110,000	190,000,000	170,000
Benzo(ghi)perylene	40,000	23,000 J	6,500 J	6,000 J	170,000,000	190,000,000	180,000
Chrysene	52,000	24,000	5,600 J	10,000 J	11,000,000	190,000,000	230,000
Fluorene	26,000	29,000	5,900 J	ND (1,900)	110,000,000	190,000,000	3,800,000
Phenanthrene	150,000	99,000	14,000 J	ND (1,900)	190,000,000	190,000,000	10,000,000
Pyrene	110,000	50,000	ND (2,200)	18,000 J	84,000,000	190,000,000	2,200,000

NOTES:

All soil samples collected at approximately 6" below grade.

All results in ug/kg (micrograms per kilogram)

ND (100) = Not detected at or above the laboratory reporting limit

J = Estimated value

MSCs = Medium-Specific Concentrations

(1)= Pennsylvania Land Recycling Program (25 PA code Chapter 250), Appendix A, Table 3 A (Revised November 24, 2001)

(2)= Pennsylvania Land Recycling Program (25 PA code Chapter 250), Appendix A, Table 3 B (Revised November 24, 2001)

BOLD = Exceeds PADEP Medium-Specific Concentration

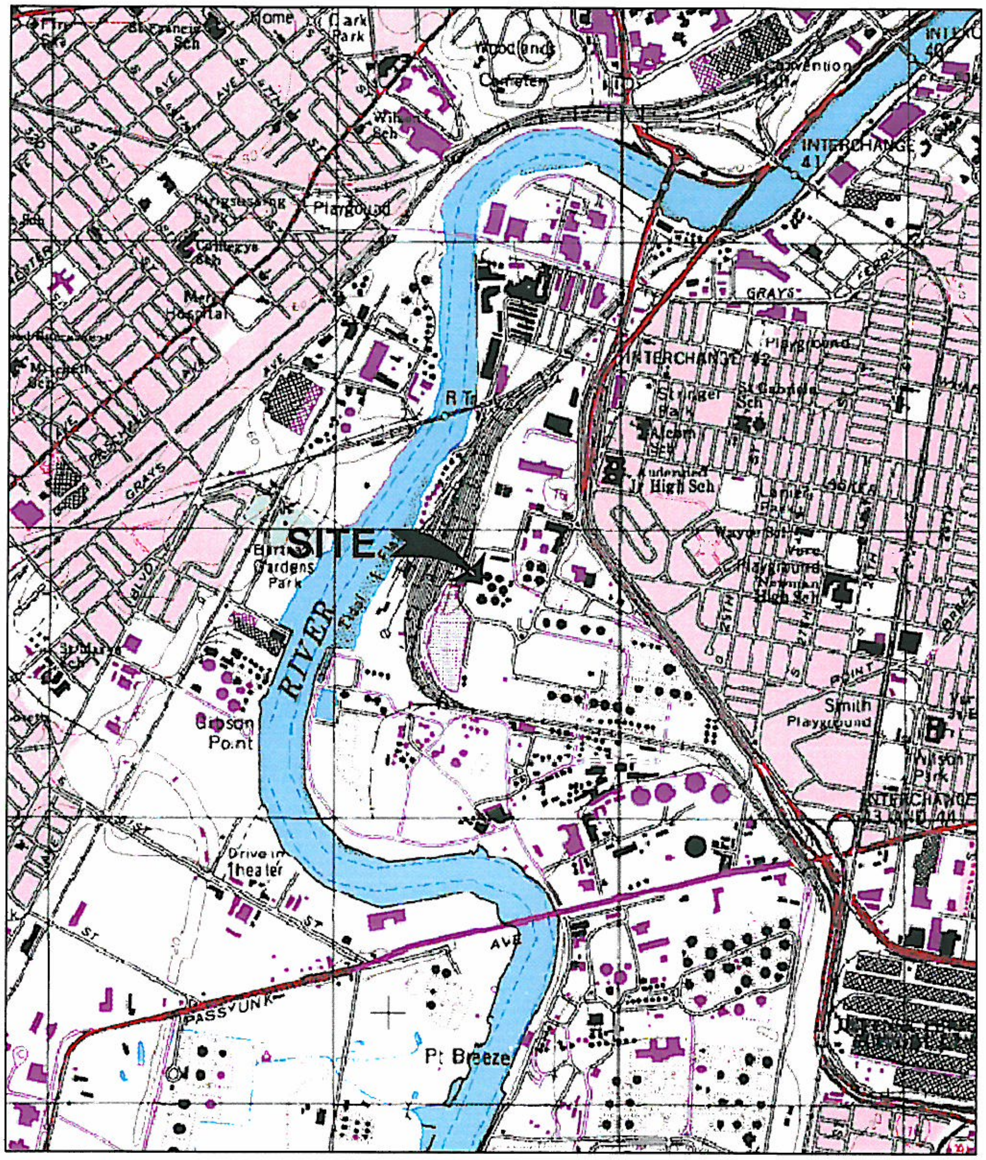
Table 2
SPLP Results
AST 663 Area - Line Leak
SUNOCO Philadelphia Refinery
Philadelphia, Pennsylvania

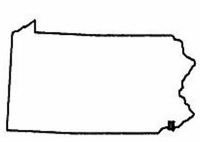
Sample Identification	663 Area-1	663 Area-2	663 Area-1	663 Area-2	MSCs Used Aquifer, Non-Residential (1)
Sample Collection Date	6/4/2004	6/4/2004	7/22/2004	7/22/2004	
VOCs					
Naphthalene	NA	ND (25)	NA	NA	100
SVOCs					
Benzo(a)pyrene	ND (1)	NA	ND (0.019)	NA	0.2

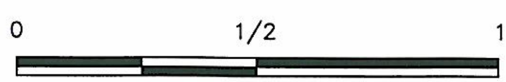
NOTES:
All results in ug/l (micrograms per liter)
Soil samples were collected at approximately 6" below grade
ND (25) = Not detected at or above the laboratory reporting limit
NA = Not analyzed
MSCs = Medium-Specific Concentrations
(1)= Pennsylvania Land Recycling Program (25 PA code Chapter 250),
Appendix A, Table 1 (Revised November 24, 2001)
BOLD = Exceeds PADEP Medium-Specific Concentration

P:\Clients\Sunoco\AST Investigations\AST 663 area\[663 area analytical results.xls]SPLP results

FIGURES







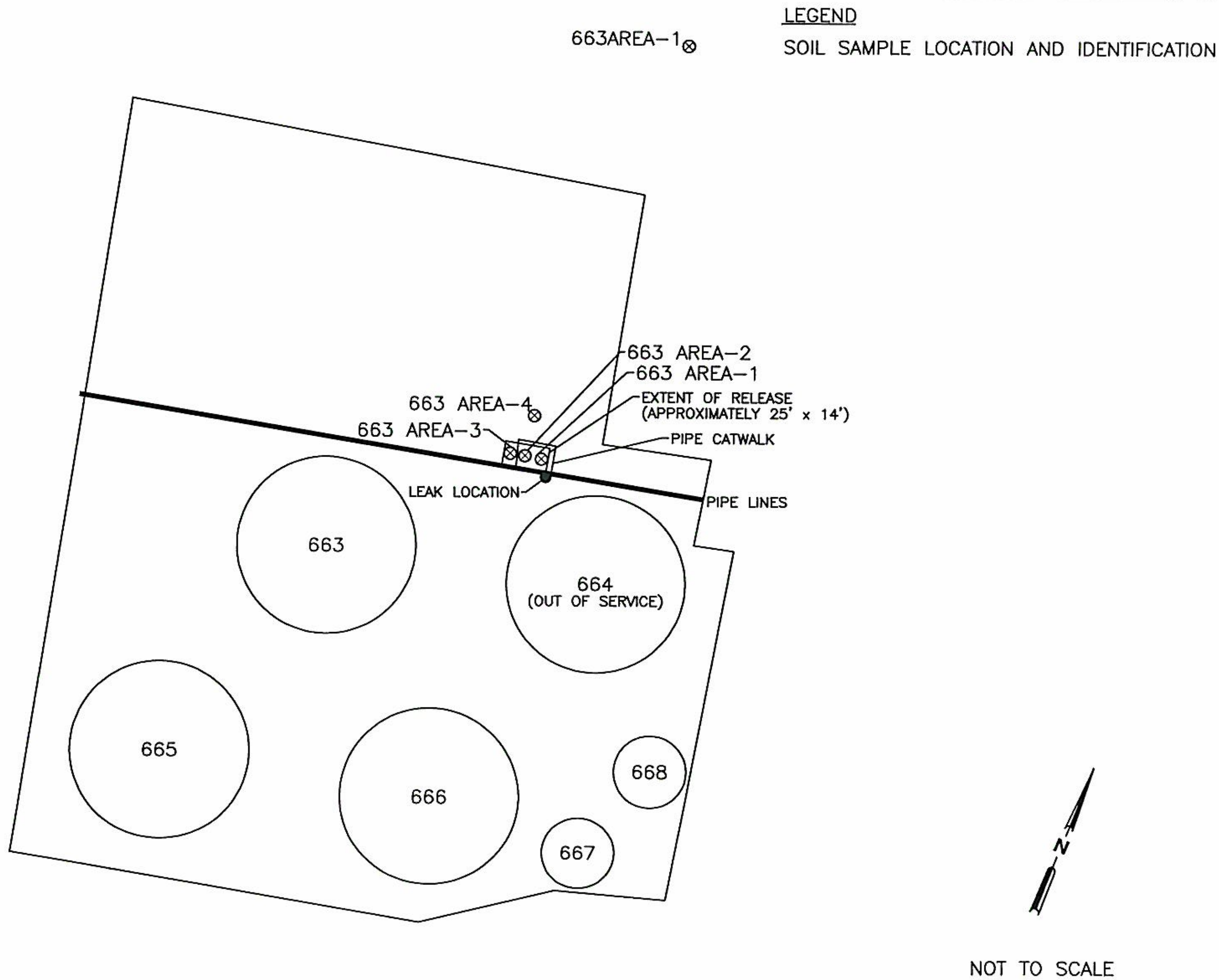
REFERENCE: USGS 7.5 MINUTE QUADRANGLE; PHILADELPHIA, PENNSYLVANIA–NEW JERSEY; 1995

SECOR

102 PICKERING WAY, SUITE 200
EXTON, PENNSYLVANIA
PHONE: (484) 875-3075/875-9286 (FAX)

PREPARED FOR:		SITE LOCATION MAP		FIGURE:
SUNOCO PHILADELPHIA REFINERY PHILADELPHIA, PENNSYLVANIA				1
JOB NUMBER: 62SU.01055.04	DRAWN BY: KEF	CHECKED BY:	APPROVED BY:	DATE: 09/15/2004

62SU-1055-AST663-SL.DWG



SECOR
102 PICKERING WAY, SUITE 200
EXTON, PENNSYLVANIA
PHONE: (484) 875-3075/875-9286 (FAX)

FOR: SUNOCO PHILADELPHIA REFINERY PHILADELPHIA, PENNSYLVANIA		AST 663 AREA SOIL SAMPLE LOCATIONS		FIGURE: 2
JOB NUMBER: 62SU.01055.04	DRAWN BY: KEF	CHECKED BY: SM	APPROVED BY:	DATE: 10/26/2004

FILEPATH:

62SU-1055-AST663-SS-U04.DWG

APPENDIX A

Laboratory Analytical Report
June 4, 2004 Soil Analytical Results

ANALYTICAL RESULTS

Prepared for:

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341
484-875-3075

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 898750. Samples arrived at the laboratory on Friday, June 04, 2004. The PO# for this group is PHILA. REFINERY.

Client Description	Lancaster Labs Number
663 AREA-1 Grab Soil Sample	4287056
663 AREA-2 Grab Soil Sample	4287057
663 AREA-3 Grab Soil Sample	4287058
663 AREA-4 Grab Soil Sample	4287059
Trip Blank Methanol Sample	4287060

1 COPY TO Secor International, Inc. Attn: Sergio Morescalchi

Questions? Contact your Client Services Representative
Sandra L Patton at (717) 656-2300.

Respectfully Submitted,

Dana M Kauffman

Dana M. Kauffman
Group Leader

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. SW 4287056

663 AREA-1 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 11:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663A1

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	25.6	0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.					
08181	BTEX/Naphthalene					
08183	Benzene	71-43-2	N.D.	57.	ug/kg	530
08189	Naphthalene	91-20-3	7,800.	280.	ug/kg	530
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system. Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.					
07804	PAHs in Soil by GC/MS					
01195	Pyrene	129-00-0	110,000.	4,500.	ug/kg	10
03768	Fluorene	86-73-7	26,000.	450.	ug/kg	1
03775	Phenanthrene	85-01-8	150,000.	4,500.	ug/kg	10
03776	Anthracene	120-12-7	38,000.	450.	ug/kg	1
03781	Benzo(a)anthracene	56-55-3	67,000.	4,500.	ug/kg	10
03782	Chrysene	218-01-9	52,000.	450.	ug/kg	1
03786	Benzo(b)fluoranthene	205-99-2	80,000.	4,500.	ug/kg	10
03788	Benzo(a)pyrene	50-32-8	56,000.	4,500.	ug/kg	10
03791	Benzo(g,h,i)perylene	191-24-2	40,000.	450.	ug/kg	1
	Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.					

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 03:48	Stephanie A Selis	530
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 11:09	Susan L Scheuering	1
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/09/2004 10:39	Susan L Scheuering	10

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287056

663 AREA-1 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 11:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663A1

06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:00	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

Lancaster Laboratories Sample No. SW 4287057

663 AREA-2 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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Exton PA 19341

663A2

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	28.3		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		100.	ug/kg	918
08189	Naphthalene	91-20-3	31,000.		510.	ug/kg	918
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system.						
	Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	50,000.		2,300.	ug/kg	5
03768	Fluorene	86-73-7	29,000.		2,300.	ug/kg	5
03775	Phenanthrene	85-01-8	99,000.		2,300.	ug/kg	5
03776	Anthracene	120-12-7	15,000.	J	2,300.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	27,000.		2,300.	ug/kg	5
03782	Chrysene	218-01-9	24,000.		2,300.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	32,000.		2,300.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	26,000.		2,300.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	23,000.	J	2,300.	ug/kg	5
	Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.						
	Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.						

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287057

663 AREA-2 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A2

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 03:11	Stephanie A Selis	918
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 11:53	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:03	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

Analysis Report

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Lancaster Laboratories Sample No. SW 4287058

663 AREA-3 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:30 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A3

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	25.6		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		57.	ug/kg	526
08189	Naphthalene	91-20-3	8,100.		280.	ug/kg	526
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system. Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	N.D.		2,200.	ug/kg	5
03768	Fluorene	86-73-7	5,900.	J	2,200.	ug/kg	5
03775	Phenanthrene	85-01-8	14,000.	J	2,200.	ug/kg	5
03776	Anthracene	120-12-7	N.D.		2,200.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	4,100.	J	2,200.	ug/kg	5
03782	Chrysene	218-01-9	5,600.	J	2,200.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	6,700.	J	2,200.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	6,000.	J	2,200.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	6,500.	J	2,200.	ug/kg	5

The GC/MS semivolatile surrogate recoveries were outside of QC limits. The analysis was repeated and surrogate recoveries were again outside of QC limits, indicating a matrix effect.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

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Laboratory Chronicle

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287058

663 AREA-3 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:30 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A3

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 02:33	Stephanie A Selis	526
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 12:08	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:01	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287059

663 AREA-4 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A4

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	10.9		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		1.9	ug/kg	21.3
08189	Naphthalene	91-20-3	N.D.		110.	ug/kg	21.3
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. Due to the presence of an interferent near its retention time, the normal reporting limit was not attained for naphthalene. The presence or concentration of this compound cannot be determined due to the presence of this interferent.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	18,000.	J	1,900.	ug/kg	5
03768	Fluorene	86-73-7	N.D.		1,900.	ug/kg	5
03775	Phenanthrene	85-01-8	N.D.		1,900.	ug/kg	5
03776	Anthracene	120-12-7	N.D.		1,900.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	3,800.	J	1,900.	ug/kg	5
03782	Chrysene	218-01-9	10,000.	J	1,900.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	4,400.	J	1,900.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	5,200.	J	1,900.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	6,000.	J	1,900.	ug/kg	5

Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287059

663 AREA-4 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A4

00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 04:26	Stephanie A Selis	21.3
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 12:23	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:04	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

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Lancaster Laboratories Sample No. G5 4287060

Trip Blank Methanol Sample
Sunoco Philadelphia Refinery

Collected: n.a.

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

TB663

Account Number: 11183

Secor International, Inc.
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CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
08181	BTEX/Naphthalene					
08183	Benzene	71-43-2	N.D.	2.0	ug/kg	25
08189	Naphthalene	91-20-3	N.D.	10.	ug/kg	25

The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 11:15	Martha L Seidel	25
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:02	Medina A Long	n.a.

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Analysis Report

Quality Control Summary

Client Name: Secor International, Inc.
Reported: 06/17/04 at 02:07 PM

Group Number: 898750

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 04157SLA026	Sample number(s): 4287056-4287059							
Pyrene	N.D.	33.	ug/kg	99		71-110		
Fluorene	N.D.	33.	ug/kg	108		66-115		
Phenanthrene	N.D.	33.	ug/kg	101		70-107		
Anthracene	N.D.	33.	ug/kg	98		71-107		
Benzo(a)anthracene	N.D.	33.	ug/kg	89		74-107		
Chrysene	N.D.	33.	ug/kg	88		72-109		
Benzo(b)fluoranthene	N.D.	33.	ug/kg	97		71-113		
Benzo(a)pyrene	N.D.	33.	ug/kg	99		79-113		
Benzo(g,h,i)perylene	N.D.	33.	ug/kg	107		74-119		
Batch number: 04159820003A	Sample number(s): 4287056-4287059							
Moisture				99		99-101		
Batch number: 04161A31C	Sample number(s): 4287056-4287059							
Benzene	N.D.	2.0	ug/kg	102	102	86-113	0	30
Naphthalene	N.D.	10.	ug/kg	96	96	70-125	0	30
Batch number: 04161A31D	Sample number(s): 4287060							
Benzene	N.D.	2.0	ug/kg	102	102	86-113	0	30
Naphthalene	N.D.	10.	ug/kg	96	96	70-125	0	30

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 04157SLA026	Sample number(s): 4287056-4287059								
Pyrene	(2)	(2)	28-144	16	30				
Fluorene	(2)	(2)	39-137	15	30				
Phenanthrene	(2)	(2)	29-143	19	30				
Anthracene	(2)	(2)	35-138	24	30				
Benzo(a)anthracene	(2)	(2)	26-144	17	30				
Chrysene	(2)	(2)	23-150	27	30				
Benzo(b)fluoranthene	(2)	(2)	32-140	19	30				
Benzo(a)pyrene	(2)	(2)	23-154	26	30				
Benzo(g,h,i)perylene	(2)	(2)	17-152	32*	30				
Batch number: 04159820003A	Sample number(s): 4287056-4287059								
Moisture						17.0	18.5	9	15

*- Outside of specification

(1) The result for one or both determinations was less than five times the LOQ.

(2) The background result was more than four times the spike added.

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Analysis Report

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Quality Control Summary

Client Name: Secor International, Inc.
Reported: 06/17/04 at 02:07 PM

Group Number: 898750

Surrogate Quality Control

Analysis Name: PAHs in Soil by GC/MS
Batch number: 04157SLA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
4287056	117	96	103
4287057	116	111	132
4287058	92	97	117
4287059	123	109	109
Blank	96	95	106
LCS	96	98	103
MS	116	96	93
MSD	114	97	94
Limits:	47-128	55-123	49-133

Analysis Name: BTEX/Naphthalene
Batch number: 04161A31C

	Trifluorotoluene-P
4287056	5*
4287057	3*
4287058	5*
4287059	99
Blank	110
LCS	107
LCSD	107
Limits:	72-122

Analysis Name: BTEX/Naphthalene
Batch number: 04161A31D

	Trifluorotoluene-P
4287060	107
Blank	107
LCS	107
LCSD	107
Limits:	72-122

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Analysis Request / Environmental Services Chain of Custody

Lancaster Laboratories
Where quality is a science.

For Lancaster Laboratories use only
Acct. # 11183 Group# 898700 Sample # 4287056-60

COC # 0056395

Please print. Instructions on reverse side correspond with circled numbers.

1
Client: SECOR Acct. #:
Project Name/#: SUNOCO 663 AREA PWSID #:
Project Manager: S. MORESCALCHI P.O.#:
Sampler: S. MORESCALCHI Quote #:
Name of state where samples were collected: PA

For Lab Use Only
FSC:
SCR #: 1191028

2 Sample Identification	Date Collected	Time Collected	3 Grab	Composite	Soil	Water	Other	4 Total # of Containers	5 PADEP Fuel Oil 4,5,6	SPLP-HOLD Fuel Oil 4,5,6	Remarks
663 AREA-1	06-04-04	1150	✓		✓			4	✓		0011040 - HOLD SPLP
663 AREA-2	↓	1210	✓		✓			4	✓		0011041 - ↓
663 AREA-3	↓	1230	✓		✓			4	✓		0011042 - ↓
663 AREA-4	↓	1250	✓		✓			4	✓		011014 - ↓ ↓
TRIP BLANK							✓	1	✓		

7 **Turnaround Time Requested** (TAT) (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.) P7
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

8 **Data Package Options** (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No
Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

9
Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	6/2/04	1610	[signature]	6-3-04	0840
[signature]	6-3-04	1440			
[signature]	6/4/04	1705	R. Kindig	6/4/04	1705
R. Kindig	6/4/04	1810			
			Jessica B[illegible]	6/4/04	1810

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

2102 Rev. 10/27/02

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL LANCASTER LABORATORIES BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF LANCASTER LABORATORIES AND (B) WHETHER LANCASTER LABORATORIES HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Lancaster Laboratories which includes any conditions that vary from the Standard Terms and Conditions of Lancaster Laboratories and we hereby object to any conflicting terms contained in any acceptance or order submitted by client.

APPENDIX B

Laboratory Analytical Reports
June 4, 2004 SPLP Analytical Results
July 22, 2004 SPLP Analytical Results

Lancaster Laboratories

Analysis Report

ANALYTICAL RESULTS

Prepared for:

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341
484-875-3075

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 900291. Samples arrived at the laboratory on Wednesday, June 16, 2004. The PO# for this group is PHILA. REFINERY.

Client Description	Lancaster Labs Number
663 AREA-1 Grab Soil Sample	4294644
663 AREA-2 Grab Soil Sample	4294645
663 AREA-2 Grab Soil Sample	4294646

1 COPY TO Secor International, Inc. Attn: Sergio Morescalchi

Questions? Contact your Client Services Representative
Sandra L Patton at (717) 656-2300.

Respectfully Submitted,

Victoria M. Martell

Victoria M. Martell
Chemist

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. TL 4294644

663 AREA-1 Grab Soil Sample
SPLP Non-Volatile Ext. Re-entry of LL#4287056
Sunoco Philadelphia Refinery
Collected:06/04/2004 11:50 by SM

Account Number: 11183

Submitted: 06/16/2004 16:30
Reported: 06/28/2004 at 12:40
Discard: 07/13/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663-1

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
07805	PAHs in Water by GC/MS					
03977	Benzo(a)pyrene	50-32-8	N.D.	1.	ug/l	1

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07805	PAHs in Water by GC/MS	SW-846 8270C	1	06/23/2004 16:03	Chad A Moline	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	06/17/2004 10:00	Zachary S Dennis	n.a.
07807	BNA Water Extraction	SW-846 3510C	1	06/19/2004 05:30	Felix C Arroyo	1

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. TL 4294645

663 AREA-2 Grab Soil Sample
SPLP Non-Volatile Ext. Re-entry of LL#4287057
Sunoco Philadelphia Refinery
Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/16/2004 16:30
Reported: 06/28/2004 at 12:40
Discard: 07/13/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

6632N

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
07805	PAHs in Water by GC/MS					
03977	Benzo(a)pyrene	50-32-8	N.D.	1.	ug/l	1

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07805	PAHs in Water by GC/MS	SW-846 8270C	1	06/23/2004 16:49	Chad A Moline	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	06/17/2004 10:00	Zachary S Dennis	n.a.
07807	BNA Water Extraction	SW-846 3510C	1	06/19/2004 05:30	Felix C Arroyo	1

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. TL 4294646

663 AREA-2 Grab Soil Sample
SPLP Zero Headspace Ext. Re-entry of LL#4287057
Sunoco Philadelphia Refinery
Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/16/2004 16:30
Reported: 06/28/2004 at 12:40
Discard: 07/13/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663-2

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
08227	Naphthalene					
00781	Naphthalene	91-20-3	N.D.	25.	ug/l	5

Due to the nature of the sample matrix, normal reporting limits were not attained.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
08227	Naphthalene	SW-846 8021B	1	06/18/2004 21:24	Linda C Pape	5
08792	SPLP Volatile Extraction	SW-846 1312	1	06/17/2004 12:00	Melvin O Strother	n.a.

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Quality Control Summary

Client Name: Secor International, Inc.
Reported: 06/28/04 at 12:41 PM

Group Number: 900291

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 04170A53A	Sample number(s): 4294646							
Naphthalene	N.D.	1.0	ug/l	96	97	44-139	1	30
Batch number: 04170WAA026	Sample number(s): 4294644-4294645							
Benzo(a)pyrene	N.D.	1.	ug/l	94	99	74-116	6	30

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 04170A53A	Sample number(s): 4294646								
Naphthalene	105		39-150						

Surrogate Quality Control

Analysis Name: Naphthalene
Batch number: 04170A53A

	Trifluorotoluene-P
4294646	98
Blank	97
LCS	99
LCSD	101
MS	102
Limits:	66-136

Analysis Name: PAHs in Water by GC/MS
Batch number: 04170WAA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
4294644	85	88	79
4294645	91	86	87
Blank	81	77	80
LCS	83	78	83
LCSD	88	84	92
Limits:	54-124	64-112	53-124

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Analysis Report

Quality Control Summary

Client Name: Secor International, Inc.
Reported: 06/28/04 at 12:41 PM

Group Number: 900291

Surrogate Quality Control

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Analysis Request / Environmental Services Chain of Custody

Lancaster Laboratories
Where quality is a science.

For Lancaster Laboratories use only

Acct. #: 11183 Group#: ~~828760~~ 900291 Sample #: ~~42870656-60~~ 4294614-46

COC # 0056395

Please print. Instructions on reverse side correspond with circled numbers.

(1)
Client: SECOR Acct. #:
Project Name/#: SUNOCO 663 AREA PWSID #:
Project Manager: S. MORESCALCHI P.O.#:
Sampler: S. MORESCALCHI Quote #:
Name of state where samples were collected: PA

(2) (3) (4) (5)

For Lab Use Only
FSC:
SCR #: 119028

(6)

								PADEP Fuel Oil 4.5 lb	SPLP-HOLD Fuel Oil 4.5 lb	Remarks
663 AREA-1	06-04-04	1150	✓	✓			4	✓		0011040 - HOLD SPLP
663 AREA-2	↓	1210	✓	✓			4	✓		0011041 - ↓ ↓
663 AREA-3		1230	✓	✓			4	✓		0011042 -
663 AREA-4		1250	✓	✓			4	✓		011014 -
TRIP BLANK						✓	1	✓		

(7) **Turnaround Time Requested** (TAT) (please circle): Normal Rush P7
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

(8) **Data Package Options** (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No

Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

(9)

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	6/2/04	1640	[signature]	6/3/04	0840
[signature]	6/3/04	1440			
[signature]	06-04-04	1705	R. Kindig	6/4/04	1705
R. Kindig	6/4/04	1810			
			Jessica B[signature]	6/4/04	1810

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

2102 Rev. 10/27/02

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

< less than - The number following the sign is the <u>limit of quantitation</u>, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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ANALYTICAL RESULTS

Prepared for:

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341
484-875-3075

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 904987. Samples arrived at the laboratory on Friday, July 23, 2004. The PO# for this group is AST 663 AREA.

Client Description	Lancaster Labs Number
663_Area-1 Grab Soil Sample	4316706
663_Area-2 Grab Soil Sample	4316707

1 COPY TO Secor International, Inc. Attn: Sergio Morescalchi

Questions? Contact your Client Services Representative
Sandra L Patton at (717) 656-2300.

Respectfully Submitted,

Michele A Jarosick

Michele A. Jarosick
Senior Chemist, Coordinator

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. TL 4316706

663_Area-1 Grab Soil Sample
SPLP NON-VOLATILE EXTRACTION
SUN: AST 663 Area
Collected:07/22/2004 14:45 by SM

Submitted: 07/23/2004 16:05
Reported: 08/05/2004 at 12:50
Discard: 08/20/2004

663-1

Account Number: 11183

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
00774	PAH's in Water by HPLC					
00823	Benzo(a)pyrene	50-32-8	N.D.	0.019	ug/l	1

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00774	PAH's in Water by HPLC	SW-846 8310	1	07/31/2004 19:42	Mark A Clark	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	07/29/2004 12:35	Zachary S Dennis	n.a.
03337	PAH Water Extraction	SW-846 3510C	1	07/31/2004 10:30	Felix C Arroyo	1

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. TL 4316707

663_Area-2 Grab Soil Sample
SPLP NON-VOLATILE EXTRACTION
SUN: AST 663 Area
Collected:07/22/2004 14:50 by SM

Account Number: 11183

Submitted: 07/23/2004 16:05
Reported: 08/05/2004 at 12:50
Discard: 08/20/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663-2

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
00774	PAH's in Water by HPLC					
00823	Benzo(a)pyrene	50-32-8	N.D.	0.021	ug/l	1

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00774	PAH's in Water by HPLC	SW-846 8310	1	07/31/2004 22:17	Mark A Clark	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	07/29/2004 12:35	Zachary S Dennis	n.a.
03337	PAH Water Extraction	SW-846 3510C	1	07/31/2004 10:30	Felix C Arroyo	1

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Quality Control Summary

Client Name: Secor International, Inc.
Reported: 08/05/04 at 12:50 PM

Group Number: 904987

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 04212WAA026	Sample number(s): 4316706-4316707							
Benzo(a)pyrene	N.D.	0.020	ug/l	80		68-112		

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 04212WAA026	Sample number(s): 4316706-4316707								
Benzo(a)pyrene	83	84	52-114	3	30				

Surrogate Quality Control

Analysis Name: PAH's in Water by HPLC
Batch number: 04212WAA026

	Nitrobenzene	Triphenylene
4316706	90	95
4316707	86	94
Blank	87	97
LCS	88	96
MS	88	97
MSD	88	96
Limits:	63-154	59-131

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Analysis Request / Environmental Services Chain of Custody

Lancaster Laboratories
Where quality is a science.

For Lancaster Laboratories use only
Acct. # 11183 Group# 904987 Sample # 4316706-07

COC # 0033001

1 OF 1

Please print. Instructions on reverse side correspond with circled numbers.

(1)
Client: SECOR Acct. #:
Project Name/#: SUNOCO- AST 663 AREA PWSID #:
Project Manager: S. MORESCALCHI P.O.#:
Sampler: S.M. Quote #:
Name of state where samples were collected: PA

(3) (4) (5) (6)

For Lab Use Only
FSC:
SCR #:

(2) Sample Identification	Date Collected	Time Collected			Soil				SPLP-BENZO(A)PYRENE	Remarks
663 AREA-1	07-22-04	1445	✓		✓			1	✓	* MEET PADEP MSCs *
663 AREA-2	07-22-04	1450	✓		✓			1	✓	TIME 7.5-8°C TJB 7/23/04

(7) **Turnaround Time Requested** (TAT) (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

(8) **Data Package Options** (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No
Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

(9)

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	07-23-04	0945	L Wolf	7/23/04	0945
L Wolf	7/23/04	1605			
			Jessica Bu[illegible]	7/23/04	1605

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

2102 Rev. 10/27/02

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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DEP - RECEIVED
SOUTHEAST REGION

RECEIVED
DEP BUREAU OF
WASTE MANAGEMENT

11 JUN -8 AM 11:16

STORAGE TANK PROGRAM

JUN 09 '11

incident 46786

MTI
Mott Tank Inspection, Inc.

P.O. Box 394
Clarks Summit, PA 18411
Phone: 1-800-577-8279
Fax: 570-586-7998

June 6, 2011

PA DEP
Division of Storage Tanks
Rachel Carson State Bldg, 10th Floor
400 Market Street
Harrisburg, PA 17101

Facility #: 51-19781

Dear Sir or Madam:

Enclosed, please find the ***Notification of Contamination*** for Tank PB 663 (187A) located at the Sunoco Point Breeze Refinery in Philadelphia, PA. This copy is for your records.

If you have any questions, please contact our office.

Sincerely,

Kristin Evans

Kristin Evans
Administrative Assistant

cc: Southeast Regional Office
Client

DEP - RECEIVED
SOUTHEAST REGION

JAN 09 '11

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

☐ Initial
☐ Follow-Up

NOTIFICATION OF CONTAMINATION *(Certified Installers and Inspectors)*

NOTIFICATION OF REPORTABLE RELEASE *(Owners and Operators)*

The Storage Tank Program's Corrective Action Process (CAP) regulations establish release reporting requirements for owners and operators of storage tanks and storage tank facilities.

Subsection 245.305(a) of the regulations requires owners or operators to notify the appropriate regional office of the Department as soon as practicable, but no later than 24 hours, after the confirmation of a reportable release.

Subsection 245.305(d) requires owners or operators to provide an initial written notification to the Department, each municipality in which the reportable release occurred, and each municipality where that release has impacted environmental media or water supplies, buildings, or sewer or other utility lines, within 15 days of the notice required by Subsection 245.305(a).

Subsection 245.305(e) requires owners or operators to provide follow-up written notification to the Department and to each impacted municipality of new impacts to environmental media or water supplies, buildings, or sewer or other utility lines discovered after the initial written notification required by subsection 245.305(d). Written notification is to be made within 15 days of the discovery of the new impact.

This form may be used to comply with Subsection 245.305(d) and (e).

OWNERS AND OPERATORS (O/O)
INDICATE IF THIS IS AN INITIAL OR FOLLOW-UP NOTIFICATION BY MARKING THE APPROPRIATE BOX FOUND IN THE TOP RIGHT-HAND CORNER OF THIS FORM. PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIB, IV, V, VII and VIII.

NOTIFICATION OF CONTAMINATION
(Certified Installers and Inspectors)

The Storage Tank Program's Certification regulations establish standards of performance for certified installers and inspectors of storage tanks and storage tank facilities.

Subsection 245.132(a)(4) of the regulations requires certified installers and inspectors to report to the Department a release of a regulated substance or confirmed or suspected contamination of soil, surface or groundwater from regulated substances observed while performing services as a certified installer or inspector.

This form may be used to comply with Subsection 245.132(a)(4). Subsection 245.132(a)(4) requires submission of the form within 48 hours of observing suspected or confirmed contamination. Where there is a reportable release, the form may be submitted jointly by the owner, operator, certified installer and certified inspector. In this instance, the form must be received by the appropriate regional office within 15 days of the notice required by Subsection 245.305(a).

CERTIFIED INSTALLERS AND INSPECTORS (I/I)
PLEASE COMPLETE ALL INFORMATION IN SECTIONS I, II, IIIA, IIIC, VI, VII and VIII.

INSTRUCTIONS

I. **FACILITY INFORMATION** - Record the name, I.D. number and physical location (not P.O. Box) of the facility at which a reportable release has been confirmed or at which suspected or confirmed contamination has been observed. Include the name and phone number of a person to contact at the facility.

II. **OWNER/OPERATOR INFORMATION** - Record the name, business address and phone number of the owner of the facility identified in Section I. Also, record the name and phone number of the operator of the facility.

III. **REGULATED SUBSTANCE INFORMATION** - Indicate to the best of your knowledge: A) the type of product or products involved; B) the quantity of product or products released; and C) whether the contamination is suspected or confirmed.

IV. **REPORTABLE RELEASE INFORMATION** - Record the date of confirmation of the reportable release, e.g., "9/18/01"; the date and regional office notified; and the date the local municipality(ies) [provide name of municipality(ies)] was/were sent a copy of this form. Indicate to the best of your knowledge the source/cause of the release, how the release was discovered and the environmental media affected and impacts.

V. **INTERIM REMEDIALACTIONS** - Indicate the interim remedial actions planned, initiated or completed.

VI. **SUSPECTED/CONFIRMED CONTAMINATION INFORMATION** - Record the date of observation of the suspected or confirmed contamination, e.g., "11/24/01". Indicate to the best of your knowledge the indications of a suspected release or extent of confirmed contamination resulting from the release of the regulated substance.

VII. **ADDITIONAL INFORMATION** - Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include in this section specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Use additional 8½" x 11" sheets of paper, if necessary.

VIII. **CERTIFICATION** - Please print your name, and provide your signature and date of signature. If a certified installer/inspector, provide certification number and company certification number.

IX. **ATTACHMENT** - If a certified installer/inspector, provide a copy of failed valid tightness test(s), if applicable.

PLEASE SEND COMPLETED ORIGINAL FORM TO:
PA Department of Environmental Protection
Environmental Cleanup Program
Storage Tank Section
(and the appropriate address below,
depending on where the FACILITY is located)

Southeast Region	Northeast Region	Southcentral Region	Northcentral Region	Southwest Region	Northwest Region
2 East Main Street Norristown, PA 19401 PHONE: 484-250-5900 FAX: 484-250-5961	2 Public Square Wilkes-Barre, PA 18711-0790 PHONE: 570-826-2511 FAX: 570-820-4907	909 Elmerton Avenue Harrisburg, PA 17110 PHONE: 877-333-1904 FAX: 717-705-4830	208 W. Third Street, Suite 101 Williamsport, PA 17701 PHONE: 570-321-6525/327-3696 FAX: 570-327-3420	400 Waterfront Drive Pittsburgh, PA 15222 PHONE: 412-442-4091/4000 FAX: 412-442-4328	230 Chestnut Street Meadville, PA 16335-3481 PHONE: 814-332-6945 800-373-3398 FAX: 814-332-6121
Counties Bucks, Chester, Delaware, Montgomery, Philadelphia	**Counties** Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne, Wyoming	**Counties** Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, York	**Counties** Bradford, Cameron, Centre, Clinton, Clearfield, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga, Union	**Counties** Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland	**Counties** Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren

I. FACILITY INFORMATION (Both O/O and I/I)

Facility Name: Sunoco Point Breeze Refinery
Facility I.D. Number: 51-19781
Street Address (P.O. Box not acceptable): 3144 Passyunk Ave.
City: Philadelphia State: PA Zip Code: 19145 -
County: Delware Municipality: Philadelphia
Contact Person: Joe Grawe Phone Number: (610) 859 - 6266

II. OWNER/OPERATOR INFORMATION (Both O/O and I/I)

Owner Name: Sunoco Inc.
Address: 1735 Market St. Ste LL
City: Philadelphia State: PA Zip Code: 19103 - 7583
Phone Number: (215) 977 - 3000
Operator Name: Phone Number: ( ) -

III. REGULATED SUBSTANCE INFORMATION

A. Type of Product(s) Involved (Mark All That Apply ☒): Both O/O and I/I		B. Quantity (Gallons) of Product(s) Released: O/O Only	C. Contamination Suspected [S] or Confirmed [C] (Mark All That Apply ☒): I/I Only [S]	[C]
Leaded Gasoline	☐		☐	☐
Unleaded Gasoline	☐		☐	☐
Aviation Gasoline	☐		☐	☐
Kerosene	☐		☐	☐
Jet Fuel	☐		☐	☐
Diesel Fuel	☐		☐	☐
New Motor Oil	☐		☐	☐
Used Motor Oil	☐		☐	☐
Fuel Oil No. 1	☐		☐	☐
Fuel Oil No. 2	☐		☐	☐
Fuel Oil No. 4	☐		☐	☐
Fuel Oil No. 5	☐		☐	☐
Fuel Oil No. 6	☐		☐	☐
Other (Specify) Main Frac Bottoms	☒	0	☒	☐
Unknown	☐		☐	☐

IV. REPORTABLE RELEASE INFORMATION (O/O Only)

Date Reportable Release was Confirmed: ___ / ___ / ___ (m d y)

Date Owner/Operator Verbally Notified Appropriate Regional Office of Reportable Release and Office Notified:
Date: ___ / ___ / ___ (m d y) Office ______

Date Owner/Operator Sent Copy of this Written Notification to Local Municipality(ies) and Name of Municipality(ies) Notified:
Date: ___ / ___ / ___ (m d y) Municipality ______
Date: ___ / ___ / ___ (m d y) Municipality ______

Source (Mark All That Apply ☒):

- Tank (DEP Assigned Nos. 187A) ☒
- Piping System (Aboveground Regulated) ☐
- Piping System (Underground Regulated) ☐
- Piping System (Non-Regulated) ☐
- Dispenser/Dispensing Equipment ☐
- Spill Catchment Basin ☐
- Accident/Natural Disaster ☐
- Submersible Turbine Pump Head/Fittings ☐
- Containment/Sump Failure ☐
- Other (Specify) ______ ☐
- Unknown ☐

Cause (Mark All That Apply ☒):

- Faulty Installation ☐
- Corrosion ☒
- Physical/Mechanical Failure ☐
- Spill During Delivery ☐
- Overfill at Delivery ☐
- Vehicle Gas Tank Overfill ☐
- Product Delivery Hose Rupture ☐
- Other (Specify) ☐
- Unknown ☐

How Discovered (Mark All That Apply ☒):

- During Closure ☐
- Lining Installation ☐
- Routine Leak Detection ☐
- Third Party Inspection ☒
- Tightness Testing Activities ☐
- Visible Product or Odor Reports ☐
- Water in Tank ☐
- Construction ☐
- Upgrade/Repair ☐
- Supply Well Sample Results ☐
- Monitoring Well Sample Results ☐
- Property Transfer ☐
- Other (Specify) ______ ☐
- Unknown ☐

Environmental Media Affected and Impacts (Mark All That Apply ☒):

- Soil ☐
- Sediment ☐
- Surface Water ☐
- Ground Water ☐
- Bedrock ☐
- Water Supplies ☐
- Vapors/Product in Buildings ☐
- Vapors/Product in Sewer/Utility Lines ☐
- Ecological Receptors ☐

V. INTERIM REMEDIAL ACTIONS (O/O Only)

(Mark All That Apply ☒):

	Planned	Initiated	Completed	Not Applicable
Regulated Substance Removed from Storage Tanks	☐	☐	☒	☐
Fire, Explosion and Safety Hazards Mitigated	☐	☐	☒	☐
Contaminated Soil Excavated	☐	☐	☐	☒
Free Product Recovered	☐	☐	☐	☒
Water Supplies Identified and Sampled	☐	☐	☐	☒
Temporary Water Supplies Provided	☐	☐	☐	☒
Other (Specify)	☐	☐	☐	☒

VI. SUSPECTED / CONFIRMED CONTAMINATION INFORMATION (I/I Only)

Date of Observation of Suspected/Confirmed Contamination: 05 / 20 / 2011 (m / d / y)

Indication of Suspected Contamination (Mark All That Apply ☒):

- Unusual Level of Vapors ☐
- Erratic Behavior of Product Dispensing Equipment ☐
- Release Detection Results Indicate a Release ☐
- Discovery of Holes in the Storage Tank ☒
- Other (Specify) ☐

Extent of Confirmed Contamination (Mark All That Apply ☒):

- Product Stained or Product Saturated Soil or Backfill ☐
- Ponded Product ☐
- Free Product or Sheen on Ponded Water ☐
- Free Product or Sheen on the Ground Water Surface ☐
- Free Product or Sheen on Surface Water ☐
- Other (Specify) ☐

VII. ADDITIONAL INFORMATION (Both O/O and I/I)

Provide any additional, relevant, available information concerning the reportable release or suspected or confirmed contamination. Include specific details or problems about the release. For example, if the piping was the source of the release and the cause was corrosion of a metal connector or flexible connector, it is important to include that information here. Provide DEP assigned and owner/operator assigned tank number(s), where applicable. Use additional 8½" x 11" sheets of paper, if necessary.

Approximately 23 holes were found in the tank floor during the inspection process, after cleaning and blasting activites were performed. No visual evidence of leaks were found during the tank inspection. No further investigative actions will be taken. The tank is currently out of service and free of hydrocarbons.

VIII. CERTIFICATION (Both O/O and I/I)

I, Joseph Grawe, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the owner or operator of the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Owner or Operator — Date: 6 / 3 / 2011

I, ______, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified installer who performed tank handling activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Installer — Date: / /

Installer Certification Number — Company Certification Number

I, Ed Hetzel, hereby certify, under penalty of law as provided in 18 Pa.
(Print Name)

C.S.A. §4904 (relating to unsworn falsification to authorities) that I am the certified inspector who performed inspection activities at the above referenced storage tank facility and that the information provided by me in this notification is true, accurate and complete to the best of my knowledge and belief.

Signature of Certified Inspector — Date: 05 / 20 / 2011

Inspector Certification Number: 5587 — Company Certification Number: 1034

APPENDIX C
QUALITY ASSURANCE/QUALITY CONTROL PLAN
AND FIELD PROCEDURES MANUAL
(electronic only)

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

Stantec

Quality Assurance/ Quality Control Plan and Field Procedures Manual

Sunoco Partners Marcus Hook Industrial Complex and Philadelphia Energy Solutions (PES) Philadelphia Refinery Complex

Evergreen Resources Management Operations
May 20, 2016

Table of Contents Page

Appendix

1.0 INTRODUCTION

This Quality Assurance/Quality Control Plan and Field Procedures Manual (QA/QC Plan) outlines the procedures developed to ensure the collection and analysis of quality data for investigations completed under the United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA), Pennsylvania Department of Environmental Protection (PADEP) Act 2, and Pennsylvania and Delaware's Tank programs at the Sunoco Partners Marketing and Terminals, LP (Sunoco Partners) Marcus Hook Industrial Complex (MHIC) and the Philadelphia Energy Solutions Refining and Marketing, LLC (PES) Philadelphia Refinery Complex (PRC) on behalf of Evergreen Resources Management Operations (Evergreen). This document shall be used in conjunction with the site-specific work plans developed for each site and Standard Operating Procedures (SOPs) for field work as incorporated as Appendix A of this QA/QC Plan.

The QA/QC Plan is a planning document that provides a "blueprint" for obtaining the type and quality of data needed to support environmental decision making. The QA/QC Plan integrates relevant technical and quality aspects of a project and documents quality assurance and quality control.

The selection criteria and evaluation specified in this document will be used for validating the data in accordance with the USEPA Guidance on Environmental Data Verification and Data Validation (USEPA 240-R-02-004), dated November 2002 (EPA QA/G-8), USEPA Contract Laboratory Program National Functional Guidelines (NFGs) for Superfund Organic Methods Data Review (USEPA 540-R-08-01), dated June 2008 (SOM02.2) and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (USEPA 540-R-10-011), dated January 2010 (ISM02.2). Qualifiers assigned to the data will be consistent with the data qualifiers specified in the NFGs and the USEPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (USEPA 540-R-08-01), collectively referred to herein as validation guidance.

2.0 QUALITY CONTROL REQUIREMENTS

The field and laboratory QC requirements for the characterization and remediation activities are discussed in the following subsections. Specific QC checks and acceptance criteria are provided in the referenced analytical methods.

2.1 Field Sampling Quality Control

The field QC requirements include analyzing reference standards for field instrument calibration and for routine calibration verifications. All initial and continuing calibration procedures will be implemented by trained personnel following the manufacturer's instructions to ensure the equipment is functioning within the specified tolerances. The calibration and maintenance history of the project-specific field instrumentation will be maintained in an active field logbook.

Field QC samples for this project include field duplicate samples to assess the overall precision of the sampling and analysis event, equipment rinse blanks to ensure proper cleaning of non-dedicated equipment is conducted between samples to avoid potential cross contamination (also generally referred to as field blanks), and trip blank samples to monitor cross contamination of water samples by volatile organic compounds (VOCs) during sample transport.

The frequency of collection of equipment rinse blanks will be one per sampling event. Field duplicate samples will only be prepared for groundwater samples, not for soil sampling events, at a collection frequency of 1 in 20 samples. One trip blank will be included for every shipment of samples to an analytical laboratory, at a minimum frequency of one trip blank per sample shipment which contains samples for VOCs analyses.

2.2 Analytical Quality Control

The laboratory QC requirements for the analyses may include evaluating chemical/thermal preservation, holding times, handling requirements, method blanks, instrument performance checks, initial calibration standards, calibration verification standards, internal standards, surrogate compound spikes, interference check samples, serial dilution samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and laboratory control samples (LCS). The acceptance criteria for the above identified requirements will be generated by the laboratory and included in the laboratory reports, along with the other laboratory QC requirements.

3.0 DATA VERIFICATION, VALIDATION, AND USABILITY

All field and laboratory data will be reviewed, verified, and/or validated. These terms are defined as follows:

- Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly.
- Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, and/or contractual requirements.
- Data validation is an analyte-specific and sample-specific process that extends the evaluation of data beyond method, procedure, or contractual compliance (i.e., data verification) to determine the quality of a specific data set relative to the end use.

Field data and logbooks will be reviewed to ensure that the requirements of the sampling program, including the number of samples and locations, sampling, and sample handling procedures, were fulfilled.

Data verification, validation, and usability assessments performed on a percentage of lab packages to ensure that the data are scientifically defensible, properly documented, of known quality, and meet the project objectives, are described in the following sections. Data determined to be unusable may require corrective action be taken. Data use limitations will be identified in the data validation and usability assessment (VUA) report, which will be generated as required for characterization or final reporting to the agencies.

3.1 Data Review, Verification, and Validation Requirements

Data review, verification, and validation of the analytical data will be performed by each consultant completing the field activities. The exception to this scenario will be Aquaterra Technologies, Inc. (Aquaterra), in which case Aquaterra will review/verify the data and the consultant company working with Aquaterra will subsequently validate the samples.

Field information will be reviewed to ensure that all field measurements were conducted in accordance with the requirements of the site-specific work plan and this QA/QC Plan including applicable SOPs. Field measurements obtained using procedures inconsistent with the requirements of these documents will be evaluated and may require that additional samples are collected or the use of the data be restricted.

Stage 1 Verification and Validation Checks

One hundred percent of the sample results will go through a Stage 1 verification and validation. As part of the data management process, each consultant will complete verification and validation based on the validation guidance. Data verification and validation will consist of the following items based on the guidance stated.

Stage 1 verification and validation of the laboratory analytical data package consists of checks for the compliance of sample receipt conditions, sample characteristics (e.g., percent moisture), and analytical results (with associated information). It is recommended that the following minimum baseline checks (as relevant) be performed on the laboratory analytical data package received for a Stage 1 validation label:

1. Documentation identifies the laboratory receiving and conducting analyses, and includes documentation for all samples submitted by the project or requester for analyses.
2. Requested analytical methods were performed and the analysis dates are present.
3. Requested target analyte results are reported along with the original laboratory data qualifiers and data qualifier definitions for each reported result.
4. Requested target analyte result units are reported.
5. Requested reporting limits for all samples are present and results at and below the requested (required) reporting limits are clearly identified (including sample detection limits if required).
6. Sampling dates (including times if needed), date and time of laboratory receipt of samples, and sample conditions upon receipt at the laboratory (including preservation, pH and temperature) are documented.
7. Sample results are evaluated by comparing sample conditions upon receipt at the laboratory (e.g., preservation checks) and sample characteristics (e.g., percent moisture) to the validation guidance.

Stage 2 Verification and Validation Checks

A minimum of 10 percent of the samples will be flagged for VUA. When a laboratory work order is selected, the entire work order will undergo Stage 2 validation. Laboratory work orders or sample delivery groups (SDGs) that are selected for VUA will undergo validation based on the NFGs.

The selection of samples that will undergo VUA process is designed to meet the needs of the site investigation, characterization, remediation, and closure programs, such as tank closures. Sampling that falls outside these programs will not undergo the VUA process. This includes samples that are collected for permit compliance, such as RCRA and effluent wastewater, as well as product samples, onsite soil reuse samples, and waste characterization samples.

Ten percent of samples will be selected based on the following additional conditions:

1. Sample package selected will contain a field duplicate sample.
2. Sample package selected will contain an equipment rinse blank.
3. Sample package selected will be representative of the contracted analytical laboratories, sample media, parameters, time, and project goals.

QC samples that are collected in the field will provide the best information for completing the VUA reports. The conditions for selection of samples are designed to provide the most useful information regarding sample analysis. Therefore, field duplicate samples have been identified as a priority condition. However, field duplicate samples will only be prepared for groundwater samples, not for soil sampling events. This is due to the known, inherent heterogeneity of soil at the sites. For program efficiency, entire SDGs will be selected for submission in the VUA process. Individual samples should not be selected and processed unless there is an overriding reason to do so, such as a point of compliance sample result that when compared to the historic data set appears to be anomalous.

Stage 2 data validation includes a review of the following QC data deliverables:

1. Technical holding times
2. Method blanks
3. Surrogate spikes
4. MS/MSD results
5. LCS results
6. Field duplicates

7. Trip and equipment rinse blank samples

Stage 2B Verification and Validation Checks

Stage 2B verification and validation will be completed on inorganic analytical data and will contain the following (in addition to Stage 1 verification):

1. Requested methods (handling, preparation, cleanup, and analytical) are performed.
2. Method dates (including dates, times and duration of analysis for radiation counting measurements and other methods, if needed) for handling (e.g., Toxicity Characteristic Leaching Procedure), preparation, cleanup and analysis are present, as appropriate.
3. Sample-related QC data and QC acceptance criteria (e.g., method blanks, surrogate recoveries, deuterated monitoring compounds (DMC) recoveries, laboratory control sample (LCS) recoveries, duplicate analyses, matrix spike and matrix spike duplicate recoveries, serial dilutions, post digestion spikes, standard reference materials) are provided and linked to the reported field samples (including the field quality control samples such as trip and equipment blanks).
4. Requested spike analytes or compounds (e.g., surrogate, DMCs, LCS spikes, post digestion spikes) have been added, as appropriate.
5. Sample holding times (from sampling date to preparation and preparation to analysis) are evaluated.
6. Frequency of QC samples is checked for appropriateness (e.g., one LCS per twenty samples in a preparation batch).
7. Sample results are evaluated by comparing holding times and sample-related QC data to the requirements in the data validation guidance.
8. Initial calibration data (e.g., initial calibration standards, initial calibration verification [ICV] standards, initial calibration blanks [ICBs]) are provided for all requested analytes and linked to field samples reported. For each initial calibration, the calibration type used is present along with the initial calibration equation used including any weighting factor(s) applied and the associated correlation coefficients, as appropriate. Recalculations of the standard concentrations using the initial calibration curve are present, along with their associated percent recoveries, as appropriate (e.g., if required by the project, method, or contract). For the ICV standard, the associated percent recovery (or percent difference, as appropriate) is present.
9. Appropriate number and concentration of initial calibration standards are present.

10. Continuing calibration data (e.g., continuing calibration verification [CCV] standards and continuing calibration blanks [CCBs]) are provided for all requested analytes and linked to field samples reported, as appropriate. For the CCV standard(s), the associated percent recoveries (or percent differences, as appropriate) are present.
11. Reported samples are bracketed by CCV standards and CCBs standards as appropriate.
12. Method specific instrument performance checks are present as appropriate (e.g., tunes for mass spectrometry methods, DDT/Endrin breakdown checks for pesticides and aroclors, instrument blanks and interference checks for ICP methods).
13. Frequency of instrument QC samples is checked for appropriateness (e.g., gas chromatography-mass spectroscopy [GC-MS] tunes have been run every 12 hours).
14. Sample results are evaluated by comparing instrument-related QC data to the requirements in the data validation guidance.

Stage 3 Verification and Validation Checks

Stage 3 verification and validation will be completed on organic analytical data and will contain the following (in addition to Stage 2B):

1. Instrument response data (e.g., GC peak areas, ICP corrected intensities) are reported for requested analytes, surrogates, internal standards, and DMCs for all requested field samples, matrix spikes, matrix spike duplicates, LCS, and method blanks as well as calibration data and instrument QC checks (e.g., tunes, DDT/Endrin breakdowns, interelement correction factors, and Florisil cartridge checks).
2. Reported target analyte instrument responses are associated with appropriate internal standard analyte(s) for each (or selected) analyte(s) (for methods using internal standard for calibration).
3. Fit and appropriateness of the initial calibration curve used or required (e.g., mean calibration factor, regression analysis [linear or non-linear, with or without weighting factors, with or without forcing]) is checked with recalculation of the initial calibration curve for each (or selected) analyte(s) from the instrument response.
4. Comparison of instrument response to the minimum response requirements for each (or selected) analyte(s).
5. Recalculation of each (or selected) opening and closing CCV (and CCB) response from the peak data reported for each (or selected) analyte(s) from the instrument response, as appropriate.

6. Compliance check of recalculated opening and/or closing CCV (and CCB) response to recalculated initial calibration response for each (or selected) analyte(s).
7. Recalculation of percent ratios for each (or selected) tune from the instrument response, as appropriate.
8. Compliance check of recalculated percent ratio for each (or selected) tune from the instrument response.
9. Recalculation of each (or selected) instrument performance check (e.g., DDT/Endrin breakdown for pesticide analysis, instrument blanks, interference checks) from the instrument response.
10. Recalculation and compliance check of retention time windows (for chromatographic methods) for each (or selected) analyte(s) from the laboratory reported retention times.
11. Recalculation of reported results for each reported (or selected) target analyte(s) from the instrument response.
12. Recalculation of each (or selected) reported spike recovery (surrogate recoveries, DMC recoveries, LCS recoveries, duplicate analyses, matrix spike and matrix spike duplicate recoveries, serial dilutions, post digestion spikes, standard reference materials etc.) from the instrument response.
13. Each (or selected) sample result(s) and spike recovery(ies) are evaluated by comparing the recalculated numbers to the laboratory reported numbers according to the requirements in the data validation guidance.

Stage 4 Verification and Validation Checks

Additional data validation may be completed for selected sites and/or sampling events, up to EPA Level 4 data review, which will require a laboratory data package inclusive of raw data. Stage 4 verification and validation includes all of the elements of the previous stages of validation and the following:

1. Evaluation of instrument performance checks (GC/MS)
2. Initial and continuing calibration checks (organic and inorganic analyses)
3. Review of internal standards (GC/MS)
4. Instrument blanks (inorganics)
5. Interference check samples (metals)
6. Recalculations of sample results and reporting limits

3.2 Validation Codes

Consultant specific validation codes will be added to the database. This will allow quick identification of the consultant that has performed the verification and/or VUA. Stantec may append additional codes for data management purposes to the codes provided in dt_result table approval_code field. Valid codes are as follows:

Langan:

- LAN1 – Historical data collected by Langan Level 1 Validation (Verification)
- LAN-VER – Langan performed verification
- LAN-USB – Langan performed usability

GHD:

- GHD-VER – GHD performed verification
- GHD-USB – GHD performed usability

Stantec:

- STN-VER – Stantec performed verification
- STN-USB – Stantec performed usability

This methodology creates a means for consultants to perform verification and usability on data collected by another consultant.

3.3 Data Updates in the Electronic Data Deliverables

All consultants will request EQuIS 4 file format Electronic Data Deliverables (EDDs) for data management from the analytical laboratories. In order to facilitate the data updates in the database, the following methodology will be used.

1. The consultant chemist / chemist team will open the .RES file for the EDD that has been selected to be validated for usability. The file can be opened using Excel, Access, Notepad, or similar tool. Although, it is a best practice to open the file in a way to preserve the textual nature of the EDD, it is not necessary.
2. The chemist will use the result_comment field in the .RES file to enter the qualifiers associated with the record and add a semicolon as a delimiter (;) followed by the reason code for the qualification.

3. The .RES file is to be saved with a .USB extension at the end of the file. This file is to be separate from the original .RES file provided and should not be used to over write the original .RES file that was sent with the EDD. This will result in the laboratory work order undergoing VUA having five files instead of four for the EDD. For example:
   - 1234.SMP
   - 1234.TST
   - 1234.BCH
   - 1234.RES
   - 1234.RES.USB
4. Stantec will use the fifth file to update the database with the appropriate qualifiers and codes in validator_qualifiers and approval_a through approval_d fields in dt_result table in the database.
5. Stantec will also change the validated y/n field in dt_result table in the database for the particular EDD.

3.4 Validation Qualifiers

The following qualifiers should be used during the validation/usability process. These are based on the NFGs, validation guidance, and commonly used qualifiers.

Data Qualifiers and Definitions

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample, potentially biased high.
J-	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample, potentially biased low.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
NJ	The analyte has been "tentatively identified" or "presumptively identified" as present and the associated numerical value is the estimated concentration in the sample.

R The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

B The analyte was detected in the method, field, and/or trip blank. This qualifier is not pursuant to the NFGs.

If additional qualifiers are required, please forward the suggestions to the Stantec Data Management Team and they will be added to the list of approved codes.

Submitting Data and Validation Codes for Inclusion in the Database

EDDs will be submitted to the database using the SharePoint portal intake forms. The appropriate qualifiers and codes that have been added to the result_comment field in the .RES.USB file will be included in the submission.

Reason Codes

Following is a list of reason codes available for validation. If additional codes are required, please forward the suggestions to the Stantec Data Management Team and they will be added to the list of approved codes.

Reason Code	Reason Description
General Use	
EC	Result exceeds the calibration range.
HT	Holding time requirement was not met
MB	Method blank or preparation blank contamination
LCS	Laboratory control sample evaluation criteria not met
FB	Field blank contamination
RB	Rinsate blank contamination
SQL	The analysis meets all qualitative identification criteria, but the measured concentration is less than the reporting limit.
FD	Field duplicate evaluation criteria not met
TvP	Total to Partial criteria not met
RL	Reporting limit exceeds decision criteria (for non-detects)
Inorganic Methods	
ICV	Initial calibration verification evaluation criteria not met
CCV	Continuing calibration verification evaluation criteria not met
CCB	Continuing calibration blank contamination
PB	Preparation Blank
ICS	Interference check sample evaluation criteria not met
D	Laboratory duplicate or spike duplicate precision evaluation criteria not met
MS	Matrix spike recovery outside acceptance range
PDS	Post-digestion spike recovery outside acceptance range
MSA	Method of standard additions correction coefficient _0.995
DL	Serial dilution results did not meet evaluation criteria
Organic Methods	
TUNE	Instrument performance (tuning) criteria not met
ICAL	Initial calibration evaluation criteria not met
CCAL	Continuing calibration evaluation criteria not met
SUR	Surrogate recovery outside acceptance range
MS/SD	Matrix spike/matrix spike duplicate precision criteria not met
MS	Matrix spike recovery outside acceptance range
IS	Internal standard evaluation criteria not met
LM	The PFK lock mass SICPs indicate that ion suppression evident
ID	Target compound identification criteria not met
Results Reported for Analytes Analyzed Multiple Times	
NSR	Not selected for reporting because the result was qualified as unusable
NSDL	Not selected for reporting because diluted resulted was selected for reporting
NSQ	Not selected for reporting because result was lesser quality based on data validation
NSO	Not selected for reporting because of other reason
Bias Codes	
H	Bias in sample result likely to be high
L	Bias in sample result likely to be low
I	Bias in sample result is indeterminate

3.4 Verification and Validation Summary

Verification of sample collection procedures will consist of reviewing sample collection documentation for compliance with the requirements of the site-specific work plan and this QA/QC Plan. If alternate sampling procedures were used, the acceptability of the procedure will be evaluated to determine the effect on the usability of the data. Data usability will not be affected if the procedure used is determined to be an acceptable alternative that fulfills the measurement performance criteria in this QA/QC Plan.

The results of the data verification and validation procedure will identify data that do not meet the measurement performance criteria of this QA/QC Plan. Data verification and validation will determine whether the data are acceptable, of limited usability (qualified as estimated), or rejected. Data qualified as estimated will be reviewed and a discussion of the usability of estimated data will be included in the VUA report.

Data determined to be unusable may require corrective action to be taken. Potential types of corrective action may include resampling by the field team or reanalysis of samples by the laboratory. The corrective actions taken are dependent upon the ability to mobilize the field team and whether or not the data are critical for project data quality objectives to be achieved. Data use limitations will be identified in VUA report, which will be generated as required for characterization or final reporting to the agencies. Each consultant will be responsible for their own VUA reports.

Revision History

Revision	Description	Prepared By	Date
1.0	Initial creation of document as SOP for VUA	Stantec (Gus Sukkurwala/Jennifer Menges/Andrew Bradley)	5/31/2015
2.0	Incorporation into QA/QC Plan	GHD (Colleen Costello)	3/21/2016
3.0	Inclusion of Field Procedures. Edits from Langan (Emily Strake & Kevin McKeever)	Stantec (Jennifer Menges)	5/13/2016

APPENDIX A
EVERGREEN FIELD PROCEDURES MANUAL

Evergreen
Field Procedures Manual

Sunoco Partners Marcus Hook Industrial Complex and Philadelphia Energy Solutions (PES) Philadelphia Refinery Complex

Evergreen Resources Management Operations

May 20, 2016

Table of Contents

1.0 INTRODUCTION

This Field Procedures Manual outlines the standard operating procedures developed to ensure the collection and analysis of quality data for investigations completed under the United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) program, Pennsylvania Department of Environmental Protection (PADEP) Act 2 program and Pennsylvania and Delaware's Tank programs at the Sunoco Partners Marketing and Terminals, LP (Sunoco Partners) Marcus Hook Industrial Complex (MHIC) and the Philadelphia Energy Solutions Refining and Marketing, LLC (PES) Philadelphia Refinery Complex (PRC) on behalf of Evergreen Resources Management Operations (Evergreen). The MHIC and PRC are herein referred to as facility or site.

Evergreen’s consultants collect data in pursuit of site characterization and remediation that will meet the expectations of the appropriate regulatory agencies. This document shall be used in conjunction with the site-specific work plans developed for each site and the QA/QC Plan of which this manual was incorporated as Appendix A.

1.1 Training Qualifications

All field personnel involved in field work at MHIC and the PRC shall have completed and where applicable, be current with OSHA 40-hour HAZWOPER training, annual OSHA 8-hour HAZWOPER refresher, Process Safety Management (PSM) training, site-specific safety module training for current facility badges (including fire watch and hole watch, if required), TWIC Card, annual drug screening, and annual respirator fit testing. All field personnel new to the facility should be provided with onsite health and safety (H&S) orientation by an experienced member of the project team. The onsite orientation should include review of the facility’s emergency action plan and training on Evergreen and site-specific H&S requirements. Appropriately qualified personnel should perform field work, based on the work scope and experience level required by the task to be executed.

1.2 Health and Safety Requirements

All consultants performing work at the referenced sites on behalf of Evergreen shall comply with the *Evergreen Resources Management Operations Health and Safety Requirements* dated June 1, 2014. This includes contractors, sub-contractors, and third party companies performing work for Evergreen at MHIC and the PES PRC. Each consultant must also have their own site-specific health and safety plan (HASP) submitted to and approved by Evergreen prior to performing any work. A site-specific HASP must be reviewed and signed by all field personnel prior to commencement of field activities.

1.3 PPE Requirements

The minimum standard PPE at the facilities includes fire resistant clothing (FRC; coveralls may be Nomex or other FRC, 6 ounce minimum, orange in color) with the name of the company displayed on the back of the garment, hard hat, sturdy safety-toe boots, safety glasses, long-gauntlet leather gloves, and personal H_2S monitors. Nitrile gloves for chemical protection and hearing protection may also be required depending on the location and type of work. Workers are to be trained on these PPE requirements before being permitted onsite. An appropriate respirator may be required if site-specific air monitoring action levels are met, in accordance with the site-specific HASP. If a worker has a particular sensitivity or concern, a respirator may be worn regardless of OSHA action levels. During winter weather conditions, slip prevention footwear such as crampons or overshoes should be worn for traction. Task-specific PPE will be further identified in following sections.

1.4 Site Controls

Safety cones and/or caution tape should be used in high traffic areas. The "Buddy System" may also be employed in high traffic areas, in areas where other contractors are working, and in remote areas. Additional task-specific site controls will be detailed in following sections.

1.5 Equipment and Decontamination

Numerous practices are employed throughout the processes of site investigation and sampling to assure the integrity of the resulting data. The risk in use of non-dedicated equipment at multiple sampling locations lies in the potential for cross-contamination. While the threat of cross-contamination is always present, it can be minimized through the implementation of a consistent decontamination program during sensitive site measurement and data collection activities.

All site equipment to be used in multiple locations (non-dedicated) for sampling of soil, sediment, and/or groundwater will be decontaminated immediately prior to initial use and between uses at each location according to the following steps:

- Remove particulates with a sorbent pad or towel and/or initial rinse with clean potable tap water;
- Wash equipment with clean sponge, soft cloth, or scrub brush as necessary in a solution of tap water/laboratory grade detergent (Alconox®, Liquinox®, or equivalent);
- Rinse with tap water;
- Rinse with deionized or distilled water; and
- Air dry for as long as possible.

Rinse water generated during decontamination procedures will be treated onsite by passing the water through a bucket or tube filled with activated carbon prior to discharge to the ground surface. Additional decontamination procedures may be appropriate depending on the task, and will be identified in the following sections, as applicable.

1.6 Documentation

All site activities and conditions for characterization activities should be recorded by field personnel in a field computer (e.g., YUMA) using the EQuIS Data Gathering Engine (EDGE) application, or if necessary, a field book may be used. The entry shall include at a minimum, the date, time, weather conditions, location, personnel present onsite, field readings, sampling methodology, as well as additional comments or observations. Task specific observations which should also be recorded will be identified in the following applicable sections.

2.0 LIQUID LEVEL ACQUISITION (WELL GAUGING) PROCEDURES

2.1 Potential Hazards

Traffic, pinch points, chemical (airborne and physical contact), and biological are all likely hazards to be encountered as well as slip/trip/fall potential during onsite well gauging activities. Additional hazards may be mentioned in the site-specific HASP and/or the daily job safety analysis (JSA).

2.2 Materials and Equipment Necessary for Task Completion

Optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy, decontamination supplies (laboratory-grade detergent, deionized or distilled water, appropriate containers, scrub brush, and sorbent pads or paper towels), socket set, flathead screwdriver (or pry bar or manhole cover lifter), clear bailers with string for confirmation of light non-aqueous phase liquids (LNAPL), if necessary, and air monitoring instruments (optional, based on previous site visits).

2.3 Methodology

This task involves the deployment of an optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy into a well (in most cases), recording the measurement, and decontaminating the probe. The recorded field measurements may then be utilized for one of several applications including: well sampling, water table gradient mapping, LNAPL occurrence, LNAPL thickness, and/or gradient mapping, and various testing procedures. Wells should be gauged in order of least to most contaminated, based on existing sampling data or LNAPL occurrence, to minimize the potential for cross-contamination between wells. If LNAPL is detected in a well that does not typically have LNAPL, it should be confirmed with a clear bailer.

The proper procedure for liquid level acquisition is as follows:

1) Decontaminate the optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy prior to initial deployment, and again after each well measurement to prevent cross-contamination between wells.

2) If warranted, mark off a work area surrounding the well(s) to be gauged with safety cones and/or caution tape in order to protect personnel from auto traffic; the "Buddy System" may also be employed.

3) Where applicable, lift the manhole cover off of the well head (a screwdriver, pry bar, or manhole cover lifter may be used to lift the cover depending on the size of the manhole) or open protective well casing (stickup) and remove the well plug, if present.

4) Most wells should contain a mark or notch in the top edge of the casing from which normalized readings are to be measured (reference point elevation). Slowly lower the optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy into the well until the instrument signals contact with liquid. Note whether or not the instrument's tone is indicative of the presence of free-phase LNAPL (commonly a solid tone), or water (commonly an oscillating or beeping tone). If LNAPL is present, record the depth at which LNAPL was first indicated to the nearest hundredth of a foot, as measured from the top of well casing mark/notch. Slowly lower the probe through the LNAPL until the instrument's tone changes to indicate the presence of water. Record the depth at which water was first indicated to the nearest hundredth of a foot. A clear bailer may be used to verify the existence or approximate amount and appearance of LNAPL. If no LNAPL is apparent, record the depth to water.

5) Retract the probe from the well and secure the well appropriately.

6) Note the date and time of measurement for gauging and record all measurements and observations in the field computer or, if necessary, in a field book for subsequent electronic data entry.

7) Decontaminate the probe in accordance with the decontamination procedure outlined in Section 1.5.

8) Clean up the work area, remove gauging equipment, and remove any traffic control devices.

3.0 GROUNDWATER MONITORING PROCEDURES

3.1 Potential Hazards

Traffic, pinch points, chemical (airborne and physical contact), and biological are all likely hazards to be encountered as well as slip/trip/fall potential during onsite well gauging activities. Additional hazards may be mentioned in the site-specific HASP and/or the daily JSA.

3.2 Materials and Equipment Necessary for Task Completion

A list of equipment required to access, gauge, purge, and sample site monitoring wells is presented below. Also listed are materials necessary to store, label, preserve, and transport groundwater samples.

- Current site map detailing well locations;
- Field book and/or field computer for recording site data;
- Graduated, optical oil/water interface probe;
- Keys and tools to provide well access;
- Appropriate, laboratory prepared sample containers and labels;
- Appropriate well purging apparatus as determined by volume of groundwater to be purged and compounds to be analyzed;
- Water quality meter for monitoring indicator field parameters (DO, pH, specific conductance, redox potential, and turbidity if available);
- Dedicated polyethylene bottom-loading bailer or well pump and disposable tubing for groundwater sample collection;
- Clean nylon or polypropylene bailer cord;
- Disposable nitrile sampling gloves;
- Decontamination supplies;
- Calibrated five-gallon bucket and watch or stopwatch to determine discharge rate during purging;
- Blank chain-of-custody forms; and

- Cooler(s) and ice for sample preservation.

3.3 Methodology for Three Well Volume Sampling

Prior to site visitation for the groundwater sampling event, the following data will be reviewed to ensure proper preparation for field activities:

- Most recent liquid level data from all wells;
- Most recent analytical data from all wells to determine gauging and sampling sequence; and
- Well construction characteristics.

Each monitoring well to be sampled will be gauged to obtain liquid level data immediately prior to initiation of the sampling process (refer to well gauging procedures above). Liquid level data should be recorded in a field computer or if necessary, a field book. Should free-phase LNAPL be detected by the gauging process, routine groundwater sampling will not be conducted at that location. If groundwater sampling under LNAPL is warranted, refer to the sub-LNAPL sampling section and methodology in Section 3.6.

Groundwater sampling will be initiated by purging from the well a minimum of three well volumes, except in cases where the well is pumped dry, as referenced below. Well purging is performed to remove stagnant water and to draw representative water from the aquifer into the well for subsequent sampling and analysis. In extreme cases where a well is pumped dry and/or shows little recharge capacity, the well should be evacuated once prior to sampling. Wellbore storage volume should be estimated using as-built information stored in the field computer or as indicated on the well log, and the depth to water measurement obtained immediately prior to sampling.

Water quality should be monitored and readings recorded in the field computer or field book while purging, typically through use of a multi-parameter water quality meter with a flow through cell or cord for down-well measurements. Water quality readings should be recorded a minimum of three times (pre-purge, during purge, and post-purge/sample collection) or four times (pre-purge and following each well volume). The parameters to be monitored and recorded are dissolved oxygen, pH, specific conductance, redox potential, temperature, and turbidity if available.

Well purging can be performed with various equipment including: a dedicated bailer for hand bailing low volumes of water; a surface mounted electric centrifugal pump with dedicated polyethylene tubing; and/or submersible pump (particularly when the depth to water is greater than 20 feet) with dedicated polyethylene tubing. During pumping, the intake will be placed directly below the static water surface and slowly lowered during the purging process. This procedure may not be necessary in low-yielding wells but is important in high-yielding, permeable strata where an intake initially placed deep in a well may draw laterally and have little influence in exchanging water from shallower depths within the well bore.

Flow rate during well purging will be approximated by the bucket and stop watch method. The duration of pumping required to remove three well volumes will be calculated directly from this flow rate. All fluids removed during purging will be treated onsite with activated carbon or in accordance with an approved work plan.

The sequence of obtaining groundwater samples will be based upon available historical site data for existing wells and photoionization detector (PID) readings for newly installed wells. Monitoring wells will be sampled in order of those having the lowest to highest concentration of constituents of concern (or PID readings for new wells), based upon the most recent available set of laboratory analyses, to reduce the potential for cross-contamination. For general monitoring events, groundwater samples will not be obtained for analysis from any well containing measurable free product. If groundwater sampling under LNAPL is warranted, refer to the sub-LNAPL sampling section and methodology in Section 3.6.

The following sequence of procedures will be implemented for the collection of groundwater samples from monitoring wells.

1) Establish a clean work area where sampling equipment will not come in contact with the ground or any potentially contaminated surfaces.
2) Use a dedicated polyethylene sampling bailer for each well.
3) Use a clean pair of nitrile gloves.

4) Attach an appropriate length of unused, clean nylon or polypropylene cord to the designated sampling bailer.

5) Select appropriate laboratory-provided sample containers.

6) Slowly lower sampling bailer into well until water surface is encountered; continue to lower the sampling bailer into the standing water column to one foot below the water surface.

7) Retrieve bailer at a steady rate to avoid excess agitation.

8) Visually inspect bailed sample to ensure that no free product or organic detritus has been collected.

9) Uncap first designated sample vial and fill from bailer as rapidly as possible but minimizing agitation; secure septum and lid.

10) Inspect sealed sample for entrapped air; if air is present, remove the lid and gently top off sample in vial, seal and inspect. Repeat until no air is apparent.

11) Repeat Steps 9 and 10 for the remaining sample vials based on the laboratory and/or regulatory protocol.

12) Complete and attach labels to sample containers noting sample collector, date, time, and location of sample; record same data in field computer or field book.

13) Place samples in ice-filled cooler in such a manner as to avoid breakage. Samples will be maintained at a temperature of approximately 4°C.

14) Dispose of gloves, bailer, and bailer cord as solid waste and move to next sample location.

3.4 Methodology for Low-Flow Purging and Sampling

For wells that will be purged and sampled via low-flow methodology, the USEPA Region III Bulletin QAD023: *Procedure for Low-Flow Purging and Sampling of Groundwater Monitoring Wells* will be followed. The following data will be reviewed for each well in order to set the pump intake for the low-flow sampling:

- Soil boring lithologic log;
- Well construction log showing the screened interval;
- Identification of the most permeable zone screened by the well;
- Approximate depth to static water;

- Proposed pump intake setting; and
- Technical rationale for the pump intake setting, preferably across from the most impacted/contaminated subsurface interval.

Adjustable rate, submersible, bladder pumps in conjunction with polyethylene tubing for purging and sampling will be used. An alternate set up could include a stainless steel submersible pump, such as a Hurricane® pump or a Monsoon® pump with dedicated polyethylene tubing. The tubing diameter will be between 3/16-inch and ½-inch inner diameter and the length of the tubing extended outside of the well should be minimized. Flow-through cells will be used to monitor groundwater quality parameters during sampling. Monitoring well information, equipment specifications, water level measurements, parameter readings, and other pertinent information will be recorded during well purging and sampling.

The following sequence of procedures will be implemented for the collection of groundwater samples from monitoring wells by the low-flow methodology.

1) PID Screening of Well: A PID measurement may be collected at the rim of the well immediately after the well cap is removed and recorded in the field computer or field book, if historic data is not available.
2) Depth to Water Measurement: A depth to water measurement will be collected and recorded. To avoid disturbing accumulated sediment and to prevent the inadvertent mixing of stagnant water, measuring the total depth of the well should be done at the completion of sampling.
3) Low Stress Purging Startup: Water pumping will commence at a rate of 100 to 400 milliliters per minute (mL/min). This pumping should cause very little drawdown in the well (less than 0.2-0.3 feet) and the water level should stabilize. Water level measurements are made frequently, and flow rate will be recorded in mL/min on the sampling form or field computer.
4) Low Stress Purging and Sampling: The water level and pumping rate will be monitored and recorded every five minutes during purging, and any pumping rate adjustments will be recorded. During the early phase of purging, emphasis will be placed on minimizing and stabilizing pumping stress, and recording any necessary adjustments. Adjustments, when necessary, will be made in the first 15 minutes of purging. If necessary, pumping rates will

be reduced to the minimum capabilities of the pump to avoid well dewatering. If the minimal drawdown exceeds 0.3 feet, but the water level stabilizes above the pump intake setting, purging will continue until indicator field parameters stabilize, as detailed in Step 5 below. If the water level drops below the pump intake setting at the absolute minimum purge rate, the pump will remain in place and the water level will be allowed to recover repeatedly until there will be sufficient water volume in the well to permit the collection of samples.

5) Indicator Field Parameter Monitoring: During well purging, indicator field parameters (DO, pH, specific conductance, redox potential, and turbidity if available) will be monitored every five minutes (or less frequently, if appropriate). Purging will be considered complete and sampling can commence when all the indicator field parameters have stabilized. Stabilization will be achieved when three consecutive readings, taken at five minute intervals (or less frequently, if appropriate), are within the following limits:

    - DO (±10 percent);
    - turbidity (±10 percent);
    - specific conductance (±3 percent);
    - pH (± 0.1 unit); and
    - redox potential ([Eh] ±10 mv).

   Temperature and depth to water will be also monitored during purging. Should any of the parameter-specific components of the water quality meter fail during monitoring, the sampling team will attempt to locate a replacement multi-meter or individual criteria meter. If none are available, the sampling team will continue recording the parameters that are operational, and proceed with the sampling. Any other field observations relating to sample quality, such as odor, foaming, effervescence, and sheens, will also be recorded in the field computer or on the sampling form.

6) Collection of Ground Water Samples: Water samples for laboratory analyses will be collected prior to the flow-through cell by either using a bypass assembly or by temporarily disconnecting the flow-through cell. All sample containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. During purging and sampling, the tubing should remain filled with water in order to minimize possible changes in water chemistry upon contact with the atmosphere. Methods employed to ensure that the outlet tubing will be filled include adjusting the tubing angle upward to

completely fill the tubing and restricting the diameter of the tubing near the outlet of the tubing.

The order in which samples will be collected is as follows:

- Volatile organics;
- Gas sensitive (e.g., Fe^{+2}, CH_4, H_2S/HS);
- Base neutrals or PAHs;
- Total petroleum hydrocarbons;
- Total metals;
- Dissolved metals;
- Cyanide;
- Sulfate and chloride;
- Nitrate and ammonia;
- Preserved inorganic;
- Non-preserved inorganic; and
- Bacteria.

After the appropriate laboratory-provided glassware is filled and labeled, the samples shall be placed in an ice-filled cooler and maintained at approximate 4°C for submittal to the laboratory. Upon completion of sampling at the well, decontaminate non-dedicated equipment in accordance with the decontamination procedure outlined in Section 1.5, and dispose of all dedicated equipment (gloves, tubing, etc.) as solid waste before moving to the next location.

3.5 Methodology for Passive (No-Purge) Sampling for Groundwater Collection

There are many passive groundwater sampling devices that allow for accurate sample collection without purging. Each device has specific uses and conditions for which they are more applicable. This methodology presents details for the use of HydraSleeve samplers.

The HydraSleeve is a disposable, single use device for the collection of representative groundwater samples for laboratory analysis of physical and chemical parameters.

HydraSleeves are placed within the screened interval (or other defined interval) of the well and activated after an equilibrium period. When used according to the manufacturer's instruction, the HydraSleeve will collect a groundwater sample without purging, thus causing no drawdown, agitation, or water column mixing. The HydraSleeve collects a sample from the screened interval only, and excludes water (or other fluids) from other parts of the well by use of check valve that seals when the sampler is full. The HydraSleeve takes advantage of the continuous natural movement of groundwater, which produces an equilibrium condition between the water in a well screen and the adjacent formation. HydraSleeves produce reliable data from low yield wells where other sample methods cannot due to well screen dewatering and associated alteration in water chemistry.

The HydraSleeve consists of the following components:

1) A long (usually 3 to 5 feet), flexible, lay-flat polyethylene sample sleeve, which is sealed at the bottom, and is equipped with a reed valve at the top allowing water to enter the HydraSleeve only during active sample retrieval.
2) A reusable, stainless steel weight attached with a clip to the bottom of the sleeve. The weight is used to carry the sample sleeve down the well to the specified depth (usually the bottom of the well screen). An optional top weight is also available to compress the sleeve in wells with short well screens.
3) A tether line attached to a spring clip at the top of the sample sleeve to deploy the device within the well and later retrieve it for sample collection.
4) A discharge tube is supplied with the device, which is used to puncture the wall of the sleeve after it is recovered to allow direct filling of sample bottles.

<u>Deployment</u>

Upon retrieval, the HydraSleeve is designed to effectively collect a "core" of water from within the well screen, which is equivalent in length and diameter to the sample sleeve. The upward motion opens the valve at the top, which then allows the device to fill with water. The Hydrasleeve should be installed with the top of the sample sleeve as close to the desired sample interval as possible. This will allow the sampler to fill and the check valve to close before the top of the device is pulled past the top of the sample interval.

To assemble and deploy the HydraSleeve:

1) Remove the Hydrasleeve from its package and hold it by the top, pinching the top at the holes.
2) Attach the spring clip and tether in the holes.
3) Slide the clip and bottom weight assembly into the holes at the bottom of the sleeve.
4) Lower the Hydrasleeve by the tether to the bottom or to the specified depth and secure the tether at the wellhead (Note: do not pull the HydraSleeve upward at any time during deployment, as this could cause the check valve to open and water to fill the sleeve inadvertently).

Sample Collection

Although the HydraSleeve only displaces approximately 100 milliliters (ml) of water during deployment, the well should be allowed to stabilize prior to sample collection so that natural flow conditions and contaminant distribution can return to equilibrium conditions. In certain jurisdictions, regulatory directives may prescribe a minimum equilibration period. When used for periodic monitoring programs, such as quarterly or semi-annual sampling, the HydraSleeve can be installed and remain in the well until the next sampling event, thus providing ample time for the well to equilibrate.

To collect a sample:

1) Be sure the tether is secured to the top of the well.
2) In one smooth motion, pull the tether upward at a rate of approximately 1 foot per second. The weight of the sampler will be felt when the valve closes. Continue pulling upward until the HydraSleeve is clear of the well.
3) Discard the water trapped at the top of the HydraSleeve above the reed valve.
4) Hold the HydraSleeve at the reed valve, and puncture the sleeve with the discharge tube just below the reed valve.
5) Decant the water into sample containers.
6) Discard the HydraSleeve as solid waste and process the excess water through activated carbon prior to discharge to the ground surface.

The weight and clips should be decontaminated prior to deploying a replacement HydraSleeve in the well. Tethers can be dedicated to individual wells or decontaminated and reused.

3.6 Methodology for Sub-LNAPL Sampling

The following section describes the methodology used for obtaining groundwater samples from the water column beneath LNAPL. Wells for sub-LNAPL sampling are not purged of three well volumes prior to sampling. This will prevent the potential of drawing LNAPL into the sample and to be representative of steady-state groundwater conditions beneath the LNAPL.

The following data will be reviewed for each well in order determine the appropriate equipment necessary:

- Well construction log showing diameter and total depth of the well;
- Approximate depth to LNAPL; and
- Approximate depth to static water.

A list of equipment for sub-LNAPL sampling is presented below:

- Field book or field computer for recording site data;
- Optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy;
- Keys and tools to provide well access;
- Peristaltic pump;
- Polyethylene tubing specifications of 0.25-inch outer diameter x 0.17-inch inner diameter is preferable as this small diameter assists in achieving lower flow rates;
- Silicone tubing of appropriate diameter to operate peristaltic pump;
- Polyvinyl chloride (PVC) drop tube (1.5-inch or other appropriate diameter);
- PVC rod (0.5-inch or other appropriate diameter);
- PVC end cap for drop tube;
- Tether for end cap;
- Clamps for securing drop tube to well casing;
- Appropriate sample containers and labels;

- Decontamination supplies;
- Blank chain-of-custody forms; and
- Cooler and ice for sample preservation.

The following sequence of procedures will be implemented for the collection of sub-LNAPL groundwater samples.

1) Determine LNAPL Thickness: Use an optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy to collect depth to LNAPL and depth to water measurements.
2) Installing Sampling Equipment: Deploy a 1.5-inch (or other appropriate diameter) PVC pipe (drop tube), with an attached end cap, through the LNAPL layer in the well. The end cap should be tethered to the drop tube so it is not lost in the well when removed and in a way that allows the drop tube to be sealed during installation. Lower the drop tube until the bottom of the tube is approximately two feet into the water column below the bottom of the LNAPL. Secure the drop tube to the well, and allow the system to equilibrate, approximately one half hour. The end cap is then removed by inserting a 0.5-inch (or other appropriate diameter) PVC rod into the drop tube and pushing on the cap until the lid is removed. The cap will be removed along with the tube upon completion of sampling.
3) Collection of Groundwater Samples: Lower polyethylene tubing through the 1.5-inch drop tube into the water column. Connect the polyethylene tubing to silicon tubing and engage the peristaltic pump for groundwater retrieval. Set the flow rate to the lowest pumping rate that can be sustained so that the LNAPL is not drawn into the tubing. Begin collecting groundwater in the sample container and continue until enough volume is obtained for all bottleware required by the laboratory for the requested analyses.

3.7 Decontamination Requirements

Of particular significance to the procedures of groundwater measurement and sampling is the limitation, whenever possible, of materials inserted into a well bore and, even more importantly, of materials transferred from well to well.

Many items can be discarded between well sampling and/or gauging locations without significantly impacting project costs. Dedicated sampling equipment which can be discarded between well sampling locations, will be used whenever possible to preclude decontamination requirements. Sampling equipment included in this category are polyethylene bailers, bailer cord, nitrile gloves, and sampling tubing. However, other monitoring and sampling equipment, such as oil/water interface probes and submersible sampling pumps, must be reused from well to well.

All site equipment to be used in multiple locations (non-dedicated) for gauging and/or sampling of groundwater will be decontaminated immediately prior to initial use and between uses at each location according to the following steps:

- Remove particulates with a sorbent pad or towel and/or initial rinse with clean potable tap water;
- Wash equipment with clean sponge, soft cloth, or scrub brush as necessary in a solution of tap water/laboratory grade detergent (Alconox®, Liquinox®, or equivalent);
- Rinse with tap water;
- Rinse with deionized or distilled water; and
- Air dry for as long as possible.

Rinse water generated during decontamination procedures will be treated onsite by passing the water through a bucket filled with activated carbon prior to disposal.

3.8 Documentation

All site activities and conditions at the time of purging and groundwater sampling should be recorded by field personnel in a field computer via the EDGE application or, if necessary, a field book may be used. The entry shall include the date, time, weather conditions, location (well name), personnel present onsite, PID readings, sampling methodology, purge rate, purge volume, and the aforementioned groundwater indicator parameters. A field qualifier “SL” shall be applied to each sub-LNAPL sample entry to denote sample collection as sub-LNAPL. Additional comments or observations (e.g., well damage, nearby pumping, LNAPL sheen) should also be recorded.

4.0 SOIL SAMPLING & WELL INSTALLATION PROCEDURES

4.1 Site Controls

Prior to hand augering, hydroexcavation, utilizing a backhoe, or deploying any drilling apparatus to the site, an underground utility line protection request must be made (i.e., Pennsylvania One Call) for mark-out of known subsurface utilities and associated laterals proximal to the drilling location. Site plans, if available, should be reviewed to document and avoid the location of onsite utilities.

After review of all known mapped and marked utilities, a site reconnaissance will be performed to document the location of utility meters and storm sewer drains. In addition, the location of overhead utilities must be documented. After completing the subsurface and overhead utility review, the area to drill may be considered clear of utilities, or the location may be adjusted to a nearby location, which must also be cleared.

Lastly, any drilling activities must be preceeded by clearing of the borehole, prior to advancement of augers or split spoons. To ensure the safety of workers, the borehole will be cleared by hand, hydroexcavator, or backhoe to a depth of approximately 8 feet below ground surface.

4.2 Potential Hazards

Traffic, pinch points, chemical (airborne and physical contact), and biological are all likely hazards to be encountered during soil sampling and well installation, as well as slip/trip/fall potential. Drilling is considered a high risk activity which requires facility approval prior to implementation. Additional hazards are identified in the site-specific HASP and/or the daily JSA.

4.3 Materials and Equipment Necessary for Task Completion

A list of equipment required to oversee test boring advancement and, where applicable, sample soil is presented below. Also listed are materials necessary to store, label, preserve, and transport soil samples.

- Current site map detailing well locations;
- Field computer and/or field book for recording site data;

- Appropriate, laboratory prepared sample containers and labels;
- PID;
- Single-use, disposable plastic scoops or stainless steel scoop for collecting soil samples;
- Single-use, disposable, laboratory-supplied syringes for soil sample collection (if applicable);
- Scale for weighing samples (e.g., methanol kits, if necessary);
- Disposable nitrile sampling gloves;
- Measuring tape (for measuring core recovery);
- Munsell soil color chart/book (recommended);
- Decontamination equipment (if applicable);
- Blank chain-of-custody forms; and
- Cooler(s) and ice for sample preservation.

4.4 Decontamination Requirements

All down-hole drilling equipment must be steam cleaned prior to drilling at each soil boring or well location. All soil sampling equipment must be cleaned with detergent and rinsed with deionized or distilled water prior to deployment into the borehole. All well construction materials (i.e. PVC well casing, PVC well screen, sand pack, bentonite) should be clean and dedicated to each borehole.

4.5 Methodology for Soil Boring Installation

4.5.1. Borehole Advancement

During test drilling activities, a borehole is advanced into the subsurface via a rotary or direct-push drilling technique. Various types of drilling methods could be deployed at these facilities to advance the borehole and gain access to the subsurface for characterization and sampling. A description of the most commonly utilized drilling methods is included below:

4.5.1.1 Hollow Stem Auger

A hollow, steel pipe (available diameters vary) with welded, exterior steel “flights” is used to convey subsurface material to the surface when rotated clockwise. A bit at the bottom of the lead auger cuts into the subsurface material, and the rotation conveys the loosened material (cuttings) up the flights, allowing the hole to be advanced (cuttings may not always return to the surface, such as when drilling in soft, saturated materials). The hollow center of the auger allows the driller to access the subsurface for soil sample collection and, where applicable, well installation during borehole advancement. During borehole advancement, a center stem of steel rods connected to an auger plug prevent soil cuttings from entering the drill column. Once a desired drilling depth is reached, the center plug and rods can be pulled out, leaving the auger stem in place to prevent borehole collapse. A split-spoon sampler can be threaded onto the rods in place of the plug and driven via a hammer to obtain a sample (Standard Penetration Test), or if terminal depth has been reached a monitoring well could be installed through the augers.

4.5.1.2 Air and Mud Rotary

Rotary drilling methods are similar to hollow stem auger drilling, however specialized drilling bits at the bottom of rods are used to cut into the subsurface material using compressed air, vibration, and/or pressurized drilling mud. Compressed air or mud is forced through the drilling rods via an air compressor or pump, and escapes through small holes in the drill bit. The circulation of drilling mud, or air combined with introduced water or formation water, conveys the soil cuttings to the surface (while also cooling the drilling bit and preventing borehole collapse).

4.5.1.3 Geoprobe®

A direct-push drilling method, Geoprobe® sampling utilizes a hydraulic hammer to drive steel rods into the subsurface for soil sampling. This method advances a core barrel lined with a plastic Macro-Core® sleeve into the soil column for continuous soil core collection.

4.5.1.4 Hand Auger

A stainless steel or aluminum hand auger is physically advanced to a desired soil sampling depth through rotation of the auger and head.

4.5.2 Soil Sampling

Soil samples will be obtained for lithologic logging and where appropriate, for laboratory analysis with one of three different sampling devices: Split barrel spoon sampler, hand auger, or Geoprobe® soil sampler. For either method, the sampling devices are lowered through the hollow-stem augers or open borehole to allow sampling of undisturbed sediments below the bit or drive shoe. Soil samples will be collected at regular intervals for subsurface characterization and selection of appropriate well screen interval(s). Soils which appear to be visually impacted or from intervals which exhibit the highest deflections on the screening device (PID or similar) will be sampled for laboratory analysis in accordance with an approved sampling plan.

4.5.2.1. Split barrel spoon sampler (split spoon)

The split spoon sampler will be driven into the soil column in accordance with ASTM Standard Method D1586 (Reference A6, Appendix E). Soil sampling by split spoon is characterized by drilling a borehole with a hollow-stem auger to the desired sampling depth (the standard calls for one sample per five foot depth interval). The split spoon sampler is attached to the drilling rods after removal of the auger plug. The drill operator will drive the sampler into the undisturbed soil by repeatedly striking the drilling rods with a 140 pound safety hammer over a 30 inch drop. Field personnel will record the number of blows required to drive the split spoon sampler for each successive six-inch interval. After the sampler has been filled, the driller will remove the rods and sampler from the borehole and should provide the intact sampler to field personnel for opening (the drive shoe and head can be loosened). Field personnel should split the spoon, scan with PID, measure sample recovery, thoroughly describe the soil lithology, note visual observations and odors, note degree of saturation, and where applicable collect soil sample(s) utilizing a stainless steel or disposable scoop. An approved, retractable knife may be used to trim the top and edges of the sample, and once prepared the sample should be containerized in appropriate sample containers.

4.5.2.2. Geoprobe®

The Geoprobe® operator will advance the drilling rods into the subsurface using a truck or track-mounted drill with a hydraulic hammer. A dedicated Geoprobe® Macro-Core® liner is inserted into the core barrel to collect continuous core samples, usually one per 4 foot interval. The Geoprobe® operator will remove the soil filled liner from the core barrel, cut the liner, and provide field personnel with the intact cores. After retrieval of the sample, the liner may be removed by field personnel and the soil core should be scanned with a PID and logged, including documentation of core recovery, soil lithology, visual observations and odors, and degree of saturation. Where applicable, field staff should remove the soil sample utilizing a stainless steel or disposable scoop and containerize in an appropriate sample container.

4.5.2.3. Hand Auger

The self-powered hand auger allows for soil from the desired interval to be collected directly through removal of the soil sample that is collected in the auger head for every six inches of advancement.

4.6 Methodology for Leaded Tank Bottoms Soil Sampling

Leaded tank bottom material is described as containing materials distinguished by distinctive rust/red to black, metallic, mostly oxidized scale materials, sometimes in a matrix of petroleum wax sludge. The approach for identifying leaded tank bottom materials is summarized below:

- If materials are encountered within the previously designated leaded tank bottom areas, matching the physical description given above for leaded tank bottoms, then samples should be collected for lead analysis.
- If total lead results are above the site-specific standard (SSS) for lead of 2,240 milligrams per kilogram (mg/kg) then samples should be analyzed for lead via Toxicity Characteristic Leaching Procedure (TCLP), EPA Test Method 1311.
- Delineated areas that exhibit soils that physically resemble leaded tank bottoms, exhibit lead concentrations greater than 2,240 mg/kg, and exceed 5 milligrams per liter (mg/l) for lead in the TCLP leachate (which is characteristically hazardous for lead) will retain the leaded tank bottom designation. If no soils are encountered that meet all three of these criteria, then the area will no longer be classified as a leaded tank bottom area.

4.7 Methodology for Monitoring Well or Recovery Well Installation

4.7.1 Well Construction

After drilling to a desired terminal depth via any of the drilling methods referenced above, permanent monitoring wells can be installed to allow access to groundwater for future monitoring and groundwater sampling. In general, monitoring wells are constructed of pipe with a slotted interval(s) (screen) through which groundwater can flow into the well from a desired water-bearing stratum. In most cases, PVC materials are utilized for monitoring well construction.

- For applications where LNAPL thickness measurement is necessary, the screened interval should extend above the presumed highest groundwater level.
- For applications where the shallowest groundwater interval is to be monitored (e.g., water-table aquifer), a single well casing is installed.
- For applications where multiple water bearing strata will be penetrated and where deep groundwater conditions are selected for monitoring, a double-cased well may be installed to prevent the vertical migration of contaminants to the deeper water bearing zone from shallower zone(s).

Each well construction type and considerations for field staff regarding how many casings are needed have been provided below.

4.7.1.1 Single Casing Construction

The most commonly installed monitoring well at the facilities have single casings and are constructed of PVC. To determine the length of screen used, seasonal groundwater table or tidal fluctuations should be considered to allow the water table to intercept the well screen throughout the year. Field personnel should advise the driller on the required well diameter, total well depth, screen interval, screen length, and slot size based on available subsurface information prior to drilling. Once the borehole is completed and the drilling crew has been advised on the desired construction, the drilling crew will thread the well screen onto an end cap at the wellhead and will lower the well into the borehole, adding lengths of casing until the terminal depth is reached.

While the well is held near the center of the borehole, the annular space between the well screen and formation is carefully backfilled with a sand filter pack, which consists of clean, sorted quartz sand sized to the formation grain size (typically #1 or #2 sand). The sand pack establishes continuity with the formation and acts as a filter to prevent soil from entering the well (the well screen slot size should be sized according to the formation median grain size to mitigate sediment intrusion, however is most commonly available from suppliers as 0.01 or 0.02-inch diameter slot size).

The sand pack should extend one to two feet above the top of well screen, and care must be taken by the driller to not bridge the sand or overshoot the top of sand target depth (particularly when installing wells through the auger stem). Above the sand pack, a seal (grout) is installed in the annular space between the well casing and the soil. The seal is comprised of hydrated bentonite, sometimes amended with pellets or a grout consisting of hydrated Portland cement, bentonite powder, or a blend of the two. A conventional grout blend is 95% Portland cement and 5% bentonite powder. The purpose of the seal is to prevent surface water from infiltrating the well screen. It is installed from the top of the sand to one to two feet below ground surface.

In circumstances where the top of well sand terminates below the water table (e.g., deeper groundwater or submerged screen), grout should be mixed into a slurry at the ground surface and pumped via tremmie pipe or hose to prevent bridging. Above the well seal, the annular space can be backfilled with granular bentonite or concrete. A cement cap or well pad is placed at the surface to further mitigate potential infiltration of surface water. A locking, steel protective casing (stand pipe) or a locking, flush-mounted curb box should be installed to protect the well.

4.7.1.2 Double Casing Construction

Construction of a double cased well is similar to that of a single case well; however, to prevent groundwater infiltration from shallower water bearing zones, a second casing is installed through a surface casing. This type of construction requires drilling two different diameter boreholes.

During drilling through the shallower groundwater bearing zone(s), a larger diameter borehole is drilled and should be sized according to the desired well and/or outer casing diameter. This may require reaming of the borehole depending on the conditions and drilling equipment. An outer (surface) casing is installed and the annulus is grouted. After the outer casing is installed and the grout has set, the borehole is advanced through the surface casing with a smaller diameter drill stem and bit. When the desired terminal depth is reached, a monitoring well is installed through the inner casing using the above-referenced single casing construction procedure (the annular space between the outer and inner casings above the well filter sand should be pressure grouted).

4.7.2 Handling of Soil Cuttings

Soil cuttings generated during drilling will be containerized or stockpiled on plastic until sampling and analytical data can be obtained. Soil cutting final placement (onsite soil reuse or offsite disposal) will be performed in accordance with Pennsylvania Department of Environmental Protection (PADEP) approved onsite soil reuse plans for each facility.

4.7.3 Well Development

After installation, monitoring wells will be developed to remove residual soil from within the well and filter media and to establish communication between the well and formation. Pump and surge methodology, either through use of a ditch pump or air compressor connected to black polyethylene pipe and surge block, should be utilized to successively agitate relatively clear groundwater from the well. Surging should begin from the bottom of the screened interval and continue iteratively to the top of the well screen in approximately 2 to 4-foot intervals (i.e., pump and surge each 2 to 4 foot interval of well screen several times until relatively clear discharge water is maintained, then move up to the next screen interval until all of the screen has been developed).

Alternately, a submersible pump may be used to pump water from the screened interval of shallow wells, with the screen of the well surged to evacuate silt that remains in the sand pack. The well should be alternately surged and purged until groundwater flowing from the well appears relatively free of sediments. A vacuum truck may be used for development for wells that contains product. Well development water should be managed/treated in accordance with the site-specific work plan.

4.8 Documentation

All site activities and conditions at the time of soil sampling, well installation, and well development should be recorded by field personnel in a field computer via the EDGE application or, if necessary, a field book may be used. The entry shall include the date, time, weather conditions, location (well or boring name), personnel present onsite, and the aforementioned lithologic data and well construction information. The entry shall include detailed data required to create representative soil boring lithologic logs and well as-built logs (if a well is constructed). This data should include but not be limited to soil type, soil texture (e.g., USCS), soil color, relative moisture content, depth of apparent water table, PID readings, blow counts (if split spoon samples are collected), sample recovery, total depth of borehole, length of well screen, length of well casing, sand pack interval, filter sand size, grout materials used, well seal interval, and all well construction materials. Notes should also include well development pumping rate, duration, and observations. Additional comments or observations should also be recorded, as appropriate.

5.0 LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) SAMPLING PROCEDURES

5.1 Potential Hazards

Traffic, pinch points, chemical (airborne and physical contact), and biological are all likely hazards to be encountered during LNAPL sampling, as well as slip/trip/fall potential. Additional hazards may be mentioned in the site-specific HASP and/or the daily JSA. If significant amounts of LNAPL are being handled, a Tyvek suit should also be worn.

5.2 Materials and Equipment Necessary for Task Completion

A list of equipment required to sample LNAPL from a monitoring well is presented below:

- Current site map detailing well locations;
- Field book or field computer for recording site data;
- Optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy;
- Keys and tools to provide well access;
- Appropriate sample containers and labels. LNAPL samples will be collected in laboratory provided glassware with appropriate preservative, if applicable. A minimum of 10 ml is required for most laboratory analyses. In the case that sufficient volume is not obtained, a swabbing technique (described below) could be used;
- Sorbent pads (required for swabbing technique);
- Stainless steel or clear bottom-loading or top-loading bailer, depending on product thickness;
- Clean nylon or polypropylene bailer cord;
- Decontamination supplies;
- Blank chain-of-custody forms; and
- Cooler and ice for sample preservation.

5.3 Decontamination Requirements

During LNAPL sampling activities, dedicated sampling equipment (i.e., clear bailers, nitrile gloves, and bailer cord) may be utilized; thereby, minimizing decontamination requirements. However, a stainless steel bailer may be used and decontaminated between LNAPL sampling locations. The optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy used to record the presence or absence and approximate thickness of LNAPL prior to sampling also requires decontamination between sampling locations. Decontamination procedures are detailed in Section 1.5.

5.4 Sampling Procedure

Immediately prior to sampling, each monitoring well should be gauged to obtain liquid levels (i.e., depth to LNAPL and depth to water) for estimation of current LNAPL thickness. Refer to Section 3.0 for appropriate well gauging procedures. Liquid level data should be recorded in a field book or field computer through the EDGE application or, if necessary, a field book.

LNAPL sampling may be performed via two different methods, based upon the LNAPL thickness/availability at the time of sampling: direct sample or swabbing. As indicated above, a minimum LNAPL volume of 10 mL is typically required by the analytical laboratory for most LNAPL characterization.

The following sequence of procedures will be implemented for the collection of LNAPL samples from monitoring wells:

1) A clean work area will be established so that sampling equipment will not come in contact with the ground surface or any other potentially contaminated surfaces near the wellhead.
2) A pre-cleaned stainless steel bailer or dedicated disposable bailer will be used for each well.
3) A new pair of nitrile gloves will be worn during sampling and replaced for each well.
4) Based on the gauged depth to LNAPL, an appropriate length of dedicated nylon or polypropylene cord will be tied to the sampling bailer.
5) An appropriately sized (i.e., 40 ml glass vial with plastic cap fitted with Teflon® lined septum) laboratory-provided sample container will be used to containerize the LNAPL sample.

6) The sampling bailer will be slowly lowered into the well until the liquid level is encountered. Once encountered, the sampling bailer should be lowered into the standing liquid column to a depth of approximately 1 foot, or other appropriate depth based on product thickness.

7) The bailer should be retrieved at a steady rate to avoid excess agitation.

8) The bailed sample should be visually evaluated for the presence or absence of LNAPL. If sufficient LNAPL volume is present (>10 ml), a direct sample of the LNAPL will be collected into the laboratory vial. If less than 10 ml of LNAPL is apparent, a sorbent pad may be used to absorb the LNAPL from the surface of the groundwater sample and the swab placed in the laboratory vial. The site-specific work plan should dictate whether a swab sample should be analyzed, or if the well should be monitored at a later date for re-sampling.

9) Labels will be completed and attached to the sample vials, indicating the sample collector's name, date, time, and location of sample; record same data in field computer or field notebook.

10) Store samples in a secure location until possession is transferred to the laboratory.

11) Nitrile gloves, bailer, bailer cord, and any other trash will be disposed of as solid waste.

5.5 Documentation

All site activities and conditions at the time of sampling should be recorded by field personnel in a field computer via the EDGE application or, if necessary, a field book may be used. The entry shall include the date, time, weather conditions, location (well name), personnel present onsite, and the aforementioned well gauging parameters. Additional comments or observations (e.g., color or apparent viscosity of LNAPL) should be recorded.

6.0 INDOOR AND AMBIENT AIR SAMPLING PROCEDURES

In preparation for indoor and/or ambient air sampling, appropriate facility personnel should be notified of intended sampling prior to mobilization. The purpose of this would be to confirm that there are not any non-routine activities occurring in the building, such as painting of indoor walls, which would cause incidental contamination of the samples.

6.1 Materials and Equipment Necessary for Task Completion

A list of equipment required to collect indoor and/or ambient air samples is presented below:

- Field data book or field computer for recording site data;
- Laboratory certified Summa canisters (standard size is 6 liters);
- Flow controllers (standard duration is 8-hours) with integrated vacuum gauge;
- Equipment for elevating sample intake height (examples: extended sampling inlets, zip ties to attach units to fencing, tables, etc);
- Camera; and
- Blank chain-of-custody forms.

6.2 Precautions to Avoid Incidental Contamination

EPA Method TO-15 is the most common method used for analysis of air samples at these sites. This method is highly sensitive to trace concentrations of volatile organic compounds (VOCs). To avoid incidental contamination:

- Do not wear cologne or fragrance on day of sampling;
- Do not use hand sanitizers or lotions;
- Do not store canisters near containers of gasoline, or any fuel; and
- Make sure there are no sources of VOCs in the vehicle used to transport the canisters.

6.3 Sampling Procedure

1) <u>Set Up Summa Canister</u>. Inlets of the flow controllers are to be placed in the breathing zone, approximately 4 to 6 feet above the ground surface. Elevate Summa canisters using appropriate materials available onsite or use laboratory-provided extended inlets (approximately 3 ft long sampling canes). Indoor air samples should be representative of air

in the buildings and should be placed away from obvious ventilation to outdoor air or sources of VOCs. Securely attach flow controller and extended sampling inlet if applicable.

2) Start Air Sample Collection. Open the valve. Document the initial vacuum (should be between approximately -30 inHg and -26 inHg) and the start time of the test. If the vacuum is significantly outside of the range or has a high rate of change, consider using an alternate canister or flow controller as there may be leakage.
3) Monitoring Summa Condition During Sampling Period. Several times during the sampling period, verify that the Summa is in good condition and that the vacuum is decreasing at an appropriate rate several times during the sampling period. An example of a reasonable frequency would be every two hours during an 8-hour event. During these checks, record the time, remaining vacuum, and canister condition. If necessary, obtain a permit to operate a camera, and take a least one photo of each sampling location.
4) Completing Air Sample Collection. Near the end of the sampling period, monitor the gauge more frequently. The sample collection should be stopped when the gauge reads approximately -5 inHg. At this point, close the canister valve. Record the sample end time and sample end vacuum. Ensure that the canister is labeled with the sample ID. Remove all of the attached equipment from the canister. Pack the canisters, flow controller wrapped in bubble wrap, chain of custody (additional information in the following section), and any other laboratory provided equipment back into the original packaging.

6.4 Documentation

All site activities and conditions at the time of air sampling should be recorded by field personnel. The entry shall include the date, time, weather conditions (including wind direction and start/end barometric pressure), sample locations and IDs, and personnel present onsite. Any observation that could influence the level of VOCs in the samples should be noted.

7.0 SURFACE WATER SAMPLING PROCEDURES

7.1 Field Procedures for Surface Water Sampling

7.1.1 General

Surface water sampling is performed to obtain samples for surface water bodies that are representative of existing surface water conditions. Surface water sampling (or gauging) within 3 feet of a bulkhead at certain facilities will require field personnel to wear a life vest.

Surface water sampling locations for surface water quality and groundwater interaction studies are selected based on the following:

1) Study objectives
2) Location of point surface discharges
3) Non-point source discharges and tributaries
4) Presence of structures (e.g., bridge, dam)
5) Accessibility

During surface water sampling it is important to obtain samples that are not impacted by the re-suspension of sediment produced because of improper or poor surface water sampling techniques.

7.1.2 Surface Water Sample Location Selection

Prior to conducting surface water sampling activities, the first requirement is the consideration and development of surface water sampling locations. It is important that all surface water sampling locations be selected in accordance with the work plan.

Wading for surface water samples increases the chances of disturbance of sediments from the floor of the surface water body. When wading for surface water samples be aware of potential safety and health risks. A life vest and safety line must be worn at all times where footing is unstable or when sampling in fast moving or more than 3 feet (0.9 m) deep. A two-person team is required for most surface water sampling activities. If the site conditions require the use of the life vest and safety line, the two people involved in the sampling must be competent swimmers.

Surface water samples must be collected with no suspended sediments. Surface water samples are collected commencing with the furthest downstream location to avoid sediment interference with upstream locations.

7.1.2.1 Rivers, Streams, and Creeks

Surface water samples are generally collected in areas of surface water bodies that are representative of the surface water body conditions. Representative surface water samples will usually be collected in sections of surface water bodies that have a uniform cross section and flow rate. Mixing is influenced by turbulence and water velocity, therefore the selection of surface water sampling locations immediately downstream of a riffle area (i.e., fast flow zone) will ensure good vertical mixing. These locations are also likely areas for deposition of sediment since this occurs in areas of decreased flow velocity.

Surface water sampling locations should not be established in areas near point source discharges. Surface water sampling of these source discharge points can be performed to assess the impact of these source areas on overall surface water quality. Sample tributaries as close to the mouth as possible. It is important to select surface water sample locations considering the impact downstream, including tributary flow and sediment.

In all instances, properly document all surface water sampling locations. Documentation may include photographs and tie-ins to known structures.

7.1.2.2. Sampling Equipment and Techniques

When collecting surface water samples, direct dipping of the sample container into the stream or water is acceptable unless the sample container contains preservatives. If preserved, a pre-cleaned unpreserved sample container should be used to collect the surface water sample. The surface water sample is then transferred to the appropriate preserved sample container. When collecting surface water samples, submerse the inverted bottle to the desired sample depth and tilt the opening of the sample container upstream to fill. During surface water sample collection, wading or movement may cause sediment deposits to be re-suspended and can result in biased samples. Wading is acceptable if the stream has a noticeable current and the samples are collected directly in the sample container when faced upstream. If the stream is too deep to wade in or if addition samples must be collected at various depths, additional sampling equipment will be required. Surface water samples should be collected about 6 inches (15 cm) below the surface, with the sample bottles being completely submerged. Taking the surface water sample at this depth eliminates the collection of floating debris in the sample container.

Surface water sample collection where the flow depth is less than 1 inch (<2.5 cm) requires the use of special equipment to eliminate sediment disturbance. Surface water sampling may be conducted with a container then transferred to the appropriate sample container, or collection may be performed using a peristaltic pump. A small excavation in the stream bed to create a sump for sample collection can also be considered but should be prepared in advance to allow all the sediment to settle prior to surface water sampling activities.

Teflon™ bailers can be used for surface water sampling if it is not necessary to collect surface water samples at specific depths. A bottom loading bailer with a check ball is sufficient. When the bailer is lowered through the water, the water is continually displaced through the bailer until the desired depth is reached. The bailer is retrieved and the check ball prohibits the release of the collected surface water sample. Bailers are not suitable in surface water bodies with strong currents, or where depth-specific sampling is required. For discrete and specified depth surface water sampling, and the parameters to be monitored do not require a Teflon™ coated sampling device, a standard Kemmerer or Van Dorn sampler can be used. The Kemmerer sampler is a brass cylinder with rubber stoppers that leave the sampler ends open while the sampler is being lowered. The sampler is lowered in a vertical position to allow water to pass through. The Van Dorn sampler is plastic and is lowered in a horizontal position. For both samplers, a messenger is sent down a rope when the sampler has reached the required depth. The messenger causes the stopper on the sampler to close. The sampler is then retrieved and the surface water sample can be collected through a valve. DO sample bottles can be filled by allowing overflow using a rubber tube attached to the valve. During depth-specific surface water sampling, take care not to disturb bottom sediments.

Glass beakers or stainless steel cups may also be used to collect surface water samples if

parameter interference does not occur. The beaker or cup must be rinsed at least three times with the surface water sample prior to sample collection.
All equipment must be thoroughly decontaminated.

7.1.2.3 Field Notes for Surface Water Sampling

Record daily surface sampling activities, describe surface water sampling locations, sampling techniques, and, if applicable, provide a description of photographs taken. Visual observations are important and provide valuable information when interpreting surface water quality results. Observations include:

1) Weather conditions
2) Stream flow directions
3) Stream physical conditions (width, depth, etc.)
4) Tributaries
5) Effluent discharges
6) Impoundments
7) Bridges
8) Railway trestles
9) Oil sheens
10) Odors
11) Buried debris
12) Vegetation
13) Algae
14) Fish and other aquatic life
15) Surrounding industrial areas

The following factors should be considered for surface water sampling:

1) Predominant Surrounding Land Use: Observe the prevalent land use type in the vicinity and note any other land uses in the area which, although not dominant, may potentially affect surface water quality.

2) Local Watershed Erosion: Note the existing or potential erosion of soil in the local watershed and its movement into the stream. Erosion can be rated through visual observation of watershed stream characteristics including increases or decreases in turbidity.

3) Local Watershed Non-Point Source Pollution: This refers to problems or potential problems other than erosion and sedimentation. Nonpoint source pollution can be diffuse agricultural and urban runoff. Other factors may include feed lots, wetlands, septic systems, dams, impoundments, and mine seepage.

4) Estimated Stream Width: The estimated distance from shore at a transect representative of the stream width in the area.

5) Estimated Stream Depth: Riffle (rocky area), run (steady flow area), and pool (still area). Estimate the vertical distance from the water surface to the bottom of the surface water body at a representative depth at three locations.

6) High Water Mark: Estimate the vertical distance from the bank of the surface water body to the peak overflow level, as indicated by debris hanging in bank or flood plain vegetation, and deposition of silt. In instances where bank flow is rare, high water marks may not be evident.

7) Velocity: Record or measure the stream velocity in a representative run area.

8) Dam Present: Indicate the presence or absence of a dam upstream or downstream of the surface water sampling location. If a dam is present, include specific information detailing the alteration of the surface water flow.

9) Channelized: Indicate if the area surrounding the surface water sampling location is channelized.

10) Canopy Cover: Note the general proportion of open to shaded areas which best describes the amount of cover at the surface water sampling location.

7.2 References

For additional information pertaining to surface water sampling, the user of this manual may reference the following:

ASTM D5358 Practice for Sampling with a Dipper or Pond Sampler

ASTM D4489 Practices for Sampling of Waterborne Oils

ASTM D3325 Practice for the Preservation of Waterborne Oil Samples

ASTM D4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents

ASTM D4411 Guide for Sampling Fluvial Sediment in Motion

ASTM D4823 Guide for Core-Sampling Submerged, Unconsolidated Sediments

ASTM D3213 Practice for Handling, Storing, and Preparing Soft Undisturbed Marine Soil

ASTM D3976 Practice for Preparation of Sediment Samples for Chemical Analysis

ASTM E1391 Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing

ASTM D4581 Guide for Measurement of Morphologic Characteristics of Surface Water Bodies

ASTM D5906 Guide for Measuring Horizontal Positioning During Measurements of Surface Water Depths

ASTM D5073 Practice for Depth Measurement of surface water

8.0 SEDIMENT SAMPLING PROCEDURES

8.1. Introduction

Sediment sampling is conducted to obtain samples that are representative of existing chemical and/or physical conditions of sediment.

8.2 Equipment Decontamination

On environmental sites, sediment sampling equipment (e.g., split spoons, trowel, spoons, shovels, bowls, dredges, corers, scoops) are typically cleaned as follows:

1) Wash with clean potable water and laboratory detergent, using a brush as necessary to remove particulates.
2) Rinse with tap water.
3) Rinse with deionized water.
4) Air dry for as long as possible.

Additional or different decontamination procedures may be necessary if sampling for some parameters, including VOCs and metals.

8.3 Sample Site Selection

Before any sampling is conducted, the first requirement is to consider suitable sampling locations. Sampling locations should be selected in accordance with the work plan. Wading for sediment samples in lagoons, lakes, ponds, and slow-moving rivers and streams must be done with caution since bottom deposits are easily disturbed. Sampling must only be attempted where safe conditions exist and samples must be collected from undisturbed sediments. All sediment samples are to be collected commencing with the most downstream sample to avoid sediment interference with other downstream samples. A life vest and safety line should be worn in all cases where footing is unstable or where water is fast moving or over 3 feet (0.85 m) in depth. A second person may also be required for most of the sampling scenarios.

8.3.1. Rivers, Streams, and Creeks

Sediment samples may be collected along a cross-section of a river or stream in order to adequately characterize the bed material, or from specific sediment deposits as described in the work plan. A common procedure is to sample at quarter points along the cross-section of the sampling site selected. Samples may be composited as described in the work plan. Samples of dissimilar composition (e.g., grain size, organic content) should not be combined. Representative samples can usually be collected in portions of the surface water body that have a uniform cross-section and flow rate. Since mixing is influenced by turbulence and water velocity, the selection of a site immediately downstream of a riffle area (e.g., fast flow zone) are likely areas for deposition of sediment since the greatest deposition occurs where stream velocity slows.

A site that is clear of immediate point sources (e.g., tributaries and industrial and municipal effluents) is preferred for the collection of sediment samples unless the sampling is being performed to assess these sources.

8.4 Sampling Equipment and Techniques

8.4.1. General

Any equipment or sampling technique(s) [e.g., stainless steel, polyvinyl chloride (PVC)] used to collect a sample is acceptable so long as it provides a sample which is representative of the area being sampled and is consistent with the work plan.

8.4.2. Sediment Sampling Equipment and Techniques

A variety of methods may be used to collect sediment samples from a stream, river, or lake bed. Dredging (Peterson, Ponar, Van Veen), coring and scooping are acceptable sediment sample collection techniques. Precautions shall be taken to ensure that a representative sample of the targeted sediment is collected. Caution should be exercised when wading in shallow water so as not to disturb the area to be sampled. Samplers should be selected based on the interval to be sampled, type of sediment/sludge (silt, sand, gravel), and required sample volume. More than one sampler is often required to implement a sampling program at a site. The following describes some of these methods. Manufacturer's information should be consulted to determine the limitations of each type of sampling equipment.

8.4.3 Dredging

The Peterson dredge is best used for rocky bottoms, in very deep water, or when the stream velocity is rapid. The dredge should be lowered slowly as it approaches the bottom, so as to not disturb the lighter sediments.

The Ponar dredge is similar to the Peterson dredge in size and weight. The Ponar dredge is a "clam-shell" type unit that closes on contact with the river/lake bottom. Depending on the size of the unit, a winch is required for larger units, whereas smaller units are available for lowering by a hand line. Once retrieved, the unit is opened and the sample extracted using a sample scoop or spoon. The unit has been modified by the addition of side plates and a screen on top of the sample compartment. This permits water to pass through the sampler as it descends.

The Ponar grab sampler functions by the use of a spring-latch-messenger arrangement. The sampler is lowered to the bottom of the water body by means of a rope, then the messenger is sent down to trip the latch causing the sampler to close on the sediments. The sampler is then raised slowly to minimize the disturbance of the lighter sediments. Sediment is then placed into a stainless steel bowl, homogenized, and placed into the appropriate sample container (if collecting for VOC parameters, fill the VOC jars before homogenization).

8.4.4. Corers

Core samplers are used to obtain vertical columns of sediment. Many types of coring devices are available, depending on the depth of water from which the sample is to be collected, the type of bottom material, and the length of core to be obtained. They vary from hand-push tubes to weight or gravity-driven devices to vibrating penetration devices.

Coring devices are useful in contaminant monitoring due to the minimal disturbance created during descent. The sample is withdrawn intact, allowing the removal of only those layers of interest. Core liners consisting of plastic or Teflon may also be added, thereby reducing the potential for sample contamination and maintaining a stratified sample. The samples may be shipped to the lab in the tubes in which they were collected. The disadvantage of coring devices is that only a small sampling surface area and sample size is obtained, often necessitating repetitive sampling in order to collect the required amount of sediment for analysis. It is also often difficult to extract the sediment sample back out through the water column without losing the sample.

The core tube is pushed/driven into the sediment until only 4 inches (10 cm) or less of tube is above the sediment-water interface. When sampling hard or coarse sediments, a slight rotation of the tube while it is pushed will create greater penetration and reduce compaction. Cap the tube with a Teflon plug or a sheet of Teflon. The tube is then slowly withdrawn, keeping the sample in the tube. Before pulling the bottom part of the core above the water surface, it must be capped.

8.4.5 Scooping

The easiest way to collect a sediment sample is to scoop the sediment using a stainless steel spoon or scoop. This may be done by wading into the stream or pond and, while facing upstream (into the current), scooping the sample from along the bottom in an upstream direction. This method is only practical in very shallow water.

8.4.6 Mixing

Sediment samples collected for chemical analysis should be thoroughly mixed (except for VOCs) in a stainless steel bowl prior to placement in the appropriate sample container. Standard procedures exist for preparation of sediment samples (ASTM D3976). These should be followed or the laboratory informed of applicable procedures.

8.4.7 Air Monitoring

Prior to sediment/sludge sampling, measure the breathing space above the sample location with a PID, should the potential for volatiles be present, and use a hydrogen sulfide meter should hydrogen sulfide be present. Repeat these measurements during sampling. If either of these measurements exceed any of the air quality criteria established in the HASP, air purifying respirators (APRs) or supplied air systems will be required.

8.4.8 Sample Location Tie-In/Surveying

The recording of the sample locations and depth on the site plan is extremely important. This may be accomplished by manual measurement (i.e., swing ties), global positioning system (GPS) survey, or stadia methods. Manual measurements for each sample location should be tied into three permanent features (e.g., buildings, utility poles, hydrants). Diagrams with measurements should be included in the field book.

8.5 Field Notes

A bound field book is used to record daily activities, describe sampling locations and techniques, and describe photographs (if taken). Visual observations are important, as they may prove invaluable in interpreting water or sediment quality results. Observations shall include (as applicable) weather, stream flow conditions, stream physical conditions (width, depth, etc.), tributaries, effluent discharges, impoundments, bridges, railroad trestles, oil sheens, odors, buried debris, vegetation, algae, fish or other aquatic life, and surrounding industrial areas. The following observations should be considered:

- Predominant Surrounding Land Use: Observe the prevalent land use type in the vicinity (noting any other land uses in the area which, although not predominant, may potentially affect water quality).
- Local Watershed Erosion: The existing or potential erosion of soil within the local watershed (the portion of the watershed that drains directly into the stream) and its movement into a stream is noted. Erosion can be rated through visual observation of watershed and stream characteristics. (Note any turbidity observed during water quality assessment.)
- Local Watershed Non-point Source Pollution: This item refers to problems and potential problems other than siltation. Non-point source pollution is defined as diffuse agricultural and urban runoff (e.g., stormwater runoff). Other compromising factors in a watershed that may affect water quality are feedlots, wetlands, septic systems, dams and impoundments, and/or mine seepage.
- Estimated Stream Width: Estimate the distance from shore at a transect representative of the stream width in the area.

- Estimated Stream Depth: Riffle (rocky area), run (steady flow area), and pool (still area). Estimate the vertical distance from water surface to stream bottom at a representative depth at each of the three locations.
- High Water Mark: Estimate the vertical distance from the stream bank to the peak overflow level, as indicated by debris hanging in bank or floodplain vegetation, and deposition of silt or soil. In instances where bank overflow is rare, a high water mark may not be evident.
- Velocity: Record an estimate of stream velocity in a representative run area (see Section 12.0).
- Dam Present: Indicate the presence or absence of a dam upstream or downstream of the sampling station. If a dam is present, include specific information relating to alteration of flow.
- Channelized: Indicate whether the area around the sampling station is channelized.
- Canopy Cover: Note the general proportion of open to shaded area which best describes the amount of cover at the sampling station.
- Sediment Odors: Disturb sediment and note any odors described (or include any other odors not listed) which are associated with sediment in the area of the sampling station.
- Sediment Oils: Note the term which best describes the relative amount of any sediment oils observed in the sampling area.
- Sediment Characteristics: Note the grain size, color, consistency, layering, presence of biological organisms, man-made debris, etc. in accordance with standard ASTM soil description protocols.
- Sediment Deposits: Note those deposits described (or include any other deposits not listed) which are present in the sampling area. Also indicate whether the undersides of rocks not deeply embedded are black (which generally indicates low dissolved oxygen or anaerobic conditions).

8.6 References

For additional information pertaining to this topic, the user of this manual may reference the following:

ASTM D5358 Practice for Sampling with a Dipper or Pond Sampler
ASTM D4489 Practices for Sampling of Waterborne Oils
ASTM D3325 Practice for the Preservation of Waterborne Oil Samples

ASTM D4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents

ASTM D4416 Guide for Sampling Fluvial Sediment in Motion

ASTM D4823 Guide for Core-Sampling Submerged, Unconsolidated Sediments

ASTM D3213 Practice for Handling, Storing, and Preparing Soft Undisturbed Marine Soil

ASTM D3976 Practice for Preparation of Sediment Samples for Chemical Analysis

ASTM E1391 Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing

ASTM D4581 Guide for Measurement of Morphologic Characteristics of Surface Water Bodies

ASTM D5906 Guide for Measuring Horizontal Positioning During Measurements of Surface Water Depths

ASTM D5073 Practice for Depth Measurement of Surface Water

ASTM D5413 Test Methods for Measurement of Water Levels in Open-Water Bodies

9.0 SLUG TEST PROCEDURES

9.1 Materials and Equipment Necessary for Task Completion

Water level (data) logger capable of recording pressure and/or depth at sub-second time intervals (preferably a vented logger capable of advanced logging modes); vented, direct-read cable of sufficient length (with dessicant); interface tape/probe or water level meter; solid (mechanical) slug, pneumatic slug, or packer system [the introduction or removal of water is not recommended (e.g., bailer or bucket)]; 5 gallon bucket, traffic cones and/or barricades, deionized or distilled water and Alconox®; decontamination bucket and brush; and laptop computer or rugged reader.

9.2 Decontamination Requirements

Equipment utilized during slug testing must be thoroughly decontaminated with Alconox® and deionized/distilled water prior to and between uses at each test well to prevent cross contamination between wells. Any groundwater removed from the well during testing must be containerized and either treated and discharged to ground surface, or disposed of in an approved manner, preferably in a properly installed, onsite holding tank. If LNAPL is encountered/recovered, it should be containerized and properly disposed onsite. However, the preferred test initiation methods (solid and/or pneumatic slug) do not generate any groundwater.

9.3 Methodology for Slug Testing

Slug tests are utilized to provide in-situ estimations of hydraulic conductivity (k) in saturated media, most often in geologic formations that exhibit aquifer properties (low k media can also be tested with special consideration). Slug tests involve rapidly displacing the static water level in a well, and analyzing the well’s rate and pattern of recovery back to near-static conditions. Falling head or slug-in tests involve analysis of displacement due to the addition of volume, and rising head or slug-out tests involve the analysis of displacement due to the removal of volume. Displacement is initiated using either a solid or pneumatic slug. Water level response is monitored immediately following the initial displacement and for the ensuing time period until the water level has returned to near-static level (generally within 5% of static). Water level response should be recorded using a water level (data) logger capable of recording pressure and/or depth at sub-second time intervals (preferably a vented logger). Logarithmic logging modes are preferred to shorten the data file while still providing high resolution data just after test initiation.

9.4 Field Procedures

1) Test Well Construction and Configuration - Well construction details are needed to perform slug test calculations and are important considerations when selecting appropriate wells for testing. Important as-built details include: total well depth, well screened interval(s), depth to (static) water, casing diameter, screen diameter, filter pack diameter, filter pack size, and filter pack interval. While these details should be documented on the well log, static water level and total well depth should be field-confirmed before the test. Of particular importance to the testing procedure is the relationship between static water level and well screened interval, and the degree of well development. Test results for poorly or insufficiently-developed wells may be strongly affected by drilling debris/disturbance in the formation that can create skin effects, lowering the apparent formation k. Analysis of testing data for wells screened across the water-table should consider drainage of the filter pack media. In addition, a pneumatic slug assembly should not be utilized unless the test well is screened below the water table and the water level remains above the screen throughout the test.

2) Test Setup and Initiation - Upon arrival, the test well should be gauged for static depth to water and total well depth so that the total water column length can be estimated. Well gauging data should be recorded in a rugged reader using an EDGE file, if available, or field form or book.

   a. Solid Slug

      The displacement volume of the slug is needed. It is suggested that the slug be prefabricated and calibrated for displacement volume prior to site use. Calculate the expected initial well displacement, using the slug volume and well casing radius, and deploy the data logger/cable to a depth just below that level while considering the slug length (to avoid conflict and tangling of the slug and transducer). Also consider the submergence depth limit of the data logger (usually indicated on the logger body). Generally, placing the data logger a foot or two below the bottom of the slug is good practice. Once submerged, allow the data logger temperature to equilibrate with groundwater prior to initiating the test (up to 30 minutes).

While the data logger temperature equilibrates, secure the slug to an adequate length of disposable string or rope and hang in the well to a depth just above the water surface. Mark the string/rope to accommodate the slug length and tie off. Using the rugged reader or field computer, set up a new test (logarithmic mode or sub-second recording interval) in the data logger supplied software and start the test. Indicate in the file name the type of test and test number (e.g., rising or falling head; test 1 or 2). Once logging is initiated, quickly and smoothly lower the slug (slug-in or falling head test) to the submerged depth and tie off the string/rope (displacement should be instantaneous). Monitor the data logger data until the water level has returned to near-static level. Stop the falling head test.

Without moving the slug or data logger, set up a new test in the data logger supplied software with the same settings and indicate in the file name the type of test being performed (rising head or slug out). Start the test and once the data logger is running, instantaneously lift the slug and tie off the string/rope to its pre-test position (just above static). Monitor the data being recorded by the data logger and stop the test when the water level has returned to near-static.

b. Pneumatic Slug

If a high formation k is anticipated, solid slug removal is found to be too slow to capture well recovery, or to minimize equipment decontamination for wells with submerged screens, a pneumatic slug assembly should be utilized.

Open air release valve, secure pneumatic slug assembly to well casing and tighten coupling to provide an air tight seal. Insert the data logger/cable and deploy to the target submergence depth [it is generally best to keep the data logger shallow (~1-2 feet below static water level) and use small initial displacements to avoid dynamic recovery effects in high k formations]. Close the air release valve and attach the air pump or compressor. Pressurize the well and use the pressure gauge to set initial displacement. Check for air leaks using a soapy water mixture and sprayer (assembly must be air tight). Allow the water level to return to static and remove the air pump. Using the rugged reader or field computer, set up a new test (logarithmic mode or sub-second recording interval) in the data logger supplied software and start the test. Indicate in the file name the type of test and test number (e.g., rising head; test number). Once logging is initiated, open the air release valve and monitor the test data. Stop the test when the water level has returned to near-static.

3) Test Monitoring and Guidelines - The following are general guidelines for slug testing performance as published by Midwest Geosciences Group in "Field Guide for Slug Testing and Data Analysis:"

- Conduct at least three or more tests per well and if possible conduct both rising and falling head test data.
- Use two or more initial displacement values (2 slug sizes or air pressures applied) that vary by an order of magnitude or more.
- Final slug test initial displacement should be nearly equivalent to the first test's displacement.
- Allow tests to run until near-static conditions are achieved (+/- 5% of static)
- Digital slug test data files collected with the data loggers and/or EDGE files should be backed up to either a thumb drive, corporate email server, and/or corporate file server immediately after collection.

4) Test Data Reduction and Processing - Prior to slug test analyses, digital data logger files should be normalized so that multiple tests conducted on the same test well can be compared for the assessment of test validity and well conditions. Reducing the data as follows:

- From each raw data file, estimate the time of test initiation and the head (depth or pressure) under static conditions.

- In each slug test data file, subtract the time of test initiation from the elapsed time and save to a new field (normalized time or test time; start of test should be time zero).
- In each slug test data file, subtract the static pressure head from the test period pressure head values and save to a new field (deviation from static).
- To normalize the deviation from static values, divide that field by the displacement expected based upon the slug volume or air pressure head applied.
- Create a graphical plot of the normalized head data versus test time for each test performed on the test well. Review the data plots and confirm that the testing data for each repeat test roughly concur. Also confirm that the actual and expected initial displacements are nearly equal.
- If repeat testing data and/or expected versus actual initial displacements vary widely, review well completion details and testing methods prior to performing further analysis (step 5 below) as the results may not be valid (e.g., the well screen interval may be poorly developed or fouled, the data logger may have moved or placed too deep in the well, slug was removed too slowly). The well may need to be retested.

5) Test Data Analysis - For the purposes of this standard operating procedural document, it is assumed that slug test analysis software will be used to apply standard solution methods to the testing data. Various computer programs are available, such as AQTESOLV Professional. Choose an appropriate test solution method by considering the following well configurations (in AQTESOLV, use the Solution Expert):

   a. Submerged Screen and/or Confined Aquifer Well - If the well screen fully penetrates the intersecting aquifer, utilize the Cooper et al. Model or Hvorslev Model and analyze the curve match and/or best fit. If well is partially penetrating a confined formation, utilize the KGS Model or Hvorslev Model. If well screen is submerged in an unconfined formation, utilize the KGS Model or Bouwer and Rice Model.

b. Water-Table Intersects Well Screen - If the well screen is intersected by the water table, utilize the Bouwer and Rice Model (double straight line effect) or KGS Model.

c. Rapid Well Recovery in High k Formations - If well response to displacement is extremely rapid and normalized head plots display an oscillatory or concave-downward form, utilize the Butler and Zhan Model (most comprehensive solution available) or High-k Hvorslev Model for confined wells, or the High-k Bouwer and Rice Model.

9.5 Limitations

In general, results of slug test data analyses provide an initial estimate of formation k and have a small scale of relevance (particularly in high k settings). Slug tests can be strongly affected by the degree of well development and can be used diagnostically to assess the degree of well development. In most cases, slug testing should be performed on several wells in an area of interest to develop an understanding of the formation characteristics (e.g., heterogeneous or homogeneous formations).

10.0 PUMP TEST PROCEDURES

10.1 Materials and Equipment Necessary for Task Completion

Water-level (data) loggers (transducers) capable of recording pressure and/or depth at sub-second time intervals (preferably a vented logger capable of advanced logging modes for at least the pumping well); vented, direct-read cables of sufficient length (with dessicant packs); interface tape/probe or water-level meter; well pump (preferably a submersible pump), drop pipe and layflat or comparable discharge line of sufficient length, totalizing flow meter (recommended) and 5 gallon bucket, stop watch, rain gauge or nearby weather station; materials needed to monitor surface water bodies near the test site (e.g., staff gauge, weir, stakes, data logger, camera with permission from refinery personnel); traffic cones and/or barricades, deionized or distilled water and Alconox®; decontamination bucket and brush; laptop computer or rugged reader; portable generator or other power supply appropriate for the submersible pump; and containment (e.g., frac tank) or activated carbon filtration for the temporary staging or filtering of discharge water.

10.2 Decontamination Requirements

Equipment utilized during pumping tests must be thoroughly decontaminated with Alconox® and deionized/distilled water prior to and between uses at each test well to prevent cross contamination between wells. Any groundwater removed from the tested well must be containerized and either treated (filtered as appropriate) and discharged to ground surface, or disposed of in an approved manner, preferably in a properly installed, onsite holding tank. If LNAPL is encountered/recovered, it should be containerized and properly disposed of on or off-site.

10.3 Methodology for Pump Testing

10.3.1 Pre-test Considerations

In general, pumping tests are performed to estimate large-scale in-situ hydraulic properties of water-bearing strata in the subsurface (i.e., transmissivity and storativity) and average out local-scale heterogeneity that can limit the applicability of smaller-scale testing methods, such as slug tests. The geographical area influenced by a pumping test will be determined by the hydraulic properties of the strata being tested (including hydraulic properties of other strata supplying recharge to the pumped formation), boundary conditions, and on the duration of the test.

Pumping tests are also commonly performed to generate drawdown data from which hydraulic boundary conditions, hydraulic flow regime (e.g., anisotropy), and aquifer type (i.e., unconfined or confined, leaky confined) may be estimated. Smaller-scale pumping tests may also be utilized to address pumping efficiency and/or signal to noise ratio (pumping rate) at the pumping well, or to assist in remedial system design. However at this scale, the assumptions of some data analysis methods may not be applicable and should be considered prior to testing.

Appropriate design of a pumping test should include review of site-specific information regarding the geology and hydrogeology of the test area. Pumping test design should also consider the goal(s) of the test (i.e., scale of application of derived aquifer properties, identification of boundary influences, sources of recharge, well efficiency). This should include review of available lithologic well logs or test boring logs, geologic maps, cross sections, structure contour maps, isopach maps, and any other available information so that a conceptual model relating geologic units to hydrostratigraphic units or water-bearing strata can be developed. Additional pre-test considerations should include identification of any potential positive or negative hydraulic barriers, tidal effects, and/or influence from other wells that may be pumping in the test area. Without sufficient knowledge of factors influencing water-levels and hydrology of the test area, test results could be misinterpreted.

Often times, budget considerations and/or time limitations will necessitate the use of an existing monitoring well as the pumping well and/or existing wells as observation points. While this is generally acceptable, the wells must be screened appropriately with respect to the goals of the test and knowledge of well construction is critical to applying test solutions. Wells should also be redeveloped prior to testing if they are relatively old or if records of sufficient well development at the time of installation are not readily available.

Pumping tests can be divided into two general classifications: step-drawdown tests and constant rate tests. Step tests typically involve pumping a well at progressively higher rates or “steps” at intervals of one or two hours per step (typically up to 3 steps). They are often used to estimate the yield a well will sustain during a constant rate pumping test and to evaluate well efficiency (frictional head losses between the screen/gravel pack and the formation). Constant rate pumping tests are used primarily to evaluate hydraulic properties of water-bearing strata for design of groundwater treatment systems and/or water supply purposes (e.g., groundwater allocation). Where budgets permit, the best pumping test approach is to first perform a step-drawdown test on the pumping well to evaluate well efficiency and sustainable yield (and to gauge whether or not the pumping well needs additional development), allow recovery to near-static conditions, and then initiate a constant rate test.

The test duration is subject to goals of the test and to budget considerations. Optimally, a constant rate test should be run until all drawdowns have stabilized or boundary conditions are identified, and gravity drainage effects are curtailed; however, this is seldom practical due to time limitations. In most instances, an 8 hour constant rate test will be adequate, and a 24 hour test will be sufficient for higher sensitivity sites. Occasionally a 72 hour pumping test is warranted, though this is usually reserved for large scale water supply work. If there are any unexplained water level anomalies observed toward the scheduled end of a test, the test should be continued if at all possible.

The approximate test flow rate needs to be determined in advance for proper pump and discharge design selection, and sizing of discharge containment. If it is not appropriate to perform a step test, sustainable yield can be estimated from slug test data or a brief (<30 minutes) pumping episode the day before the actual test. Generally, it is best to pump the test well at a rate that maximizes the signal to noise ratio (a higher pumping rate does not influence test scale and should not be used as a means to shorten the test duration).

If testing must be performed in an area where contamination is known to be present, careful consideration of the impacts of the test scale should be considered prior to testing so that the spread of subsurface contamination is not increased. If floating product (LNAPL) is present at or near the pumping well, drawdown should be limited so as to not impact uncontaminated soils below the static water table (i.e., create a “smear” zone or allow for the significant migration of free-phase product). Discharge water must be either 1) treated prior to discharge or 2) containerized for on or off-site disposal. If it is to be discharged directly on-site and allowed to infiltrate, it must be routed sufficiently far enough from the test area as to avoid any artificial recharge effects. All appropriate withdrawal and discharge permits must be obtained and complied with. If discharge water is to be treated on-site, proper contaminant loading calculations for the test flow rate, approximate contaminant loading and test duration must be performed in advance to insure treatment is sufficient. Any on-site treatment should also include at least one discharge effluent sample analysis by an approved laboratory to document treatment effectiveness.

10.3.2 Pre-Test Water Level Monitoring

Water-level conditions in the test area should be monitored for at least one week prior to initiation of testing to identify background trends and factors influencing groundwater levels in the test area. Data loggers should be deployed in all wells to be utilized in the pumping test and set to record depth or pressure at a resolution that is high enough to identify any potential trends (generally a 15 minute recording interval is sufficient for background monitoring). A manual water level should be measured with a water-level meter or interface probe and referenced to the top of casing mark to calibrate the data logger data at the time of deployment and at sufficient intervals throughout the recording period to validate the data and provide backup data in the event that a data logger was to fail.

Ideally, groundwater levels should be static prior to starting a pumping test so that pumping influences alone can be readily evaluated. Any significant precipitation events within the previous several days (documented through use of a site rain gauge or nearby weather station) will usually result in noticeable water level changes. If there are any major water level changes observed that cannot be explained prior to testing, additional investigation into possible area influences (e.g., local well pumping or construction de-watering) should be conducted.

10.3.3 Pumping Test Set Up

Prior to starting the test, all well measuring points (i.e. top of casing) should be clearly marked and preferably surveyed to the nearest 0.01 feet in elevation. The horizontal distance between all wells utilized should be measured and illustrated on a base map. If there are any surface water bodies in the vicinity, a staff gauge (or similar measuring device) should be set up and surveyed to evaluate possible test influences on water levels or stream flow.

The preferred pump to be used for a pumping test is a submersible centrifugal pump powered by either existing site power or a portable generator. These pumps are not explosion proof, so a conductivity probe must be tied into the pump controls to alleviate any possibility of product coming into contact with the pump (if product is anticipated). If the test pump is designed to pump total fluids (e.g. air operated double diaphragm pump, jack pump, etc.) discharge must either be containerized, or treatment must include an oil/water separator to handle any floating product. The submersible pump should be set deep enough to maintain flow during the test period or at a maximum of just above the screened interval, using a handling line to support the pump's weight [**NOTE:** extreme care must be taken that the power cord is neither bearing any of the pumps weight, nor damaged during installation due to the potential for severe electric shock]. A check valve (or two check valves) should be installed above the pump in the discharge line to prevent backflow into the well after testing.

Discharge piping from the pump should include a flow meter (preferably with totalizer), followed by a flow adjustment valve. The flow meter should be installed in a straight section of hard piping of sufficient length to avoid meter distortion caused by turbulence (typically about 10 pipe diameters on either side of the meter). In low-flow pumping tests, flow rate can be calculated by measuring the exact time required to fill a known-sized container (bucket and stop watch) several times throughout the testing period. The bucket and stop watch method of estimating flow should also be used to back up and check the flow meter data.

Precise and frequent water-level measurements (to the nearest 0.01 feet) and time denotations before, during, and after pumping tests are critical to achieving accurate test results. In terms of prioritization, data loggers should be utilized in at least the pumping well and observation wells closest to the pumping well. Wells further from the pumping well may be manually monitored, due to the reduced likelihood that early-time drawdown will be critical at distal locations. Back-up manual measurements should be collected at least hourly during the first 8 hours of the test, and then at least every 3 hours, to verify data logger measurements. Readings from the transducers are not completely reliable until they have been submerged for at least 30 minutes (sensor equilibration period). All field personnel should have watches with a second hand, and they should all be calibrated to the same time. Liquid level measurements should be obtained using an optical oil/water interface probe with a graduated measuring tape to 0.01 foot accuracy for those wells with floating product. For wells without product, a water-level meter may be sufficient. All non-dedicated probes must be properly decontaminated after each level reading to prevent any possibility of cross- contamination between wells.

Data loggers should be deployed in each selected well to a depth that will maintain submergence through the test period. Data loggers selected should be capable of being submerged to that anticipated depth (typically noted on the instrument body). The transducer cable should be secured at the wellhead (manufacturer supplied hangers, well caps, or electrical tape/cable ties) to minimize any movement of the sensor. Care must be taken that the transducer cable is not damaged from rough edges at the well head, and that no vehicles run over the cable. The data logger installed in the pumping well will need to be installed at a depth that will maintain submergence through the test, but also remain clear of the submersible pump (and pump noise if possible). In addition, wells with floating product may require an inner PVC stilling well surrounding the data logger cable to prevent damage from contact with the product. A stilling well may also eliminate the need for any water-level corrections for product thickness.

10.3.4 Running the Test

Once the data loggers have been deployed and secured, tests should be set up in each device and each device either started or “future” started to begin logging when the pump is turned on. The data logger in the pumping well should be set to logarithmic logging mode to capture sub-second data during the early portion of the test. If possible, the pump discharge control valve should be have been pre-set (based on the step test or mini pump test) to the desired flow rate prior to turning on the pump. However, depending on the test pumps performance curves, minor flow rate adjustments are generally needed during the first hour or two of the test to correct for the additional lift required by the pump due to increasing drawdown. In addition, movement of the discharge hose after the test has been started should be avoided, since any change in the elevation of the discharge will affect the pumping rate. All changes in flow rate should be recorded and time stamped.

A minimum of two field personnel are needed to run a pumping test, with additional personnel required for tests with multiple observations wells or additional complexity. One person should be designated to turn on the pump, monitor and adjust flow rate, maintain discharge and treatment, maintain the generator, etc. The second person should be responsible for data logger management and manual water-level measurements. As a rule of thumb regarding the frequency of manual well gauging, one measurement every half minute during the first 5 to 10 minutes, followed by one measurement every 3 to 5 minutes during the first hour, one measurement every 10 to 20 minutes for the second hour, and one hourly measurement thereafter is acceptable.

Throughout the test, data loggers should be downloaded in real time through use of direct-read, vented cables (or non-vented with a barometric logger for compensation) to monitor water-level conditions. It is essential that some data reduction be accomplished in the field, so that major water level trends are recognized during the test. At a minimum, drawdown trends from the pumping well and two of the nearest monitoring wells need to be semi-log plotted against time so that deviations indicative of boundary conditions can be discerned before pumping is ceased. This will allow decisions to be made about whether the test should run longer than planned.

Generally, water quality samples are collected during a pumping test for laboratory analysis of constituents of concern. These are generally collected after the first hour of pumping and just prior to pump shutdown. If the test is of more than 24 hours duration, it is advisable to collect additional samples during the testing period. All groundwater samples should be collected following Evergreen Field Procedures.

10.3.5 Post-test Recovery

At the conclusion of the test, water level recovery data should be collected until near-static conditions are re-established. This requires the installation of a check valve in the discharge line above the submersible pump to prevent backflow. The recovery data has the advantage in that there are no variations in the curve produced due to variations in pumping rate and is independent of test length. In water-table aquifers, however, the effects of formation de-watering can cause the recovery trends to be substantially different from drawdown trends. Consequently, recovery (residual drawdown) data should be used in conjunction with drawdown data where possible.

10.3.6 Data Analysis

The data collected during pumping tests are analyzed to estimate aquifer hydraulic properties, such as transmissivity, conductivity, and storage. Data collected by transducers must be downloaded and transformed (dimensionless drawdown or displacement from static) prior to analysis. Analysis typically involves curve matching of site data to type curves established in literature for particular flow regimes. Curve matching is commonly performed utilizing computer software, such as HydroSOLV's AQTESOLV program, along with diagnostic methods and derivative analysis to best estimate aquifer properties through identification of flow regimes and conditions.

It is noted that the mathematical solutions used in pumping test analysis include many assumptions that must be considered in the context of each test area (e.g., the formation is of uniform thickness and of infinite areal extent). In addition, some of the values incorporated into typical pumping test solutions are not actually measured, but are educated estimates (e.g., porosity based on lithology, etc.). Many problems associated with pumping test data evaluation are due to not recognizing, and/or correcting for, deviations from the theoretical solution employed. Some of the more common analytical errors occur due to: partial well penetration effects, formation de-watering effects, casing storage effects, poor pumping well efficiency and/or the application of incorrect equations or units. Consequently, a thorough understanding of the underlying assumptions inherent to the solution employed is required before the validity of the results can be trusted.

APPENDIX D
SITE SPECIFIC HEALTH AND SAFETY PLAN
(electronic only)

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

APPENDIX E
SOIL BORING LOGS

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

PROJECT: **Philadelphia Refinery**
LOCATION: **AOI-8**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE NO:

BH-16-059 PAGE 1 OF 1

Aquaterra Technologies, Inc.

DRILLING / INSTALLATION:
STARTED **8/11/16** COMPLETED: **9/15/16**
DRILLING COMPANY: **All State**
DRILLING EQUIPMENT: **HydroVac**
DRILLING METHOD: **HydroVac**
SAMPLING EQUIPMENT: **Hand Auger**

NORTHING (ft):
LAT:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
STATIC DTW (ft): **Not Encountered**
WELL CASING DIA. (in): **---**
LOGGED BY: **LM**

EASTING (ft):
LONG:
TOC ELEV (ft):
WELL DEPTH (ft): **---**
BOREHOLE DEPTH (ft): **8.0**
BOREHOLE DIA. (in): **12**
CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			GRAVELLY SILT ; black and brownish tan; Fill (slag).		08:00 BH-16-059 -0-2 -20160811			0.7	
			GRAVELLY SAND ; brown to light tan; fine to medium-grained; rounded; Fill.		BH-16-059@ 2-4'			1.1	
5			**SILTY GRAVEL AND SAND** ; brownish tan and black; fine to coarse-grained; Fill.		BH-16-059@ 4-6'			3.0	5
			SANDY SILT ; black and brown; Fill.		15:30 BH-16-059 -6-8 -20160915			16	
			Refusal at 8 feet. Borehole terminated at 8 feet.						
10									10
15									15
20									20
25									25
30									30
35									35

PROJECT: **Philadelphia Refinery** LOCATION: **AOI-8** PROJECT NUMBER:	WELL / PROBEHOLE / BOREHOLE NO: **BH-16-060** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **8/11/16** COMPLETED: **9/16/16** DRILLING COMPANY: **All State** DRILLING EQUIPMENT: **HydroVac** DRILLING METHOD: **HydroVac** SAMPLING EQUIPMENT: **Hand Auger**	NORTHING (ft): EASTING (ft): LAT: LONG: GROUND ELEV (ft): TOC ELEV (ft): INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **---** STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **6.0** WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **12** LOGGED BY: **LM** CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			GRAVELLY SILT ; black and brownish red; Fill.		10:00 BH-16-060 0-2 -20160811			2.0	
			SANDY SILT WITH GRAVEL ; black and gray; Fill (metallic slag).		BH-16-060@ 2-4'			4.6	
5			**GRAVELLY CLAY WITH SAND** ; moist; Multicolored (white, brown, gray, black)		10:00 BH-16-060 4-6 -20160916			44	5
			Borehole terminated at 6 feet.						
10									10
15									15
20									20
25									25
30									30
35									35

PROJECT: **Philadelphia Refinery** LOCATION: **AOI-8** PROJECT NUMBER:	WELL / PROBEHOLE / BOREHOLE NO: **BH-16-061** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **8/11/16** COMPLETED: **9/16/16** DRILLING COMPANY: **All State** DRILLING EQUIPMENT: **HydroVac** DRILLING METHOD: **HydroVac** SAMPLING EQUIPMENT: **Hand Auger**	NORTHING (ft): LAT: GROUND ELEV (ft): INITIAL DTW (ft): **Not Encountered** STATIC DTW (ft): **Not Encountered** WELL CASING DIA. (in): **---** LOGGED BY: **LM**
	EASTING (ft): LONG: TOC ELEV (ft): WELL DEPTH (ft): **---** BOREHOLE DEPTH (ft): **6.0** BOREHOLE DIA. (in): **12** CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			CLAYEY SILT ; Fill. Multicolored (orange, red, black, brown)		12:00 BH-16-061 -0-2 -20160811			93	
			SILTY GRAVEL WITH SAND ; Fill (slag) Multicolored (black, brown, orange, red)		BH-16-061@ 2-4'			62	
5			**GRAVELLY CLAY WITH SILT** ; Multicolored (brown, black, dark gray)		12;00 BH-16-061 -0-2 -20160916			73	5
			Borehole terminated at 6 feet.						
10									10
15									15
20									20
25									25
30									30
35									35

PROJECT: **Philadelphia Refinery**
LOCATION: **AOI-8**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE NO:

BH-16-078

DRILLING / INSTALLATION:
STARTED **10/18/16** COMPLETED: **10/18/16**
DRILLING COMPANY: **Aquaterra**
DRILLING EQUIPMENT: **Hand Auger**
DRILLING METHOD: **Hand Auger**
SAMPLING EQUIPMENT: **Hand Auger**

NORTHING (ft):
LAT:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
STATIC DTW (ft): **Not Encountered**
WELL CASING DIA. (in): **---**
LOGGED BY: **LM**

EASTING (ft):
LONG:
TOC ELEV (ft):
WELL DEPTH (ft): **---**
BOREHOLE DEPTH (ft): **2.0**
BOREHOLE DIA. (in): **2**
CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			SILT SOME GRAVEL ; black and brownish tan; loose; rounded		13:30 BH-16-078 -0-2 -20161018			9.5	
			Borehole terminated at 2 feet.						
5									5
10									10
15									15
20									20
25									25
30									30
35									35

PROJECT: **Philadelphia Refinery** LOCATION: **AOI-8** PROJECT NUMBER:	WELL / PROBEHOLE / BOREHOLE NO: **BH-16-079** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **10/18/16** COMPLETED: **10/18/16** DRILLING COMPANY: **Aquaterra** DRILLING EQUIPMENT: **Hand Auger** DRILLING METHOD: **Hand Auger** SAMPLING EQUIPMENT: **Hand Auger**	NORTHING (ft): EASTING (ft): LAT: LONG: GROUND ELEV (ft): TOC ELEV (ft): INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **---** STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **2.0** WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **2** LOGGED BY: **LM** CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			SILT ; tan and yellow; soft; rounded		14:00 BH-16-079 -0-2 -20161018			0.9	
			SILTY SAND ; brown and black; hard						
			Borehole terminated at 2 feet.						
5									5
10									10
15									15
20									20
25									25
30									30
35									35

GEO FORM 304 2016-07_PHL_AOI8_SOIL BORINGS.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 11/15/16

PROJECT: **Philadelphia Refinery** LOCATION: **AOI-8** PROJECT NUMBER:	WELL / PROBEHOLE / BOREHOLE NO: **BH-16-080** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **10/18/16** COMPLETED: **10/18/16** DRILLING COMPANY: **Aquaterra** DRILLING EQUIPMENT: **Hand Auger** DRILLING METHOD: **Hand Auger** SAMPLING EQUIPMENT: **Hand Auger**	NORTHING (ft): LAT: GROUND ELEV (ft): INITIAL DTW (ft): **Not Encountered** STATIC DTW (ft): **Not Encountered** WELL CASING DIA. (in): **---** LOGGED BY: **LM**
	EASTING (ft): LONG: TOC ELEV (ft): WELL DEPTH (ft): **---** BOREHOLE DEPTH (ft): **2.0** BOREHOLE DIA. (in): **2** CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			SILT ; tan and yellow; soft		14:30 BH-16-080 -0-2 -20161018			0.8	
			SILT WITH FINE GRAVEL ; red and brown						
			Borehole terminated at 2 feet.						
5									5
10									10
15									15
20									20
25									25
30									30
35									35

PROJECT: **Philadelphia Refinery**	WELL / PROBEHOLE / BOREHOLE NO:
LOCATION: **AOI-8**	**BH-16-082** PAGE 1 OF 1
PROJECT NUMBER:	

DRILLING / INSTALLATION:	NORTHING (ft):	EASTING (ft):
STARTED **10/28/16** COMPLETED: **10/28/16**	LAT:	LONG:
DRILLING COMPANY: **Aquaterra**	GROUND ELEV (ft):	TOC ELEV (ft):
DRILLING EQUIPMENT: **Hand Auger**	INITIAL DTW (ft): **Not Encountered**	WELL DEPTH (ft): **---**
DRILLING METHOD: **Hand Auger**	STATIC DTW (ft): **Not Encountered**	BOREHOLE DEPTH (ft): **2.0**
SAMPLING EQUIPMENT: **Hand Auger**	WELL CASING DIA. (in): **---**	BOREHOLE DIA. (in): **2**
	LOGGED BY: **LM**	CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			SILT AND GRAVEL ; dark brown; weak cementation		08:00 BH-16-082 -0-2 -20161028			0.1	
			Borehole terminated at 2 feet.						
5									5
10									10
15									15
20									20
25									25
30									30
35									35

GEO FORM 304 2016-07_PHL_AOI8_SOIL BORINGS.GPJ STANTEC ENVIRO TEMPLATE 010509.GDT 5/9/17

PROJECT: **Philadelphia Refinery** LOCATION: **AOI-8** PROJECT NUMBER:	WELL / PROBEHOLE / BOREHOLE NO: **BH-16-083** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **3/28/17** COMPLETED: **3/28/17** DRILLING COMPANY: **Aquaterra** DRILLING EQUIPMENT: **Hand Auger** DRILLING METHOD: **Hand Auger** SAMPLING EQUIPMENT: **Hand Auger**	NORTHING (ft): EASTING (ft): LAT: LONG: GROUND ELEV (ft): TOC ELEV (ft): INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **---** STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **2.0** WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): **2** LOGGED BY: **LM** CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)
			GRAVELLY SILT ; dark brownish and blackish; medium to coarse-grained		1345 BH-16-083 -0-2 -20170328			0.1	
			Borehole terminated at 2 feet.						
5									5
10									10
15									15
20									20
25									25
30									30
35									35

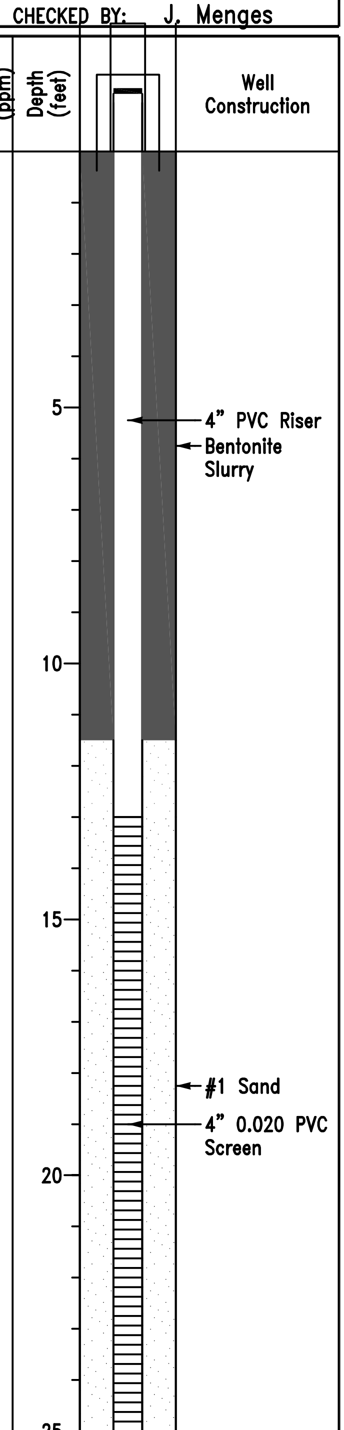
PROJECT: Philadelphia Refinery Complex
LOCATION: AOI–8 Point Breeze North Yard, Philadelphia, PA
PROJECT NUMBER: 213402435

WELL / PROBEHOLE / BOREHOLE NO: N–146
PAGE 1 OF 1

DRILLING: STARTED 11/5/13 COMPLETED: 11/8/13
INSTALLATION: STARTED COMPLETED:
DRILLING COMPANY: Total Quality Drilling
DRILLING EQUIPMENT: Mobil B57
DRILLING METHOD: Hollow Stem Auger
SAMPLING EQUIPMENT: Hand Auger/Split Spoon

NORTHING (ft): 227726 EASTING (ft): 2682830
LATITUDE: LONGITUDE:
GROUND ELEV (ft): 22.775 TOC ELEV (ft): 26.31
INITIAL DTW (ft): ~21 BOREHOLE DEPTH (ft): 26
STATIC DTW (ft): ~16 WELL DEPTH (ft): 26
WELL CASING DIAMETER (in): 4 BOREHOLE DIAMETER (in): 12
LOGGED BY: J. DeBoer CHECKED BY: J. Menges

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (ppm)
0–1			0'–2' – FILL, gray, medium sand and gravel, moist		1300 AOI–8–N–146 0–2			
1								0.0
2			2'–10' – FILL, black and brown, fine sand and clay, some rounded gravel		-- --			1.1
3								
4					-- --			3.8
5								
6			6'–8' – Moist to wet		-- --			1.6
7								
8					-- --			0.0
9			9.5'–10' – Brick			0.7	4 8 9 26	
10			10'–21' – FILL, white and black to brown, fine to medium sand and clay, sand is flaked mica, very light, moist, likely "clay-like" material for tank dike		-- --			0.0
11						1.2	6 6 6 6	
12					-- --			25
13						1.2	3 3 5 6	
14					-- --			38
15						2	5 6 9 9	
16								
17					1415 AOI–8–N–146 17–18	2	4 5 4 4	55
18								
19					-- -- -- --	NM	3 4 5 5	51
20								0.0
21			21'–25' – FILL, dark gray clay, sand and gravel, wet			NM	4 8 9 8	
22					-- --			0.0
23						NM	3 5 5 7	
24			Glass fragment at 24'		-- --			0.0
25			Auger refusal and wood fragment at 25' Brick fragment at 25.5'			NM	4 49 30 49	
26			Borehole terminated at 26 feet Notes: Hydroexcavated to 8 feet NM – Not Measured					
27								
28								
29								



PROJECT: **Philadelphia Refinery**
LOCATION: **AOI-8**
PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE NO: **N-154** PAGE 1 OF 1

Aquaterra Technologies, Inc.

DRILLING / INSTALLATION:
STARTED **7/11/16** COMPLETED: **8/8/16**
DRILLING COMPANY: **Parratt Wolff**
DRILLING EQUIPMENT: **HSA**
DRILLING METHOD: **HSA**
SAMPLING EQUIPMENT: **Split Spoon**

NORTHING (ft):
LAT:
GROUND ELEV (ft):
INITIAL DTW (ft): **Not Encountered**
STATIC DTW (ft): **Not Encountered**
WELL CASING DIA. (in): **4**
LOGGED BY: **LM/SS**

EASTING (ft):
LONG:
TOC ELEV (ft):
WELL DEPTH (ft): **14.0**
BOREHOLE DEPTH (ft): **14.0**
BOREHOLE DIA. (in): **8**
CHECKED BY: **MS**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
			Fill (slag). Utilities cleared to a depth of 8' bgs.		10:00 N-154 -0-2 -20160711			0.2		0-8' bgs: Bentonite/Grout
			SILTY CLAY ; brown to dark brown; Fill.							
			CLAYEY SILT WITH GRAVEL ; brown to dark brown; Fill.		N-154@ 2-4'			2.3		
5			**CLAYEY SILT WITH GRAVEL** ; angular; Multicolored (orange, white, gray). Fill.		N-154@ 4-6'			4.0	5	
			CLAYEY SILT AND GRAVEL ; wet; Multicolored (tan, gray, white, orange, black). Fill (timbers).		N-154@ 6-8'			218		
			CLAY ; orange and gray; slightly moist; Fill.		N-154@ 8-10'	1	WOH WOH 4 3	0.4		8-14' bgs: Sand
10			**SILT AND GRAVEL TRACE CLAY** ; black and dark gray; slightly moist; Fill.						10	9-14' bgs: PVC Screen
			SAND AND SILT AND CLAY ; black; high plasticity; wet; Fill (wood, brick). Pliable. Visible dark LNAPL.		14:25 N-154 -10-12 -20160808	1.67	5 11 15 11	0.9		
			SANDY CLAY ; gray and dark gray; moist to wet		N-154@ 12-14'	1	3 9 10 7	0.4		
			Borehole terminated at 14 feet.							
15									15	
20									20	
25									25	
30									30	
35									35	

APPENDIX F
LIST OF CONSTITUENTS OF CONCERN

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

Evergreen Comprehensive List (June 2016)

VOCs by EPA Method 8260	CAS No.
Benzene	71-43-2
Butylbenzene, sec-	135-98-8
Butylbenzene, tert-	98-06-6
Cumene	98-82-8
Cyclohexane	110-82-7
Dichloroethane, 1,2-	107-06-2
Ethylbenzene	100-41-4
Ethylene Dibromide*	106-93-4
Hexane	110-54-3
Methyl tert butyl ether	1634-04-4
Toluene	108-88-3
Trimethylbenzene, 1,2,4-	95-63-6
Trimethylbenzene, 1,3,5-	108-67-8
Xylenes	1330-20-7

Metals by Method 6010/6020	CAS No.
Cobalt ***	7440-48-4
Lead***	7439-92-1
Nickel***	7440-02-0
Vanadium***	7440-62-2
Zinc***	7440-66-6

SVOCs by EPA Method 8270	CAS No.
Acenaphthene	83-32-9
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluroranthene	205-99-2
Benzo(g,h,i)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Biphenyl, 1,1-	92-52-4
Bis(2-ethylhexyl) phthalate	117-81-7
Chrysene	218-01-9
Cresol, m- (3-methylphenol)	108-39-4
Cresol, o- (2-methylphenol)	95-48-7
Cresol, p- (4-methylphenol)	106-44-5
Dibenz(a,h)anthracene	53-70-3
Diethyl phthalate	84-66-2
Dimethylphenol, 2,4-	105-67-9
Dibutyl phthalate, n-	84-74-2
Dinitrophenol, 2,4-	51-28-5
Fluoranthene	206-44-0
Fluorene	86-73-7
Indeno(1,2,3-cd)pyrene	193-39-5
Methylnaphthalene, 2-	91-57-6
Naphthalene**	91-20-3
Nitrophenol, 4-	100-02-7
Phenanthrene	85-01-8
Phenol	108-95-2
Pyrene	129-00-0
Pyridine	110-86-1
Quinoline	91-22-5

*Ethylene Dibromide (EDB) should be analyzed by Method 8011 instead of 8260 in soil for tank investigations and in **all groundwater samples**. EDB in all trip blank samples should be analyzed by 8260 regardless of method used for primary samples.

**Naphthalene should be analyzed by EPA Method 8260 instead of 8270 for tank investigations.

***Metals analysis should be total in soil and dissolved in groundwater.

This list is generated from the PADEP SERO Crude Oil Parameters for Corrective Action (CDB|SERO|PADEP|9 Aug 2013) combined with PADEP Short List of Petroleum Products (leaded and unleaded gasoline and No. 1, 2, 4, 5, 6 Fuel Oils).

APPENDIX G
SOIL LABORATORY ANALYTICAL RESPORTS
(electronic only)

SITE CHARACTERIZATION REPORT
FOR ABOVEGROUND STORAGE TANK PB 663

Philadelphia Refining Complex, Point Breeze Refinery
3144 Passyunk Avenue, Philadelphia, Pennsylvania

Stantec

ANALYTICAL RESULTS

Prepared for:

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341
484-875-3075

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 898750. Samples arrived at the laboratory on Friday, June 04, 2004. The PO# for this group is PHILA. REFINERY.

Client Description	Lancaster Labs Number
663 AREA-1 Grab Soil Sample	4287056
663 AREA-2 Grab Soil Sample	4287057
663 AREA-3 Grab Soil Sample	4287058
663 AREA-4 Grab Soil Sample	4287059
Trip Blank Methanol Sample	4287060

1 COPY TO Secor International, Inc. Attn: Sergio Morescalchi

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Questions? Contact your Client Services Representative
Sandra L Patton at (717) 656-2300.

Respectfully Submitted,

Dana M Kauffman

Dana M. Kauffman
Group Leader

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. SW 4287056

663 AREA-1 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 11:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663A1

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	25.6	0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.					
08181	BTEX/Naphthalene					
08183	Benzene	71-43-2	N.D.	57.	ug/kg	530
08189	Naphthalene	91-20-3	7,800.	280.	ug/kg	530
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system. Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.					
07804	PAHs in Soil by GC/MS					
01195	Pyrene	129-00-0	110,000.	4,500.	ug/kg	10
03768	Fluorene	86-73-7	26,000.	450.	ug/kg	1
03775	Phenanthrene	85-01-8	150,000.	4,500.	ug/kg	10
03776	Anthracene	120-12-7	38,000.	450.	ug/kg	1
03781	Benzo(a)anthracene	56-55-3	67,000.	4,500.	ug/kg	10
03782	Chrysene	218-01-9	52,000.	450.	ug/kg	1
03786	Benzo(b)fluoranthene	205-99-2	80,000.	4,500.	ug/kg	10
03788	Benzo(a)pyrene	50-32-8	56,000.	4,500.	ug/kg	10
03791	Benzo(g,h,i)perylene	191-24-2	40,000.	450.	ug/kg	1
	Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.					

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 03:48	Stephanie A Selis	530
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 11:09	Susan L Scheuering	1
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/09/2004 10:39	Susan L Scheuering	10

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. SW 4287056

663 AREA-1 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 11:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663A1

06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:00	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

Lancaster Laboratories **Analysis Report**

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Lancaster Laboratories Sample No. SW 4287057

663 AREA-2 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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Suite 200
Exton PA 19341

663A2

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	28.3		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		100.	ug/kg	918
08189	Naphthalene	91-20-3	31,000.		510.	ug/kg	918
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system. Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	50,000.		2,300.	ug/kg	5
03768	Fluorene	86-73-7	29,000.		2,300.	ug/kg	5
03775	Phenanthrene	85-01-8	99,000.		2,300.	ug/kg	5
03776	Anthracene	120-12-7	15,000.	J	2,300.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	27,000.		2,300.	ug/kg	5
03782	Chrysene	218-01-9	24,000.		2,300.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	32,000.		2,300.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	26,000.		2,300.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	23,000.	J	2,300.	ug/kg	5

Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax 717-656-2681 • www.lancasterlabs.com

Lancaster Laboratories Sample No. SW 4287057

663 AREA-2 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:10 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

663A2

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 03:11	Stephanie A Selis	918
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 11:53	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:03	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287058

663 AREA-3 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:30 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
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Suite 200
Exton PA 19341

663A3

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	25.6		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		57.	ug/kg	526
08189	Naphthalene	91-20-3	8,100.		280.	ug/kg	526
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. The reporting limits were raised because sample dilution was necessary to bring target compounds into the calibration range of the system. Poor surrogate recoveries were observed for this sample due to the dilution needed to perform the analysis.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	N.D.		2,200.	ug/kg	5
03768	Fluorene	86-73-7	5,900.	J	2,200.	ug/kg	5
03775	Phenanthrene	85-01-8	14,000.	J	2,200.	ug/kg	5
03776	Anthracene	120-12-7	N.D.		2,200.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	4,100.	J	2,200.	ug/kg	5
03782	Chrysene	218-01-9	5,600.	J	2,200.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	6,700.	J	2,200.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	6,000.	J	2,200.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	6,500.	J	2,200.	ug/kg	5

The GC/MS semivolatile surrogate recoveries were outside of QC limits. The analysis was repeated and surrogate recoveries were again outside of QC limits, indicating a matrix effect.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

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Analysis Report

Lancaster Laboratories Sample No. SW 4287058

663 AREA-3 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:30 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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663A3

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 02:33	Stephanie A Selis	526
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 12:08	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:01	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287059

663 AREA-4 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

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Suite 200
Exton PA 19341

663A4

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
00111	Moisture	n.a.	10.9		0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						
08181	BTEX/Naphthalene						
08183	Benzene	71-43-2	N.D.		1.9	ug/kg	21.3
08189	Naphthalene	91-20-3	N.D.		110.	ug/kg	21.3
	The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately. Due to the presence of an interferent near its retention time, the normal reporting limit was not attained for naphthalene. The presence or concentration of this compound cannot be determined due to the presence of this interferent.						
07804	PAHs in Soil by GC/MS						
01195	Pyrene	129-00-0	18,000.	J	1,900.	ug/kg	5
03768	Fluorene	86-73-7	N.D.		1,900.	ug/kg	5
03775	Phenanthrene	85-01-8	N.D.		1,900.	ug/kg	5
03776	Anthracene	120-12-7	N.D.		1,900.	ug/kg	5
03781	Benzo(a)anthracene	56-55-3	3,800.	J	1,900.	ug/kg	5
03782	Chrysene	218-01-9	10,000.	J	1,900.	ug/kg	5
03786	Benzo(b)fluoranthene	205-99-2	4,400.	J	1,900.	ug/kg	5
03788	Benzo(a)pyrene	50-32-8	5,200.	J	1,900.	ug/kg	5
03791	Benzo(g,h,i)perylene	191-24-2	6,000.	J	1,900.	ug/kg	5

Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor

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Analysis Report

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Lancaster Laboratories Sample No. SW 4287059

663 AREA-4 Grab Soil Sample
Sunoco Philadelphia Refinery

Collected:06/04/2004 12:50 by SM

Account Number: 11183

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

Secor International, Inc.
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Exton PA 19341

663A4

00111	Moisture	EPA 160.3 modified	1	06/07/2004 18:02	Scott W Freisher	1
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 04:26	Stephanie A Selis	21.3
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	06/08/2004 12:23	Susan L Scheuering	5
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:04	Medina A Long	n.a.
07806	BNA Soil Extraction	SW-846 3550B	1	06/07/2004 09:00	Olivia Arosemena	1

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Analysis Report

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Lancaster Laboratories Sample No. G5 4287060

Trip Blank Methanol Sample
Sunoco Philadelphia Refinery

Collected: n.a.

Submitted: 06/04/2004 18:10
Reported: 06/17/2004 at 14:07
Discard: 07/18/2004

TB663

Account Number: 11183

Secor International, Inc.
102 Pickering Way
Suite 200
Exton PA 19341

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Units	Dilution Factor
08181	BTEX/Naphthalene					
08183	Benzene	71-43-2	N.D.	2.0	ug/kg	25
08189	Naphthalene	91-20-3	N.D.	10.	ug/kg	25

The analysis for volatiles was performed on a sample which was preserved in methanol. The reporting limits were adjusted appropriately.

Commonwealth of Pennsylvania Lab Certification No. 36-037

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
08181	BTEX/Naphthalene	SW-846 8021B	1	06/11/2004 11:15	Martha L Seidel	25
06169	Field Preserved MeOH Dept 25	SW-846 5035	1	06/05/2004 14:02	Medina A Long	n.a.

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Quality Control Summary

Client Name: Secor International, Inc. Group Number: 898750
Reported: 06/17/04 at 02:07 PM

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 04157SLA026	Sample number(s): 4287056-4287059							
Pyrene	N.D.	33.	ug/kg	99		71-110		
Fluorene	N.D.	33.	ug/kg	108		66-115		
Phenanthrene	N.D.	33.	ug/kg	101		70-107		
Anthracene	N.D.	33.	ug/kg	98		71-107		
Benzo(a)anthracene	N.D.	33.	ug/kg	89		74-107		
Chrysene	N.D.	33.	ug/kg	88		72-109		
Benzo(b)fluoranthene	N.D.	33.	ug/kg	97		71-113		
Benzo(a)pyrene	N.D.	33.	ug/kg	99		79-113		
Benzo(g,h,i)perylene	N.D.	33.	ug/kg	107		74-119		
Batch number: 04159820003A	Sample number(s): 4287056-4287059							
Moisture				99		99-101		
Batch number: 04161A31C	Sample number(s): 4287056-4287059							
Benzene	N.D.	2.0	ug/kg	102	102	86-113	0	30
Naphthalene	N.D.	10.	ug/kg	96	96	70-125	0	30
Batch number: 04161A31D	Sample number(s): 4287060							
Benzene	N.D.	2.0	ug/kg	102	102	86-113	0	30
Naphthalene	N.D.	10.	ug/kg	96	96	70-125	0	30

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 04157SLA026	Sample number(s): 4287056-4287059								
Pyrene	(2)	(2)	28-144	16	30				
Fluorene	(2)	(2)	39-137	15	30				
Phenanthrene	(2)	(2)	29-143	19	30				
Anthracene	(2)	(2)	35-138	24	30				
Benzo(a)anthracene	(2)	(2)	26-144	17	30				
Chrysene	(2)	(2)	23-150	27	30				
Benzo(b)fluoranthene	(2)	(2)	32-140	19	30				
Benzo(a)pyrene	(2)	(2)	23-154	26	30				
Benzo(g,h,i)perylene	(2)	(2)	17-152	32*	30				
Batch number: 04159820003A	Sample number(s): 4287056-4287059								
Moisture						17.0	18.5	9	15

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Quality Control Summary

Client Name: Secor International, Inc.
Reported: 06/17/04 at 02:07 PM

Group Number: 898750

Surrogate Quality Control

Analysis Name: PAHs in Soil by GC/MS
Batch number: 04157SLA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
4287056	117	96	103
4287057	116	111	132
4287058	92	97	117
4287059	123	109	109
Blank	96	95	106
LCS	96	98	103
MS	116	96	93
MSD	114	97	94
Limits:	47-128	55-123	49-133

Analysis Name: BTEX/Naphthalene
Batch number: 04161A31C

	Trifluorotoluene-P
4287056	5*
4287057	3*
4287058	5*
4287059	99
Blank	110
LCS	107
LCSD	107
Limits:	72-122

Analysis Name: BTEX/Naphthalene
Batch number: 04161A31D

	Trifluorotoluene-P
4287060	107
Blank	107
LCS	107
LCSD	107
Limits:	72-122

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Analysis Request / Environmental Services Chain of Custody

Lancaster Laboratories
Where quality is a science.

For Lancaster Laboratories use only
Acct. # 11183 Group# 898700 Sample # 4287056-60

COC # 0056395

Please print. Instructions on reverse side correspond with circled numbers.

1
Client: SECOR Acct. #:
Project Name/#: SUNOCO 663 AREA PWSID #:
Project Manager: S. MORESCALCHI P.O.#:
Sampler: S. MORESCALCHI Quote #:
Name of state where samples were collected: PA

2 3 4 5

Analyses Requested

For Lab Use Only
FSC:
SCR #: 1191028

6

Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	PADEP Fuel Oil 4,5,6	SPLP-HOLD Fuel Oil 4,5,6	Remarks
663 AREA-1	06-04-04	1150	✓		✓			4	✓		0011040 - HOLD SPLP
663 AREA-2	↓	1210	✓		✓			4	✓		0011041 - ↓ ↓
663 AREA-3	↓	1230	✓		✓			4	✓		0011042 - ↓ ↓
663 AREA-4	↓	1250	✓		✓			4	✓		011014 - ↓ ↓
TRIP BLANK							✓	1	✓		

7 **Turnaround Time Requested** (TAT) (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.) P7
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

8 **Data Package Options** (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No
Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

9

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	6/2/04	1610	[signature]	6/3/04	8:40
[signature]	6/3/04	1440			
[signature]	6/4/04	1705	R. Kindig	6/4/04	1705
R. Kindig	6/4/04	1810			
			Jessica B[signature]	6/4/04	1810

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2425 New Holland Pike • Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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ANALYTICAL RESULTS

Prepared by:	Prepared for:
Eurofins Lancaster Laboratories 2425 New Holland Pike Lancaster, PA 17601	Stantec 1060 Andrew Drive Suite 140 West Chester PA 19380

May 28, 2013

Project: PES - Philly

Submittal Date: 05/15/2013
Group Number: 1390120
PO Number: 213402269
State of Sample Origin: PA

Client Sample Description	Lancaster Labs (LLI) #
666-PE-1(0.5-1.0) Grab Soil Sample	7057322
666-PE-2(0.25-0.75) Grab Soil Sample	7057323
666-PE-3(0.25-0.75) Grab Soil Sample	7057324
666-PE-4(0.25-0.75) Grab Soil Sample	7057325
666-PE-5(0.25-0.75) Grab Soil Sample	7057326
666-PE-6(0.25-0.75) Grab Soil Sample	7057327
666-PE-7(0.25-0.75) Grab Soil Sample	7057328
666-PE-8(0.25-0.75) Grab Soil Sample	7057329

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO   Stantec   Attn: Jennifer Menges

Respectfully Submitted,

Amek Carter

Amek Carter
Specialist

(717) 556-7252

eurofins Lancaster Laboratories

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Analysis Report

Sample Description: 666-PE-1(0.5-1.0) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057322
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 08:55 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

Stantec
1060 Andrew Drive
Suite 140
West Chester PA 19380

666P1

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**		**mg/kg**	
10237	Benzene	71-43-2	0.001	J	0.0006	1.12
10237	1,2-Dibromoethane	106-93-4	N.D.		0.001	1.12
10237	1,2-Dichloroethane	107-06-2	N.D.		0.001	1.12
10237	Ethylbenzene	100-41-4	N.D.		0.001	1.12
10237	Isopropylbenzene	98-82-8	N.D.		0.001	1.12
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.0006	1.12
10237	Naphthalene	91-20-3	N.D.		0.001	1.12
10237	Toluene	108-88-3	0.008		0.001	1.12
10237	1,2,4-Trimethylbenzene	95-63-6	N.D.		0.001	1.12
10237	1,3,5-Trimethylbenzene	108-67-8	N.D.		0.001	1.12
10237	Xylene (Total)	1330-20-7	N.D.		0.001	1.12

The recovery for the sample internal standard is outside the QC acceptance limits. The following corrective action was taken: The sample was re-analyzed and the QC is again outside of the acceptance limits, indicating a matrix effect. The data is reported from the initial trial.

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**		**mg/kg**	
10724	Anthracene	120-12-7	0.78		0.073	10
10724	Benzo(a)anthracene	56-55-3	3.0		0.073	10
10724	Benzo(a)pyrene	50-32-8	2.2		0.073	10
10724	Benzo(b)fluoranthene	205-99-2	3.2		0.073	10
10724	Benzo(g,h,i)perylene	191-24-2	1.3		0.073	10
10724	Chrysene	218-01-9	3.2		0.073	10
10724	Fluorene	86-73-7	0.20	J	0.073	10
10724	Phenanthrene	85-01-8	3.3		0.073	10
10724	Pyrene	129-00-0	4.7		0.073	10

Reporting limits were raised due to interference from the sample matrix.

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
Metals	**SW-846 6010B**		**mg/kg**		**mg/kg**	
06955	Lead	7439-92-1	636		0.495	1
Wet Chemistry	**SM 2540 G-1997**		**%**		**%**	
00111	Moisture	n.a.	8.7		0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor

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Analysis Report

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Sample Description: 666-PE-1(0.5-1.0) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057322
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 08:55 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131372AA	05/18/2013 07:53	Stephanie A Selis	1.12
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 08:55	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 08:55	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 08:55	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 00:23	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:17	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

Sample Description: 666-PE-2(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057323
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:00 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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666P2

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	N.D.	0.0005	0.97
10237	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.97
10237	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.97
10237	Ethylbenzene	100-41-4	N.D.	0.001	0.97
10237	Isopropylbenzene	98-82-8	N.D.	0.001	0.97
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.97
10237	Naphthalene	91-20-3	N.D.	0.001	0.97
10237	Toluene	108-88-3	N.D.	0.001	0.97
10237	1,2,4-Trimethylbenzene	95-63-6	N.D.	0.001	0.97
10237	1,3,5-Trimethylbenzene	108-67-8	N.D.	0.001	0.97
10237	Xylene (Total)	1330-20-7	N.D.	0.001	0.97

The recovery for the sample internal standard is outside the QC acceptance limits. The following corrective action was taken: The sample was re-analyzed and the QC is again outside of the acceptance limits, indicating a matrix effect. The data is reported from the initial trial.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**	**mg/kg**	
10724	Anthracene	120-12-7	0.48	0.017	1
10724	Benzo(a)anthracene	56-55-3	1.6	0.017	1
10724	Benzo(a)pyrene	50-32-8	1.6	0.017	1
10724	Benzo(b)fluoranthene	205-99-2	1.8	0.017	1
10724	Benzo(g,h,i)perylene	191-24-2	1.1	0.017	1
10724	Chrysene	218-01-9	1.6	0.017	1
10724	Fluorene	86-73-7	0.11	0.017	1
10724	Phenanthrene	85-01-8	1.6	0.017	1
10724	Pyrene	129-00-0	2.3	0.017	1

Reporting limits were raised due to interference from the sample matrix.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06955	Lead	7439-92-1	687	0.480	1
Wet Chemistry	**SM 2540 G-1997**		**%**	**%**	
00111	Moisture	n.a.	4.1	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor

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Analysis Report

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Sample Description: 666-PE-2(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057323
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:00 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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666P2

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131372AA	05/18/2013 08:16	Stephanie A Selis	0.97
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:00	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 01:44	Holly Berry	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:29	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

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Sample Description: 666-PE-3(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057324
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:05 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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666P3

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	0.0005 J	0.0005	0.94
10237	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.94
10237	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.94
10237	Ethylbenzene	100-41-4	N.D.	0.001	0.94
10237	Isopropylbenzene	98-82-8	N.D.	0.001	0.94
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.94
10237	Naphthalene	91-20-3	0.004 J	0.001	0.94
10237	Toluene	108-88-3	0.003 J	0.001	0.94
10237	1,2,4-Trimethylbenzene	95-63-6	0.004 J	0.001	0.94
10237	1,3,5-Trimethylbenzene	108-67-8	0.002 J	0.001	0.94
10237	Xylene (Total)	1330-20-7	0.003 J	0.001	0.94

The recovery for the sample internal standard is outside the QC acceptance limits. The following corrective action was taken: The sample was re-analyzed and the QC is again outside of the acceptance limits, indicating a matrix effect. The data is reported from the initial trial.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**	**mg/kg**	
10724	Anthracene	120-12-7	2.8	0.035	10
10724	Benzo(a)anthracene	56-55-3	8.6	0.035	10
10724	Benzo(a)pyrene	50-32-8	4.5	0.035	10
10724	Benzo(b)fluoranthene	205-99-2	4.9	0.035	10
10724	Benzo(g,h,i)perylene	191-24-2	2.1	0.035	10
10724	Chrysene	218-01-9	13	0.035	10
10724	Fluorene	86-73-7	0.86	0.035	10
10724	Phenanthrene	85-01-8	12	0.035	10
10724	Pyrene	129-00-0	12	0.035	10
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	2.29	0.335	1
06955	Lead	7439-92-1	198	0.477	1
Wet Chemistry	**SM 2540 G-1997**		**%**	**%**	
00111	Moisture	n.a.	4.3	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor

Sample Description: 666-PE-3(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057324
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:05 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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West Chester PA 19380

666P3

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131372AA	05/18/2013 08:38	Stephanie A Selis	0.94
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:05	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:05	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:05	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 02:10	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06935	Arsenic	SW-846 6010B	1	131435708004	05/24/2013 13:33	Joanne M Gates	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:33	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

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Sample Description: 666-PE-4(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057325
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:10 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

Stantec
1060 Andrew Drive
Suite 140
West Chester PA 19380

666P4

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**		**mg/kg**	
10237	Benzene	71-43-2	N.D.		0.0005	0.93
10237	1,2-Dibromoethane	106-93-4	N.D.		0.001	0.93
10237	1,2-Dichloroethane	107-06-2	N.D.		0.001	0.93
10237	Ethylbenzene	100-41-4	N.D.		0.001	0.93
10237	Isopropylbenzene	98-82-8	N.D.		0.001	0.93
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.0005	0.93
10237	Naphthalene	91-20-3	N.D.		0.001	0.93
10237	Toluene	108-88-3	N.D.		0.001	0.93
10237	1,2,4-Trimethylbenzene	95-63-6	N.D.		0.001	0.93
10237	1,3,5-Trimethylbenzene	108-67-8	N.D.		0.001	0.93
10237	Xylene (Total)	1330-20-7	N.D.		0.001	0.93
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**		**mg/kg**	
10724	Anthracene	120-12-7	N.D.		0.069	10
10724	Benzo(a)anthracene	56-55-3	0.25	J	0.069	10
10724	Benzo(a)pyrene	50-32-8	0.55		0.069	10
10724	Benzo(b)fluoranthene	205-99-2	0.44		0.069	10
10724	Benzo(g,h,i)perylene	191-24-2	0.48		0.069	10
10724	Chrysene	218-01-9	0.66		0.069	10
10724	Fluorene	86-73-7	N.D.		0.069	10
10724	Phenanthrene	85-01-8	0.27	J	0.069	10
10724	Pyrene	129-00-0	0.64		0.069	10
	Reporting limits were raised due to interference from the sample matrix.					
Metals	**SW-846 6010B**		**mg/kg**		**mg/kg**	
06955	Lead	7439-92-1	107		0.482	1
Wet Chemistry	**SM 2540 G-1997**		**%**		**%**	
00111	Moisture	n.a.	3.4		0.50	1
	Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131372AA	05/18/2013 09:01	Stephanie A Selis	0.93
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:10	Client Supplied	1

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Analysis Report

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Sample Description: 666-PE-4(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057325
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:10 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

Stantec
1060 Andrew Drive
Suite 140
West Chester PA 19380

666P4

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:10	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:10	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 02:36	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:37	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

Sample Description: 666-PE-5(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057326
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:15 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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666P5

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	0.001 J	0.0005	0.87
10237	1,2-Dibromoethane	106-93-4	N.D.	0.0009	0.87
10237	1,2-Dichloroethane	107-06-2	N.D.	0.0009	0.87
10237	Ethylbenzene	100-41-4	0.006	0.0009	0.87
10237	Isopropylbenzene	98-82-8	N.D.	0.0009	0.87
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.87
10237	Naphthalene	91-20-3	0.040	0.0009	0.87
10237	Toluene	108-88-3	0.013	0.0009	0.87
10237	1,2,4-Trimethylbenzene	95-63-6	0.22	0.0009	0.87
10237	1,3,5-Trimethylbenzene	108-67-8	0.13	0.0009	0.87
10237	Xylene (Total)	1330-20-7	0.048	0.0009	0.87

The recovery for the sample internal standard is outside the QC acceptance limits. The following corrective action was taken: The sample was re-analyzed and the QC is again outside of the acceptance limits, indicating a matrix effect. The data is reported from the initial trial.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**	**mg/kg**	
10724	Anthracene	120-12-7	0.60	0.036	10
10724	Benzo(a)anthracene	56-55-3	4.5	0.036	10
10724	Benzo(a)pyrene	50-32-8	2.1	0.036	10
10724	Benzo(b)fluoranthene	205-99-2	1.4	0.036	10
10724	Benzo(g,h,i)perylene	191-24-2	0.94	0.036	10
10724	Chrysene	218-01-9	8.8	0.036	10
10724	Fluorene	86-73-7	0.47	0.036	10
10724	Phenanthrene	85-01-8	3.0	0.036	10
10724	Pyrene	129-00-0	4.8	0.036	10
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06955	Lead	7439-92-1	26.0	0.499	1
Wet Chemistry	**SM 2540 G-1997**		**%**	**%**	
00111	Moisture	n.a.	6.7	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor

Sample Description: 666-PE-5(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057326
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:15 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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Suite 140
West Chester PA 19380

666P5

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131372AA	05/18/2013 09:23	Stephanie A Selis	0.87
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:15	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 03:02	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:41	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Sample Description: 666-PE-6(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057327
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:20 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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666P6

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles		**SW-846 8260B**	**mg/kg**		**mg/kg**	
10237	Benzene	71-43-2	0.023		0.0005	0.92
10237	1,2-Dibromoethane	106-93-4	N.D.		0.001	0.92
10237	1,2-Dichloroethane	107-06-2	N.D.		0.001	0.92
10237	Ethylbenzene	100-41-4	0.26		0.001	0.92
10237	Isopropylbenzene	98-82-8	0.021		0.001	0.92
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.0005	0.92
10237	Naphthalene	91-20-3	0.97		0.049	45.37
10237	Toluene	108-88-3	0.21	J	0.049	45.37
10237	1,2,4-Trimethylbenzene	95-63-6	2.2		0.049	45.37
10237	1,3,5-Trimethylbenzene	108-67-8	0.95		0.049	45.37
10237	Xylene (Total)	1330-20-7	1.8		0.049	45.37

The recovery for the sample internal standard is outside the QC acceptance limits. The following corrective action was taken: The sample was re-analyzed and the QC is again outside of the acceptance limits, indicating a matrix effect. The data is reported from the initial trial.

The concentration reported for toluene is estimated since it exceeds the calibration range of the instrument when determined by the low level method, but is less than the quantitation limit when determined by the high level method. The result reported is from the high level determination.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles		**SW-846 8270C**	**mg/kg**	**mg/kg**	
10724	Anthracene	120-12-7	3.6	0.072	10
10724	Benzo(a)anthracene	56-55-3	29	0.072	10
10724	Benzo(a)pyrene	50-32-8	12	0.072	10
10724	Benzo(b)fluoranthene	205-99-2	7.7	0.072	10
10724	Benzo(g,h,i)perylene	191-24-2	3.5	0.072	10
10724	Chrysene	218-01-9	52	0.072	10
10724	Fluorene	86-73-7	3.6	0.072	10
10724	Phenanthrene	85-01-8	24	0.072	10
10724	Pyrene	129-00-0	25	0.072	10

Reporting limits were raised due to interference from the sample matrix.

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Metals		**SW-846 6010B**	**mg/kg**	**mg/kg**	
06955	Lead	7439-92-1	311	0.486	1
Wet Chemistry		**SM 2540 G-1997**	**%**	**%**	
00111	Moisture	n.a.	7.0	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

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Analysis Report

Sample Description: 666-PE-6(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057327
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:20 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	X131411AA	05/21/2013 08:35	Stephanie A Selis	0.92
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	R131421AA	05/22/2013 13:43	Stephanie A Selis	45.37
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:20	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:20	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:20	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 03:28	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:45	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Sample Description: 666-PE-7(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057328
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:25 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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1060 Andrew Drive
Suite 140
West Chester PA 19380

666P7

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles		**SW-846 8260B**	**mg/kg**		**mg/kg**	
10237	Benzene	71-43-2	0.0006	J	0.0005	0.83
10237	1,2-Dibromoethane	106-93-4	N.D.		0.0009	0.83
10237	1,2-Dichloroethane	107-06-2	N.D.		0.0009	0.83
10237	Ethylbenzene	100-41-4	N.D.		0.0009	0.83
10237	Isopropylbenzene	98-82-8	N.D.		0.0009	0.83
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.0005	0.83
10237	Naphthalene	91-20-3	N.D.		0.0009	0.83
10237	Toluene	108-88-3	0.003	J	0.0009	0.83
10237	1,2,4-Trimethylbenzene	95-63-6	N.D.		0.0009	0.83
10237	1,3,5-Trimethylbenzene	108-67-8	N.D.		0.0009	0.83
10237	Xylene (Total)	1330-20-7	N.D.		0.0009	0.83
GC/MS Semivolatiles		**SW-846 8270C**	**mg/kg**		**mg/kg**	
10724	Anthracene	120-12-7	0.57		0.037	10
10724	Benzo(a)anthracene	56-55-3	2.0		0.037	10
10724	Benzo(a)pyrene	50-32-8	2.0		0.037	10
10724	Benzo(b)fluoranthene	205-99-2	2.5		0.037	10
10724	Benzo(g,h,i)perylene	191-24-2	1.3		0.037	10
10724	Chrysene	218-01-9	2.0		0.037	10
10724	Fluorene	86-73-7	0.14	J	0.037	10
10724	Phenanthrene	85-01-8	2.2		0.037	10
10724	Pyrene	129-00-0	2.9		0.037	10
Metals		**SW-846 6010B**	**mg/kg**		**mg/kg**	
06955	Lead	7439-92-1	2,200		2.56	5
Wet Chemistry		**SM 2540 G-1997**	**%**		**%**	
00111	Moisture	n.a.	9.9		0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	A131441AA	05/24/2013 08:33	Stephanie A Selis	0.83
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:25	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:25	Client Supplied	1

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Analysis Report

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Sample Description: 666-PE-7(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057328
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:25 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

Stantec
1060 Andrew Drive
Suite 140
West Chester PA 19380

666P7

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:25	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 03:56	Holly Berry	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06955	Lead	SW-846 6010B	1	131435708004	05/26/2013 18:06	Tara L Snyder	5
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

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Analysis Report

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Sample Description: 666-PE-8(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057329
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:30 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

Stantec
1060 Andrew Drive
Suite 140
West Chester PA 19380

666P8

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	0.0005 J	0.0005	0.95
10237	1,2-Dibromoethane	106-93-4	N.D.	0.001	0.95
10237	1,2-Dichloroethane	107-06-2	N.D.	0.001	0.95
10237	Ethylbenzene	100-41-4	N.D.	0.001	0.95
10237	Isopropylbenzene	98-82-8	N.D.	0.001	0.95
10237	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.0005	0.95
10237	Naphthalene	91-20-3	N.D.	0.001	0.95
10237	Toluene	108-88-3	N.D.	0.001	0.95
10237	1,2,4-Trimethylbenzene	95-63-6	N.D.	0.001	0.95
10237	1,3,5-Trimethylbenzene	108-67-8	N.D.	0.001	0.95
10237	Xylene (Total)	1330-20-7	N.D.	0.001	0.95
GC/MS Semivolatiles	**SW-846 8270C**		**mg/kg**	**mg/kg**	
10724	Anthracene	120-12-7	0.059	0.003	1
10724	Benzo(a)anthracene	56-55-3	0.19	0.003	1
10724	Benzo(a)pyrene	50-32-8	0.20	0.003	1
10724	Benzo(b)fluoranthene	205-99-2	0.25	0.003	1
10724	Benzo(g,h,i)perylene	191-24-2	0.14	0.003	1
10724	Chrysene	218-01-9	0.24	0.003	1
10724	Fluorene	86-73-7	0.009 J	0.003	1
10724	Phenanthrene	85-01-8	0.15	0.003	1
10724	Pyrene	129-00-0	0.29	0.003	1
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	N.D.	1.65	5
	Reporting limits were raised due to interference from the sample matrix.				
06955	Lead	7439-92-1	110	0.470	1
Wet Chemistry	**SM 2540 G-1997**		**%**	**%**	
00111	Moisture	n.a.	3.9	0.50	1
	Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.				

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/14

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	UST 8260 Leaded/Unleaded +TMBs	SW-846 8260B	1	X131411AA	05/21/2013 07:49	Stephanie A Selis	0.95
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201313531066	05/14/2013 09:30	Client Supplied	1

Sample Description: 666-PE-8(0.25-0.75) Grab Soil Sample
PES - Philly

LLI Sample # SW 7057329
LLI Group # 1390120
Account # 11289

Project Name: PES - Philly

Collected: 05/14/2013 09:30 by PM

Submitted: 05/15/2013 16:20
Reported: 05/28/2013 13:21

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Suite 140
West Chester PA 19380

666P8

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
02392	L/H Field Preserved Bisulfate	SW-846 5035A	1	201313531066	05/14/2013 09:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035A	2	201313531066	05/14/2013 09:30	Client Supplied	1
10724	PA #4, #5, #6 Fueil Oil PAHs	SW-846 8270C	1	13136SLF026	05/22/2013 04:22	Holly Berry	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	13136SLF026	05/16/2013 14:00	David S Schrum	1
06935	Arsenic	SW-846 6010B	1	131435708004	05/26/2013 18:10	Tara L Snyder	5
06955	Lead	SW-846 6010B	1	131435708004	05/24/2013 13:53	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	131435708004	05/23/2013 23:23	Annamaria Stipkovits	1
00111	Moisture	SM 2540 G-1997	1	13137820003A	05/17/2013 23:02	Scott W Freisher	1

Quality Control Summary

Client Name: Stantec   Group Number: 1390120
Reported: 05/28/13 at 01:21 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: A131372AA	Sample number(s): 7057322-7057326							
Benzene	N.D.	0.0005	mg/kg	96	97	80-120	2	30
1,2-Dibromoethane	N.D.	0.001	mg/kg	93	96	80-120	3	30
1,2-Dichloroethane	N.D.	0.001	mg/kg	114	112	72-126	2	30
Ethylbenzene	N.D.	0.001	mg/kg	99	100	80-120	1	30
Isopropylbenzene	N.D.	0.001	mg/kg	99	100	76-120	1	30
Methyl Tertiary Butyl Ether	N.D.	0.0005	mg/kg	94	94	74-121	0	30
Naphthalene	N.D.	0.001	mg/kg	95	92	59-123	3	30
Toluene	N.D.	0.001	mg/kg	95	96	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	0.001	mg/kg	97	100	79-120	3	30
1,3,5-Trimethylbenzene	N.D.	0.001	mg/kg	97	99	78-120	2	30
Xylene (Total)	N.D.	0.001	mg/kg	96	98	80-120	2	30
Batch number: A131441AA	Sample number(s): 7057328							
Benzene	N.D.	0.0005	mg/kg	85	85	80-120	0	30
1,2-Dibromoethane	N.D.	0.001	mg/kg	89	87	80-120	3	30
1,2-Dichloroethane	N.D.	0.001	mg/kg	81	80	72-126	1	30
Ethylbenzene	N.D.	0.001	mg/kg	95	95	80-120	1	30
Isopropylbenzene	N.D.	0.001	mg/kg	95	95	76-120	0	30
Methyl Tertiary Butyl Ether	N.D.	0.0005	mg/kg	79	77	74-121	2	30
Naphthalene	N.D.	0.001	mg/kg	90	87	59-123	4	30
Toluene	N.D.	0.001	mg/kg	95	95	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	0.001	mg/kg	96	97	79-120	1	30
1,3,5-Trimethylbenzene	N.D.	0.001	mg/kg	96	97	78-120	1	30
Xylene (Total)	N.D.	0.001	mg/kg	96	95	80-120	0	30
Batch number: R131421AA	Sample number(s): 7057327							
Naphthalene	N.D.	0.050	mg/kg	83	82	59-123	2	30
Toluene	N.D.	0.050	mg/kg	100	103	80-120	3	30
1,2,4-Trimethylbenzene	N.D.	0.050	mg/kg	99	97	79-120	1	30
1,3,5-Trimethylbenzene	N.D.	0.050	mg/kg	99	97	78-120	2	30
Xylene (Total)	N.D.	0.050	mg/kg	98	100	80-120	2	30
Batch number: X131411AA	Sample number(s): 7057327,7057329							
Benzene	N.D.	0.0005	mg/kg	98	98	80-120	0	30
1,2-Dibromoethane	N.D.	0.001	mg/kg	99	99	80-120	1	30
1,2-Dichloroethane	N.D.	0.001	mg/kg	97	96	72-126	1	30
Ethylbenzene	N.D.	0.001	mg/kg	102	104	80-120	2	30
Isopropylbenzene	N.D.	0.001	mg/kg	103	106	76-120	2	30
Methyl Tertiary Butyl Ether	N.D.	0.0005	mg/kg	92	93	74-121	1	30
Naphthalene	N.D.	0.001	mg/kg	90	96	59-123	6	30
Toluene	N.D.	0.001	mg/kg	102	102	80-120	0	30
1,2,4-Trimethylbenzene	N.D.	0.001	mg/kg	100	108	79-120	7	30
1,3,5-Trimethylbenzene	N.D.	0.001	mg/kg	100	110	78-120	9	30

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Stantec   Group Number: 1390120
Reported: 05/28/13 at 01:21 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Xylene (Total)	N.D.	0.001	mg/kg	105	106	80-120	1	30
Batch number: 13136SLF026	Sample number(s): 7057322-7057329							
Anthracene	N.D.	0.003	mg/kg	110		82-118		
Benzo(a)anthracene	N.D.	0.003	mg/kg	100		73-123		
Benzo(a)pyrene	N.D.	0.003	mg/kg	113		80-123		
Benzo(b)fluoranthene	N.D.	0.003	mg/kg	100		76-124		
Benzo(g,h,i)perylene	N.D.	0.003	mg/kg	106		77-122		
Chrysene	N.D.	0.003	mg/kg	102		69-119		
Fluorene	N.D.	0.003	mg/kg	109		81-117		
Phenanthrene	N.D.	0.003	mg/kg	108		77-119		
Pyrene	N.D.	0.003	mg/kg	101		81-114		
Batch number: 131435708004	Sample number(s): 7057322-7057329							
Arsenic	N.D.	0.330	mg/kg	105		80-120		
Lead	N.D.	0.470	mg/kg	102		80-120		
Batch number: 13137820003A	Sample number(s): 7057322-7057329							
Moisture				100		99-101		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: A131372AA	Sample number(s): 7057322-7057326 UNSPK: P057681								
Benzene	96		55-143						
1,2-Dibromoethane	100		54-129						
1,2-Dichloroethane	118		49-150						
Ethylbenzene	96		44-141						
Isopropylbenzene	98		38-144						
Methyl Tertiary Butyl Ether	96		55-129						
Naphthalene	81		10-138						
Toluene	92		50-146						
1,2,4-Trimethylbenzene	93		37-149						
1,3,5-Trimethylbenzene	93		38-150						
Xylene (Total)	94		44-136						
Batch number: A131441AA	Sample number(s): 7057328 UNSPK: P067327								
Benzene	85		55-143						
1,2-Dibromoethane	94		54-129						
1,2-Dichloroethane	78		49-150						
Ethylbenzene	93		44-141						
Isopropylbenzene	82		38-144						
Methyl Tertiary Butyl Ether	80		55-129						
Naphthalene	58		10-138						
Toluene	102		50-146						
1,2,4-Trimethylbenzene	139		37-149						
1,3,5-Trimethylbenzene	124		38-150						
Xylene (Total)	102		44-136						

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Stantec Group Number: 1390120
Reported: 05/28/13 at 01:21 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: X131411AA	Sample number(s): 7057327,7057329 UNSPK: P057501								
Benzene	97		55-143						
1,2-Dibromoethane	96		54-129						
1,2-Dichloroethane	95		49-150						
Ethylbenzene	106		44-141						
Isopropylbenzene	107		38-144						
Methyl Tertiary Butyl Ether	88		55-129						
Naphthalene	87		10-138						
Toluene	100		50-146						
1,2,4-Trimethylbenzene	105		37-149						
1,3,5-Trimethylbenzene	111		38-150						
Xylene (Total)	108		44-136						
Batch number: 13136SLF026	Sample number(s): 7057322-7057329 UNSPK: 7057322								
Anthracene	72	99	41-142	21	30				
Benzo(a)anthracene	29*	94	32-150	29	30				
Benzo(a)pyrene	77	137	33-145	26	30				
Benzo(b)fluoranthene	20*	121	29-150	41*	30				
Benzo(g,h,i)perylene	74	116	48-134	25	30				
Chrysene	44	121	33-142	30	30				
Fluorene	88	99	55-128	10	30				
Phenanthrene	22*	92	34-147	29	30				
Pyrene	1*	94	29-148	30	30				
Batch number: 131435708004	Sample number(s): 7057322-7057329 UNSPK: P065387 BKG: P065387								
Arsenic	86	85	75-125	2	20	1.98	N.D.	200* (1)	20
Lead	-189 (2)	-342 (2)	75-125	9	20	287	283	1	20
Batch number: 13137820003A	Sample number(s): 7057322-7057329 BKG: P057231								
Moisture						9.5	8.7	9	13

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: TCL by 8260 (soil)
Batch number: A131372AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7057322	110	108	113	71
7057323	109	107	103	76
7057324	115	109	104	82
7057325	109	109	98	90
7057326	131	133	122	75
Blank	107	102	98	96
LCS	105	99	100	105
LCSD	104	101	101	103

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Stantec Group Number: 1390120
Reported: 05/28/13 at 01:21 PM

Surrogate Quality Control

MS	108	105	99	106
Limits:	50-141	54-135	52-141	50-131

Analysis Name: TCL by 8260 (soil)
Batch number: A131441AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7057328	96	106	109	86
Blank	95	102	103	94
LCS	96	99	106	98
LCSD	95	99	106	97
MS	96	104	113	90
Limits:	50-141	54-135	52-141	50-131

Analysis Name: TCL by 8260 (soil)
Batch number: X131411AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7057327	131	144*	147*	50
7057329	102	106	92	87
Blank	102	105	90	88
LCS	98	105	103	95
LCSD	100	103	102	95
MS	100	102	104	95
Limits:	50-141	54-135	52-141	50-131

Analysis Name: PAH 8270 (microwave)
Batch number: 13136SLF026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
7057322	84	90	90
7057323	96	104	103
7057324	86	94	97
7057325	89	96	109
7057326	92	95	103
7057327	82	85	103
7057328	89	96	97
7057329	96	106	107
Blank	100	98	111
LCS	105	103	110
MS	87	89	93
MSD	89	93	95
Limits:	54-124	58-121	61-137

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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For Eurofins Lancaster Laboratories use only
Acct. # 11289 Group # 1390120 Sample # 7057322-30
Instructions on reverse side correspond with circled numbers.

COC # 325049

1 Client Information

Client: Stantec	Acct. #:
Project Name/#: PES-Phila	PWSID #:
Project Manager: J. Menges	P.O. #: 213402269
Sampler: D. Miller	Quote #:
Name of state where samples were collected: PA	

4 Matrix: Sediment ☐; Soil ☒; Water: Ground ☐, Surface ☐, Potable ☐, NPDES ☐; Other: ____

5 Analysis Requested — Preservation Codes

For Lab Use Only
FSC:
SCR#:

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 O=Other

2 Sample Identification	Collected Date	Collected Time	3 Grab	Composite	Total # of Containers	PA Short List Leaded & Unleaded Gasoline	No 2, 4, 5 & 6 Fuel Oil	* Total Arsenic	6 Remarks
666-PE-1(0.5-1.0)	5-14-13	0855	X		4	X	X		
666-PE-2(0.25-0.75)	|	0900	|		|	X	X		
666-PE-3(0.25-0.75)	|	0905	|		|	X	X	X	* Added Total
666-PE-4(0.25-0.75)	|	0910	|		|	X	X		Arsenic per
666-PE-5(0.25-0.75)	|	0915	|		|	X	X		Jennifer M.
666-PE-6(0.25-0.75)	|	0920	|		|	X	X		5/16/13
666-PE-7(0.25-0.75)	|	0925	|		|	X	X		AC
666-PE-8(0.25-0.75)	|	0930	|		|	X	X	X	

7 Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)

Date results are needed: ____________

E-mail address: ____________

8 Data Package Options (circle if required)

Type I (Validation/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) TX TRRP-13
Type IV (CLP SOW) MA MCP CT RCP

Relinquished by	Date	Time	Received by	Date	Time
[signature]	5-15-13		[signature]	5/15/13	10:55
[signature]	5-15-13	1620			
			[signature]	5/15/13	1620

9

EDD Required? Yes No
If yes, format: ____________

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:
UPS ____ FedEx ____ Other ____

Temperature upon receipt 2.6 °C

Eurofins Lancaster Laboratories, Inc. • 2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300
The white copy should accompany samples to Eurofins Lancaster Laboratories. The yellow copy should be retained by the client.

Issued by Dept. 40 Management
7044.02

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the <u>limit of quantitation</u>, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

New Jersey
ACCUTEST
LABORATORIES

11/21/13

Technical Report for

Stantec Consulting Services Inc.

Sunoco, Philadelphia Refinery, Philadelphia, PA

AOI8

Accutest Job Number: JB52301

Sampling Date: 11/06/13

Report to:

Stantec

Stephanie.Andrews@stantec.com

ATTN: Stephanie Andrews

Total number of pages in report: **26**

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Nancy Cole
Laboratory Director

Client Service contact: Kristin Beebe 732-329-0200

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, IL, IN, KS, KY, LA, MA, MD, MI, MT, NC, OH VAP (CL0056), PA, RI, SC, TN, VA, WV, DoD ELAP (L-A-B L2248)

Sections:

1 2 3 4 5

Table of Contents

-1-

Sample Summary

Stantec Consulting Services Inc.

Job No: JB52301

Sunoco, Philadelphia Refinery, Philadelphia, PA
Project No: AOI8

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
JB52301-1	11/06/13	10:35	JD	11/06/13	SO	Soil	AOI-8-BH-13-64-0-2
JB52301-2	11/06/13	11:15	JD	11/06/13	SO	Soil	AOI-8-BH-13-64-2-4
JB52301-3	11/06/13	13:00	JD	11/06/13	SO	Soil	AOI-8-N-146-0-2
JB52301-4	11/06/13	14:00	JD	11/06/13	SO	Soil	AOI-8-N-146-4-6
JB52301-5	11/06/13	14:05	JD	11/06/13	SO	Soil	AOI-8-N-143-20.5-21
JB52301-6	11/06/13	14:05	JD	11/06/13	AQ	Trip Blank Soil	TB

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

CASE NARRATIVE / CONFORMANCE SUMMARY

Client:	Stantec Consulting Services Inc.	**Job No**	JB52301
Site:	Sunoco, Philadelphia Refinery, Philadelphia, PA	**Report Date**	11/21/2013 9:27:55 A

On 11/06/2013, 5 Sample(s), 1 Trip Blank(s) and 0 Field Blank(s) were received at Accutest Laboratories at a temperature of 3.5 C. Samples were intact and chemically preserved, unless noted below. An Accutest Job Number of JB52301 was assigned to the project. Laboratory sample ID, client sample ID and dates of sample collection are detailed in the report's Results Summary Section.Only 3 sampls are active for this report.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

Volatiles by GCMS By Method SW846 8260B

Matrix: AQ **Batch ID:** V2E4366

- All samples were analyzed within the recommended method holding time.
- Sample(s) JB52479-12MS, JB52479-12MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Matrix: SO **Batch ID:** VD8790

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52442-1MS, JB52442-1MSD were used as the QC samples indicated.
- JB52301-5: Dilution required due to sample matrix.

Matrix: SO **Batch ID:** VY6078

- All samples were analyzed within the recommended method holding time.
- Sample(s) JB52588-1DUP, JB52588-2MS were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Extractables by GCMS By Method SW846 8270D

Matrix: SO **Batch ID:** OP70508

- All samples were extracted within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52332-1MS, JB52332-1MSD were used as the QC samples indicated.

Volatiles by GC By Method SW846 8011

Matrix: AQ **Batch ID:** M:OP35660

- The data for SW846 8011 meets quality control requirements.
- JB52301-6: Analysis performed at Accutest Laboratories, Marlborough, MA.

Matrix: SO **Batch ID:** M:OP35676

- The data for SW846 8011 meets quality control requirements.
- JB52301-5: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3: Analysis performed at Accutest Laboratories, Marlborough, MA.

Metals By Method SW846 6010C

Matrix: SO	**Batch ID:** M:MP22077

- The data for SW846 6010C meets quality control requirements.
- JB52301-5 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-5 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-5 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-5 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-3 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52301-5 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.

Wet Chemistry By Method ASTM 4643-00

Matrix: SO	**Batch ID:** GN94734

- The data for ASTM 4643-00 meets quality control requirements.

Accutest certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting Accutest's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

Accutest Laboratories is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. Data release is authorized by Accutest Laboratories indicated via signature on the report cover

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Accutest New Jersey	**Job No**	JB52301
Site:	SECORPAE: Sunoco, Philadelphia Refinery, Philadelphia, PA	**Report Date**	11/20/2013 5:18:57 PM

2 Sample(s), 1 Trip Blank(s) were collected on 11/06/2013 and were received at Accutest on 11/06/2013 properly preserved, at 2.7 Deg. C and intact. These Samples received an Accutest job number of JB52301. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GC By Method SW846 8011

Matrix AQ **Batch ID:** OP35660

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC25769-10MS, MC25769-10MSD were used as the QC samples indicated.

Matrix SO **Batch ID:** OP35676

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52158-5MS, JB52158-5MSD were used as the QC samples indicated.

Metals By Method SW846 6010C

Matrix SO **Batch ID:** MP22077

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52158-4MS, JB52158-4MSD, JB52158-4SDL were used as the QC samples for metals.
- MP22077-SD1 for Zinc: Serial dilution indicates possible matrix interference.

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(JB52301).

Summary of Hits

Job Number: JB52301
Account: Stantec Consulting Services Inc.
Project: Sunoco, Philadelphia Refinery, Philadelphia, PA
Collected: 11/06/13

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
JB52301-3	**AOI-8-N-146-0-2**					
Anthracene		49.3	37	13	ug/kg	SW846 8270D
Benzo(a)anthracene		192	37	12	ug/kg	SW846 8270D
Benzo(a)pyrene		286	37	11	ug/kg	SW846 8270D
Benzo(b)fluoranthene		330	37	12	ug/kg	SW846 8270D
Benzo(g,h,i)perylene		525	37	14	ug/kg	SW846 8270D
Benzo(k)fluoranthene		98.7	37	14	ug/kg	SW846 8270D
Chrysene		285	37	12	ug/kg	SW846 8270D
Dibenzo(a,h)anthracene		94.6	37	13	ug/kg	SW846 8270D
Fluoranthene		317	37	16	ug/kg	SW846 8270D
Indeno(1,2,3-cd)pyrene		265	37	13	ug/kg	SW846 8270D
Phenanthrene		134	37	17	ug/kg	SW846 8270D
Pyrene		256	37	14	ug/kg	SW846 8270D
Cobalt [a]		6.8	4.7	0.044	mg/kg	SW846 6010C
Lead [a]		125	0.93	0.16	mg/kg	SW846 6010C
Nickel [a]		47.3	3.7	0.041	mg/kg	SW846 6010C
Vanadium [a]		41.4	0.93	0.12	mg/kg	SW846 6010C
Zinc [a]		190	1.9	0.15	mg/kg	SW846 6010C
JB52301-5	**AOI-8-N-143-20.5-21**					
Isopropylbenzene [b]		30.3 J	530	15	ug/kg	SW846 8260B
1,2,4-Trimethylbenzene [b]		44.0 J	530	17	ug/kg	SW846 8260B
Benzo(a)anthracene		202	36	12	ug/kg	SW846 8270D
Benzo(a)pyrene		84.5	36	11	ug/kg	SW846 8270D
Benzo(b)fluoranthene		76.1	36	12	ug/kg	SW846 8270D
Benzo(g,h,i)perylene		82.8	36	13	ug/kg	SW846 8270D
Chrysene		495	36	12	ug/kg	SW846 8270D
Dibenzo(a,h)anthracene		38.0	36	12	ug/kg	SW846 8270D
Fluorene		1030	36	12	ug/kg	SW846 8270D
Indeno(1,2,3-cd)pyrene		63.3	36	12	ug/kg	SW846 8270D
Phenanthrene		1540	36	16	ug/kg	SW846 8270D
Cobalt [a]		5.0	4.6	0.044	mg/kg	SW846 6010C
Lead [a]		5.9	0.93	0.16	mg/kg	SW846 6010C
Nickel [a]		9.3	3.7	0.041	mg/kg	SW846 6010C
Vanadium [a]		17.7	0.93	0.12	mg/kg	SW846 6010C
Zinc [a]		26.1	1.9	0.15	mg/kg	SW846 6010C

JB52301-6 **TB**

No hits reported in this sample.

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.
(b) Dilution required due to sample matrix.

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	AOI-8-N-146-0-2		
Lab Sample ID:	JB52301-3	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8260B	**Percent Solids:**	86.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Y140521.D	1	11/12/13	PS	n/a	n/a	VY6078
Run #2							

	Initial Weight
Run #1	5.9 g
Run #2	

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.98	0.12	ug/kg	
108-88-3	Toluene	ND	0.98	0.14	ug/kg	
100-41-4	Ethylbenzene	ND	0.98	0.17	ug/kg	
1330-20-7	Xylene (total)	ND	0.98	0.17	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.98	0.34	ug/kg	
135-98-8	sec-Butylbenzene	ND	4.9	0.18	ug/kg	
98-06-6	tert-Butylbenzene	ND	4.9	0.16	ug/kg	
110-82-7	Cyclohexane	ND	4.9	0.25	ug/kg	
107-06-2	1,2-Dichloroethane	ND	0.98	0.32	ug/kg	
110-54-3	Hexane	ND	4.9	0.53	ug/kg	
98-82-8	Isopropylbenzene	ND	4.9	0.14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	4.9	0.16	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	4.9	0.22	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	100%		59-130%
17060-07-0	1,2-Dichloroethane-D4	90%		65-123%
2037-26-5	Toluene-D8	105%		80-124%
460-00-4	4-Bromofluorobenzene	99%		71-132%

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-0-2		
Lab Sample ID:	JB52301-3	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	86.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2M58228.D	1	11/09/13	AD	11/08/13	OP70508	E2M2462
Run #2							

	Initial Weight	Final Volume
Run #1	31.5 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	180	62	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	740	45	ug/kg	
95-48-7	2-Methylphenol	ND	74	42	ug/kg	
	3&4-Methylphenol	ND	74	47	ug/kg	
100-02-7	4-Nitrophenol	ND	370	62	ug/kg	
108-95-2	Phenol	ND	74	39	ug/kg	
83-32-9	Acenaphthene	ND	37	11	ug/kg	
120-12-7	Anthracene	49.3	37	13	ug/kg	
56-55-3	Benzo(a)anthracene	192	37	12	ug/kg	
50-32-8	Benzo(a)pyrene	286	37	11	ug/kg	
205-99-2	Benzo(b)fluoranthene	330	37	12	ug/kg	
191-24-2	Benzo(g,h,i)perylene	525	37	14	ug/kg	
207-08-9	Benzo(k)fluoranthene	98.7	37	14	ug/kg	
92-52-4	1,1'-Biphenyl	ND	74	4.3	ug/kg	
218-01-9	Chrysene	285	37	12	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	94.6	37	13	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	74	8.2	ug/kg	
84-66-2	Diethyl phthalate	ND	74	13	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	74	32	ug/kg	
206-44-0	Fluoranthene	317	37	16	ug/kg	
86-73-7	Fluorene	ND	37	12	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	265	37	13	ug/kg	
91-57-6	2-Methylnaphthalene	ND	74	21	ug/kg	
91-20-3	Naphthalene	ND	37	10	ug/kg	
85-01-8	Phenanthrene	134	37	17	ug/kg	
129-00-0	Pyrene	256	37	14	ug/kg	
110-86-1	Pyridine	ND	74	15	ug/kg	
91-22-5	Quinoline	ND	180	35	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	96%		13-110%

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-0-2		
Lab Sample ID:	JB52301-3	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	86.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	95%		15-110%
118-79-6	2,4,6-Tribromophenol	100%		20-123%
4165-60-0	Nitrobenzene-d5	89%		10-110%
321-60-8	2-Fluorobiphenyl	97%		17-110%
1718-51-0	Terphenyl-d14	94%		30-124%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-0-2		
Lab Sample ID:	JB52301-3	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	86.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BK32014.D	1	11/13/13	AMA	11/11/13	M:OP35676	M:GBK1055
Run #2							

	Initial Weight	Final Volume
Run #1	30.5 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	2.8	1.1	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	88%		61-167%
460-00-4	Bromofluorobenzene (S)	119%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-0-2		
Lab Sample ID:	JB52301-3	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
		Percent Solids:	86.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	6.8	4.7	0.044	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	125	0.93	0.16	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	47.3	3.7	0.041	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	41.4	0.93	0.12	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	190	1.9	0.15	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16423
(2) Prep QC Batch: M:MP22077

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	AOI-8-N-143-20.5-21		
Lab Sample ID:	JB52301-5	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8260B	**Percent Solids:**	86.8
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	D215243.D	1	11/14/13	CM	n/a	n/a	VD8790
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	5.9 g	10.0 ml	100 ul
Run #2			

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	110	13	ug/kg	
108-88-3	Toluene	ND	110	15	ug/kg	
100-41-4	Ethylbenzene	ND	110	18	ug/kg	
1330-20-7	Xylene (total)	ND	110	19	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	110	36	ug/kg	
135-98-8	sec-Butylbenzene	ND	530	19	ug/kg	
98-06-6	tert-Butylbenzene	ND	530	17	ug/kg	
110-82-7	Cyclohexane	ND	530	27	ug/kg	
107-06-2	1,2-Dichloroethane	ND	110	34	ug/kg	
110-54-3	Hexane	ND	530	57	ug/kg	
98-82-8	Isopropylbenzene	30.3	530	15	ug/kg	J
95-63-6	1,2,4-Trimethylbenzene	44.0	530	17	ug/kg	J
108-67-8	1,3,5-Trimethylbenzene	ND	530	23	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	95%		59-130%
17060-07-0	1,2-Dichloroethane-D4	108%		65-123%
2037-26-5	Toluene-D8	109%		80-124%
460-00-4	4-Bromofluorobenzene	88%		71-132%

(a) Dilution required due to sample matrix.

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-143-20.5-21		
Lab Sample ID:	JB52301-5	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	86.8
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2M58229.D	1	11/09/13	AD	11/08/13	OP70508	E2M2462
Run #2							

	Initial Weight	Final Volume
Run #1	32.0 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	180	60	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	720	44	ug/kg	
95-48-7	2-Methylphenol	ND	72	41	ug/kg	
	3&4-Methylphenol	ND	72	46	ug/kg	
100-02-7	4-Nitrophenol	ND	360	61	ug/kg	
108-95-2	Phenol	ND	72	38	ug/kg	
83-32-9	Acenaphthene	ND	36	10	ug/kg	
120-12-7	Anthracene	ND	36	13	ug/kg	
56-55-3	Benzo(a)anthracene	202	36	12	ug/kg	
50-32-8	Benzo(a)pyrene	84.5	36	11	ug/kg	
205-99-2	Benzo(b)fluoranthene	76.1	36	12	ug/kg	
191-24-2	Benzo(g,h,i)perylene	82.8	36	13	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	36	14	ug/kg	
92-52-4	1,1'-Biphenyl	ND	72	4.2	ug/kg	
218-01-9	Chrysene	495	36	12	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	38.0	36	12	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	72	8.0	ug/kg	
84-66-2	Diethyl phthalate	ND	72	12	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	72	32	ug/kg	
206-44-0	Fluoranthene	ND	36	16	ug/kg	
86-73-7	Fluorene	1030	36	12	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	63.3	36	12	ug/kg	
91-57-6	2-Methylnaphthalene	ND	72	20	ug/kg	
91-20-3	Naphthalene	ND	36	9.8	ug/kg	
85-01-8	Phenanthrene	1540	36	16	ug/kg	
129-00-0	Pyrene	ND	36	14	ug/kg	
110-86-1	Pyridine	ND	72	14	ug/kg	
91-22-5	Quinoline	ND	180	34	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	88%		13-110%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-143-20.5-21		
Lab Sample ID:	JB52301-5	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	86.8
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	92%		15-110%
118-79-6	2,4,6-Tribromophenol	88%		20-123%
4165-60-0	Nitrobenzene-d5	86%		10-110%
321-60-8	2-Fluorobiphenyl	86%		17-110%
1718-51-0	Terphenyl-d14	95%		30-124%

ND = Not detected   MDL - Method Detection Limit   J = Indicates an estimated value
RL = Reporting Limit   B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range   N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-143-20.5-21		
Lab Sample ID:	JB52301-5	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	86.8
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BK32015.D	1	11/13/13	AMA	11/11/13	M:OP35676	M:GBK1055
Run #2							

	Initial Weight	Final Volume
Run #1	30.0 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	2.9	1.1	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	107%		61-167%
460-00-4	Bromofluorobenzene (S)	146%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-143-20.5-21		
Lab Sample ID:	JB52301-5	**Date Sampled:**	11/06/13
Matrix:	SO - Soil	**Date Received:**	11/06/13
		Percent Solids:	86.8
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	5.0	4.6	0.044	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	5.9	0.93	0.16	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	9.3	3.7	0.041	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	17.7	0.93	0.12	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	26.1	1.9	0.15	mg/kg	1	11/19/13	11/20/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16423
(2) Prep QC Batch: M:MP22077

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	TB		
Lab Sample ID:	JB52301-6	**Date Sampled:**	11/06/13
Matrix:	AQ - Trip Blank Soil	**Date Received:**	11/06/13
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2E96793.D	1	11/14/13	TYG	n/a	n/a	V2E4366
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.28	ug/l	
108-88-3	Toluene	ND	1.0	0.44	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.21	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.19	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.29	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.48	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.25	ug/l	
110-82-7	Cyclohexane	ND	5.0	0.18	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.22	ug/l	
110-54-3	Hexane	ND	5.0	1.1	ug/l	
98-82-8	Isopropylbenzene	ND	2.0	0.22	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	2.0	0.23	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	2.0	0.43	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	93%		79-117%
17060-07-0	1,2-Dichloroethane-D4	95%		72-123%
2037-26-5	Toluene-D8	97%		82-118%
460-00-4	4-Bromofluorobenzene	104%		75-118%

ND = Not detected   MDL - Method Detection Limit   J = Indicates an estimated value
RL = Reporting Limit   B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range   N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB		
Lab Sample ID:	JB52301-6	**Date Sampled:**	11/06/13
Matrix:	AQ - Trip Blank Soil	**Date Received:**	11/06/13
Method:	SW846 8011 SW846 8011	**Percent Solids:**	n/a
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BB52383.D	1	11/12/13	AMA	11/09/13	M:OP35660	M:GBB3070
Run #2							

	Initial Volume	Final Volume
Run #1	35.4 ml	2.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	0.015	0.011	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	113%		36-173%
460-00-4	Bromofluorobenzene (S)	103%		36-173%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

New Jersey
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Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Chain of Custody (Accutest Labs of New England, Inc.)

Accutest Laboratories Southeast
Chain of Custody

ACCUTEST LABORATORIES

4405 Vineland Road, Suite C-15 Orlando, Fl 32811
TEL. 407-425-6700 • FAX: 407-425-0707
www.accutest.com

WTB
SLL

Accutest JOB # JB52301 PAGE 1 OF ____

Accutest Quote # | SKIFF#

Client / Reporting Information

Company Name: Stantec
Address: 1060 Andrew Dr
City: West Chester State: PA Zip: 19380
Project Contact: Jennifer.Menges@Stantec.com E-mail
Phone#: 610-840-2500
Sampler(s) Name(s) (Printed): Jenny DeBoer ~~215~~ 610-209-2511, Jason Corbett

Project Information

Project Name: Sunoco Philadelphia Refinery AOI 8
Street
City State
Project #
Fax #
Client Purchase Order #

Analytical Information: V8260SL2 | V8011EDB | AB8270SL | CO, NI, PB, V, ZN

Accutest Sample #	Field ID / Point of Collection	Date	Time	Sampled By	Matrix	Total # of Bottles	Other	None	HCl	NaOH	HNO3	H2SO4	NaOH+ZnAc	DI Water	MeOH	V8260SL2	V8011EDB	AB8270SL	CO, NI, PB, V, ZN		LAB USE ONLY
1	AOI-8-BH-13-64-0-2	11/5/13	1035	JD	SO	5		2						2	1	X	X	X	X	HOLD	
2	AOI-8-BH-13-64-2-4	11/5/13	1115	JD	SO	5		2						2	1	X	X	X	X	HOLD	
3	AOI-8-BH-13-65-0-2	11/5/13	1300	JC	SO	5		2						2	1	X	X	X	X		
4	AOI-8-BH-13-65-4-6	11/5/13	1400	JC	SO	5		2						2	1	X	X	X	X	HOLD	
5	AOI-8-BH-13-65-20.5-21	11/5/13	1405	JD	SO	5		2						2	1	X	X	X	X		B9
6	TB110613	11/6/13	0800	JD	TB	~~8~~ 4			2							X	X				M44 T1
																					14E2
																					4947
																					2173

D.I. slurry voc vials frozen storage
Date: ____ Time: ____ Initials: ____

TURNAROUND TIME (Business Days) — Approved By: / Rush Code

- [x] 10 Days Standard
- [ ] 7 Day RUSH
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [ ] OTHER

Emergency or Rush T/A Data Available VIA Email or Lablink

Data Deliverable Information

- [ ] COMMERCIAL "A" (RESULTS ONLY)
- [x] COMMERCIAL "B" (RESULTS PLUS QC)
- [ ] REDT1 (EPA LEVEL 3)
- [ ] FULT1 (EPA LEVEL 4)
- [ ] EDD'S

Rec'd at Exton Service Center 11/6

Comments / Remarks

Analyze for comprehensive COC list for Sunoco Characterizations (attached) Hold samples indicated pending further instruction

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished by:	Date Time:	Received By:
1 [signature]	11/6/13 1010	2 [signature]	3 [signature]	11/6/13 1615	4 [signature]
Relinquished by: 5 [signature]	11/6/13 1815	Received By: 6 [signature]	Relinquished by: 7	Date Time:	Received By: 8

Lab Use Only: Custody Seal in Place: Y N Temp Blank Provided: Y N Preserved where Applicable: Y N Total # of Coolers: Cooler Temperature (s) Celsius: 3.5 C/C

3

JB52301: Chain of Custody
Page 1 of 3

SAMPLE #	MEOH VIAL	D.I. VIAL	D.I. VIAL
1	8094	8646	8645
2	8093	8648	8647
3	8105	8671	8672
4	81.03	8656	8655
5	8121	8639	8659
6			
7			
8			
9			
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JB52301: Chain of Custody
Page 2 of 3

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: JB52301 **Client:** **Project:**

Date / Time Received: 11/6/2013 **Delivery Method:** **Airbill #'s:**

Cooler Temps (Initial/Adjusted): #1: (3.5/3.5); 0

Cooler Security	Y	N		Y	N
1. Custody Seals Present:	☑	☐	3. COC Present:	☑	☐
2. Custody Seals Intact:	☑	☐	4. Smpl Dates/Time OK	☑	☐

Cooler Temperature	Y	N
1. Temp criteria achieved:	☑	☐
2. Cooler temp verification:	IR Gun	
3. Cooler media:	Ice (Bag)	
4. No. Coolers:	1	

Quality Control_Preservatio	Y	N	N/A
1. Trip Blank present / cooler:	☑	☐	☐
2. Trip Blank listed on COC:	☑	☐	☐
3. Samples preserved properly:	☑	☐	
4. VOCs headspace free:	☑	☐	☐

Sample Integrity - Documentation	Y	N
1. Sample labels present on bottles:	☑	☐
2. Container labeling complete:	☑	☐
3. Sample container label / COC agree:	☑	☐

Sample Integrity - Condition	Y	N
1. Sample recvd within HT:	☑	☐
2. All containers accounted for:	☑	☐
3. Condition of sample:	Intact	

Sample Integrity - Instructions	Y	N	N/A
1. Analysis requested is clear:	☑	☐	
2. Bottles received for unspecified tests	☐	☑	
3. Sufficient volume recvd for analysis:	☑	☐	
4. Compositing instructions clear:	☐	☐	☑
5. Filtering instructions clear:	☐	☐	☑

Comments

5.1
5

JB52301: Chain of Custody
Page 3 of 3

CHAIN OF CUSTODY

ACCUTEST LABORATORIES

2235 Route 130, Dayton, NJ 08810
TEL. 732-329-0200 FAX: 732-329-3499/3480
www.accutest.com

 NE / 9

FED-EX Tracking #	Bottle Order Control #
Accutest Quote #	Accutest Job # JB52301

Client / Reporting Information	Project Information	
Company Name: Accutest Laboratories	Project Name: Sunoco, Philadelphia Refinery, Philadelphia, PA	
Street Address: 2235 Route 130	Street	Billing Information (If different from Report to)
City: Dayton State: NJ Zip: 08810	City State	Company Name
Project Contact: kristinb E-mail: kristinb@accutest.com	Project #	Street Address
Phone #: 732-329-0200 Fax #	Client Purchase Order #	City State Zip
Sampler(s) Name(s): JD Phone	Project Manager	Attention:

Requested Analysis (see TEST CODE sheet)

Matrix Codes: DW - Drinking Water, GW - Ground Water, WW - Water, SW - Surface Water, SO - Soil, SL- Sludge, SED-Sediment, OI - Oil, LIQ - Other Liquid, AIR - Air, SOL - Other Solid, WP - Wipe, FB-Field Blank, EB-Equipment Blank, RB- Rinse Blank, TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	CO ,NI ,PB ,V ,V8011EDB ,ZN ,	V8011EDB ,	HOLD	LAB USE ONLY
1	AOI-8-BH-13-64-0-2 ✓		11/6/13	10:35:00 AM	JD	SO	1					1						H	M44 T1
2	AOI-8-BH-13-64-2-4 ✓		11/6/13	11:15:00 AM	JD	SO	1					1						H	M44 T1
3	AOI-8-N-146-0-2 ✓		11/6/13	1:00:00 PM	JD	SO	1					1				X			M44 T1
4	AOI-8-N-146-4-6 ✓		11/6/13	2:00:00 PM	JD	SO	1					1						H	M44 T1
5	AOI-8-N-143-20.5-21 ✓		11/6/13	2:05:00 PM	JD	SO	1					1				X			M44 T1
6	TB		11/6/13	2:05:00 PM	JD	AQ	2	2									X		2173
																			2M3, 2C

Turnaround Time (Business days)

- ☐ Std. 10 Business Days
- ☐ 5 Day RUSH
- ☐ 3 Day EMERGENCY
- ☐ 2 Day EMERGENCY
- ☐ 1 Day EMERGENCY
- ☒ other Due 11/20/2013

Emergency & Rush T/A data available VIA Lablink

Approved By (Accutest PM): / Date:

Data Deliverable Information

- ☐ Commercial "A" (Level 1)
- ☐ Commercial "B" (Level 2)
- ☐ FULLT1 (Level 3+4)
- ☐ NJ Reduced
- ☐ Commercial "C"
- ☐ NYASP Category A
- ☐ NYASP Category B
- ☐ State Forms
- ☐ EDD Format ________
- ☒ Other REDT2

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

Please send (1) 60ml bottle per soil sample; location M44 T1. -6 will be (2) 40ml vials with HCL; location 2173.

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 Fernando	11-7-13 17:00	1 FEDEX	2 FX	11-8-13 730	2 Bzrook
Relinquished by Sampler: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal # 295	☐ Intact ☐ Not intact	Preserved where applicable ☐ On Ice Cooler Temp. 2.7°C

5.2

5

JB52301: Chain of Custody
Page 1 of 2
Accutest Labs of New England, Inc.

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: JB52301 **Client:** ACNJ **Immediate Client Services Action Required:** No

Date / Time Received: 11/8/2013 **Delivery Method:** **Client Service Action Required at Login:** No

Project: SUB **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y	N
1. Custody Seals Present:	☑	☐
2. Custody Seals Intact:	☑	☐
3. COC Present:	☑	☐
4. Smpl Dates/Time OK	☑	☐

Cooler Temperature	Y	N
1. Temp criteria achieved:	☑	☐
2. Cooler temp verification:	Infared gun	
3. Cooler media:	Ice (bag)	

Quality Control_Preservation	Y	N	N/A
1. Trip Blank present / cooler:	☐	☐	☑
2. Trip Blank listed on COC:	☐	☐	☑
3. Samples preserved properly:	☑	☐	
4. VOCs headspace free:	☐	☐	☑

Sample Integrity - Documentation	Y	N
1. Sample labels present on bottles:	☑	☐
2. Container labeling complete:	☑	☐
3. Sample container label / COC agree:	☑	☐

Sample Integrity - Condition	Y	N
1. Sample recvd within HT:	☑	☐
2. All containers accounted for:	☑	☐
3. Condition of sample:	Intact	

Sample Integrity - Instructions	Y	N	N/A
1. Analysis requested is clear:	☑	☐	
2. Bottles received for unspecified tests	☐	☑	
3. Sufficient volume recvd for analysis:	☑	☐	
4. Compositing instructions clear:	☐	☐	☑
5. Filtering instructions clear:	☐	☐	☑

Comments

Accutest Laboratories 495 Technology Center West, Bldg One Marlborough, MA
V:508.481.6200 F: 508.481.7753 www/accutest.com

JB52301: Chain of Custody
Page 2 of 2

New Jersey
ACCUTEST
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12/03/13

Technical Report for

Stantec Consulting Services Inc.

Sunoco, Philadelphia Refinery, Philadelphia, PA

AOI-8

Accutest Job Number: JB52677

Sampling Dates: 11/07/13 - 11/08/13

Report to:

Stantec

Stephanie.Andrews@stantec.com

ATTN: Stephanie Andrews

Total number of pages in report: **39**

NELAP ACCREDITED TNI LABORATORY

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Nancy F. Cole

Nancy Cole
Laboratory Director

Client Service contact: Kristin Beebe 732-329-0200

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, IL, IN, KS, KY, LA, MA, MD, MI, MT, NC, OH VAP (CL0056), PA, RI, SC, TN, VA, WV, DoD ELAP (L-A-B L2248)

Table of Contents

Sections: 1 2 3 4 5

-1-

Sample Summary

Stantec Consulting Services Inc.

Job No: JB52677

Sunoco, Philadelphia Refinery, Philadelphia, PA
Project No: AOI-8

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
JB52677-1	11/07/13	08:55 JR	11/08/13	SO	Soil	AOI-8-N-142-0-2
JB52677-2	11/07/13	10:10 JR	11/08/13	SO	Soil	AOI-8-N-142-4-6
JB52677-3	11/07/13	10:30 JR	11/08/13	SO	Soil	AOI-8-N-141-10-10.5
JB52677-4	11/07/13	14:15 JR	11/08/13	SO	Soil	AOI-8-N-146-17-18
JB52677-5	11/08/13	15:00 JR	11/08/13	SO	Soil	AOI-8-N-145-8-10
JB52677-6	11/08/13	15:00 JR	11/08/13	AQ	Trip Blank Soil	TB110813

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

CASE NARRATIVE / CONFORMANCE SUMMARY

Client:	Stantec Consulting Services Inc.	**Job No**	JB52677
Site:	Sunoco, Philadelphia Refinery, Philadelphia, PA	**Report Date**	12/2/2013 3:07:52 PM

On 11/08/2013, 4 Sample(s), 1 Trip Blank(s) and 0 Field Blank(s) were received at Accutest Laboratories at a temperature of 1.2 C. Samples were intact and chemically preserved, unless noted below. An Accutest Job Number of JB52677 was assigned to the project. Laboratory sample ID, client sample ID and dates of sample collection are detailed in the report's Results Summary Section. One Sample on hold.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

Volatiles by GCMS By Method SW846 8260B

Matrix: AQ **Batch ID:** V3V199

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52756-4MS, JB52756-4MSD were used as the QC samples indicated.

Matrix: SO **Batch ID:** VE9201

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52677-3MS, JB52677-3MSD were used as the QC samples indicated.
- JB52677-4: Dilution required due to matrix interference.
- JB52677-3: Dilution required due to matrix interference.

Matrix: SO **Batch ID:** VE9202

- All samples were analyzed within the recommended method holding time.
- Sample(s) JB52617-3MS, JB52617-3MSD were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Matrix: SO **Batch ID:** VY6081

- All samples were analyzed within the recommended method holding time.
- Sample(s) JB52231-4DUP, JB52775-12MS were used as the QC samples indicated.
- All method blanks for this batch meet method specific criteria.

Extractables by GCMS By Method SW846 8270D

Matrix: SO	Batch ID: OP70564

- All samples were extracted within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52671-1MS, JB52671-1MSD were used as the QC samples indicated.
- Blank Spike Recovery(s) for 4-Nitrophenol are outside control limits. Outside of in house control limits.
- Matrix Spike Recovery(s) for 2,4-Dimethylphenol, 2-Methylnaphthalene, 4-Nitrophenol, Naphthalene are outside control limits. Outside control limits due to matrix interference.
- Matrix Spike Duplicate Recovery(s) for 2,4-Dimethylphenol, 2-Methylnaphthalene, 4-Nitrophenol, Naphthalene are outside control limits. Outside control limits due to matrix interference.
- JB52677-5: Elevated detection limit due to high final volume of viscous extract.
- JB52677-5 for 2-Fluorobiphenyl: Outside of in house control limits, but within reasonable method recovery limits.
- JB52677-5 for Terphenyl-d14: Outside control limits due to matrix interference.
- JB52677-5 for 2,4,6-Tribromophenol: Outside control limits due to matrix interference.
- OP70564-MS for Nitrobenzene-d5: Outside of in house control limits.
- OP70564-MB1 for Nitrobenzene-d5: Outside of in house control limits.
- OP70564-BS1 for Nitrobenzene-d5: Outside of in house control limits.
- OP70564-MSD for Nitrobenzene-d5: Outside of in house control limits.
- JB52677-5 for 2-Fluorobiphenyl: Outside control limits due to dilution.
- JB52677-5 for Nitrobenzene-d5: Outside control limits due to dilution.

Volatiles by GC By Method SW846 8011

Matrix: AQ	Batch ID: M:OP35711

- The data for SW846 8011 meets quality control requirements.
- JB52677-6: Analysis performed at Accutest Laboratories, Marlborough, MA.

Matrix: SO	Batch ID: M:OP35717

- The data for SW846 8011 meets quality control requirements.
- JB52677-4: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-5: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1: Analysis performed at Accutest Laboratories, Marlborough, MA.

Metals By Method SW846 6010C

Matrix: SO	Batch ID: M:MP22123

- The data for SW846 6010C meets quality control requirements.
- JB52677-5 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-4 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-5 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-5 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-5 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-5 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-4 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-4 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-4 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-3 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1 for Zinc: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1 for Vanadium: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1 for Cobalt: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-1 for Lead: Analysis performed at Accutest Laboratories, Marlborough, MA.
- JB52677-4 for Nickel: Analysis performed at Accutest Laboratories, Marlborough, MA.

Wet Chemistry By Method SM2540 G-97

Matrix: SO	Batch ID: GN94861

- The data for SM2540 G-97 meets quality control requirements.

Accutest certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting Accutest's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

Accutest Laboratories is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. Data release is authorized by Accutest Laboratories indicated via signature on the report cover

SAMPLE DELIVERY GROUP CASE NARRATIVE

Client:	Accutest New Jersey	**Job No**	JB52677
Site:	SECORPAE: Sunoco, Philadelphia Refinery, Philadelphia, PA	**Report Date**	12/2/2013 1:25:50 PM

4 Sample(s), 1 Trip Blank(s) and 0 Field Blank(s) were collected on between 11/07/2013 and 11/08/2013 and were received at Accutest on 11/08/2013 properly preserved, at 2.2 Deg. C and intact. These Samples received an Accutest job number of JB52677. A listing of the Laboratory Sample ID, Client Sample ID and dates of collection are presented in the Results Summary Section of this report.

Except as noted below, all method specified calibrations and quality control performance criteria were met for this job. For more information, please refer to QC summary pages.

Volatiles by GC By Method SW846 8011

Matrix: AQ **Batch ID:** OP35711

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC26200-1MS, MC26200-1MSD were used as the QC samples indicated.

Matrix: SO **Batch ID:** OP35717

- All samples were extracted within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) MC26178-2MS, MC26178-2MSD were used as the QC samples indicated.
- RPD(s) for OP35717-MSD for 1,2-Dibromoethane are outside control limits. High RPD due to possible matrix interference and/or sample non-homogeneity.

Metals By Method SW846 6010C

Matrix: SO **Batch ID:** MP22123

- All samples were digested within the recommended method holding time.
- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB52627-3MS, JB52627-3MSD, JB52627-3SDL were used as the QC samples for metals.
- RPD(s) for Serial Dilution for Nickel are outside control limits for sample MP22123-SD1. Percent difference acceptable due to low initial sample concentration (< 50 times IDL).

The Accutest Laboratories of New England certifies that all analysis were performed within method specification. It is further recommended that this report to be used in its entirety.The Accutest Laboratories of NE, Laboratory Director or assignee as verified by the signature on the cover page has authorized the release of this report(JB52677).

Summary of Hits

Job Number: JB52677
Account: Stantec Consulting Services Inc.
Project: Sunoco, Philadelphia Refinery, Philadelphia, PA
Collected: 11/07/13 thru 11/08/13

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
JB52677-1	**AOI-8-N-142-0-2**					
Anthracene		66.5	34	12	ug/kg	SW846 8270D
Benzo(a)anthracene		301	34	11	ug/kg	SW846 8270D
Benzo(a)pyrene		305	34	10	ug/kg	SW846 8270D
Benzo(b)fluoranthene		348	34	11	ug/kg	SW846 8270D
Benzo(g,h,i)perylene		217	34	13	ug/kg	SW846 8270D
Benzo(k)fluoranthene		120	34	13	ug/kg	SW846 8270D
Chrysene		326	34	11	ug/kg	SW846 8270D
Dibenzo(a,h)anthracene		64.0	34	11	ug/kg	SW846 8270D
Fluoranthene		519	34	15	ug/kg	SW846 8270D
Indeno(1,2,3-cd)pyrene		177	34	12	ug/kg	SW846 8270D
2-Methylnaphthalene		23.7 J	67	19	ug/kg	SW846 8270D
Phenanthrene		186	34	15	ug/kg	SW846 8270D
Pyrene		426	34	13	ug/kg	SW846 8270D
Cobalt [a]		4.7 B	5.2	0.049	mg/kg	SW846 6010C
Lead [a]		83.3	1.0	0.18	mg/kg	SW846 6010C
Nickel [a]		13.0	4.2	0.046	mg/kg	SW846 6010C
Vanadium [a]		72.5	1.0	0.14	mg/kg	SW846 6010C
Zinc [a]		169	2.1	0.17	mg/kg	SW846 6010C
JB52677-3	**AOI-8-N-141-10-10.5**					
sec-Butylbenzene [b]		121 J	500	18	ug/kg	SW846 8260B
Isopropylbenzene [b]		31.2 J	500	15	ug/kg	SW846 8260B
Acenaphthene		124	34	9.7	ug/kg	SW846 8270D
Anthracene		155	34	12	ug/kg	SW846 8270D
Benzo(a)anthracene		53.9	34	11	ug/kg	SW846 8270D
Benzo(a)pyrene		19.7 J	34	10	ug/kg	SW846 8270D
Chrysene		93.0	34	11	ug/kg	SW846 8270D
bis(2-Ethylhexyl)phthalate		114	67	30	ug/kg	SW846 8270D
Fluoranthene		43.9	34	15	ug/kg	SW846 8270D
Fluorene		338	34	11	ug/kg	SW846 8270D
Phenanthrene		947	34	15	ug/kg	SW846 8270D
Pyrene		191	34	13	ug/kg	SW846 8270D
Cobalt [a]		7.8	5.5	0.051	mg/kg	SW846 6010C
Lead [a]		5.0	1.1	0.18	mg/kg	SW846 6010C
Nickel [a]		13.3	4.4	0.048	mg/kg	SW846 6010C
Vanadium [a]		15.5	1.1	0.14	mg/kg	SW846 6010C
Zinc [a]		41.9	2.2	0.18	mg/kg	SW846 6010C
JB52677-4	**AOI-8-N-146-17-18**					
sec-Butylbenzene [b]		395 J	570	20	ug/kg	SW846 8260B
tert-Butylbenzene [b]		312 J	570	19	ug/kg	SW846 8260B

Summary of Hits

Job Number: JB52677
Account: Stantec Consulting Services Inc.
Project: Sunoco, Philadelphia Refinery, Philadelphia, PA
Collected: 11/07/13 thru 11/08/13

Lab Sample ID Client Sample ID Analyte	Result/ Qual	RL	MDL	Units	Method
Cyclohexane [b]	622	570	29	ug/kg	SW846 8260B
Isopropylbenzene [b]	562 J	570	17	ug/kg	SW846 8260B
1,2,4-Trimethylbenzene [b]	150 J	570	18	ug/kg	SW846 8260B
Acenaphthene	294	36	11	ug/kg	SW846 8270D
Anthracene	526	36	13	ug/kg	SW846 8270D
Benzo(a)anthracene	640	36	12	ug/kg	SW846 8270D
Benzo(a)pyrene	487	36	11	ug/kg	SW846 8270D
Benzo(b)fluoranthene	523	36	12	ug/kg	SW846 8270D
Benzo(g,h,i)perylene	404	36	14	ug/kg	SW846 8270D
Benzo(k)fluoranthene	108	36	14	ug/kg	SW846 8270D
Chrysene	1090	36	12	ug/kg	SW846 8270D
Dibenzo(a,h)anthracene	154	36	12	ug/kg	SW846 8270D
Fluoranthene	1040	36	16	ug/kg	SW846 8270D
Fluorene	1050	36	12	ug/kg	SW846 8270D
Indeno(1,2,3-cd)pyrene	245	36	13	ug/kg	SW846 8270D
Phenanthrene	3210	36	17	ug/kg	SW846 8270D
Pyrene	1210	36	14	ug/kg	SW846 8270D
Cobalt [a]	13.3	5.6	0.053	mg/kg	SW846 6010C
Lead [a]	31.9	1.1	0.19	mg/kg	SW846 6010C
Nickel [a]	20.2	4.5	0.049	mg/kg	SW846 6010C
Vanadium [a]	24.5	1.1	0.15	mg/kg	SW846 6010C
Zinc [a]	75.0	2.3	0.18	mg/kg	SW846 6010C
JB52677-5 AOI-8-N-145-8-10					
Benzene	20300	170	21	ug/kg	SW846 8260B
Toluene	6740	170	24	ug/kg	SW846 8260B
Ethylbenzene	2300	170	29	ug/kg	SW846 8260B
Xylene (total)	4730	170	30	ug/kg	SW846 8260B
sec-Butylbenzene	1330	840	30	ug/kg	SW846 8260B
tert-Butylbenzene	745 J	840	27	ug/kg	SW846 8260B
Cyclohexane	33900	4500	230	ug/kg	SW846 8260B
Hexane	56300	4500	480	ug/kg	SW846 8260B
Isopropylbenzene	20000	840	25	ug/kg	SW846 8260B
1,2,4-Trimethylbenzene	4310	840	27	ug/kg	SW846 8260B
1,3,5-Trimethylbenzene	1900	840	37	ug/kg	SW846 8260B
Acenaphthene [c]	7370	200	57	ug/kg	SW846 8270D
Anthracene [c]	11500	200	68	ug/kg	SW846 8270D
Benzo(a)anthracene [c]	2940	200	64	ug/kg	SW846 8270D
Benzo(a)pyrene [c]	1690	200	60	ug/kg	SW846 8270D
Benzo(b)fluoranthene [c]	1650	200	65	ug/kg	SW846 8270D
Benzo(g,h,i)perylene [c]	2250	200	73	ug/kg	SW846 8270D
Benzo(k)fluoranthene [c]	350	200	73	ug/kg	SW846 8270D
1,1'-Biphenyl [c]	1540	390	23	ug/kg	SW846 8270D
Chrysene [c]	6100	200	66	ug/kg	SW846 8270D

Summary of Hits

Job Number: JB52677
Account: Stantec Consulting Services Inc.
Project: Sunoco, Philadelphia Refinery, Philadelphia, PA
Collected: 11/07/13 thru 11/08/13

Lab Sample ID Client Sample ID Analyte	Result/ Qual	RL	MDL	Units	Method
Dibenzo(a,h)anthracene [c]	820	200	67	ug/kg	SW846 8270D
Fluoranthene [c]	4050	200	86	ug/kg	SW846 8270D
Fluorene [c]	18700	200	64	ug/kg	SW846 8270D
Indeno(1,2,3-cd)pyrene [c]	1090	200	68	ug/kg	SW846 8270D
2-Methylnaphthalene	105000	3900	1100	ug/kg	SW846 8270D
Naphthalene [c]	7080	200	53	ug/kg	SW846 8270D
Phenanthrene	41400	2000	890	ug/kg	SW846 8270D
Pyrene	18300	2000	750	ug/kg	SW846 8270D
Cobalt [a]	7.6	6.0	0.057	mg/kg	SW846 6010C
Lead [a]	379	1.2	0.20	mg/kg	SW846 6010C
Nickel [a]	26.7	4.8	0.053	mg/kg	SW846 6010C
Vanadium [a]	22.1	1.2	0.16	mg/kg	SW846 6010C
Zinc [a]	415	2.4	0.19	mg/kg	SW846 6010C

JB52677-6 TB110813

No hits reported in this sample.

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.
(b) Dilution required due to matrix interference.
(c) Elevated detection limit due to high final volume of viscous extract.

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Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	AOI-8-N-142-0-2		
Lab Sample ID:	JB52677-1	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8260B	**Percent Solids:**	92.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Y140576.D	1	11/13/13	PS	n/a	n/a	VY6081
Run #2							

	Initial Weight
Run #1	5.8 g
Run #2	

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	0.93	0.12	ug/kg	
108-88-3	Toluene	ND	0.93	0.13	ug/kg	
100-41-4	Ethylbenzene	ND	0.93	0.16	ug/kg	
1330-20-7	Xylene (total)	ND	0.93	0.17	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	0.93	0.32	ug/kg	
135-98-8	sec-Butylbenzene	ND	4.7	0.17	ug/kg	
98-06-6	tert-Butylbenzene	ND	4.7	0.15	ug/kg	
110-82-7	Cyclohexane	ND	4.7	0.24	ug/kg	
107-06-2	1,2-Dichloroethane	ND	0.93	0.30	ug/kg	
110-54-3	Hexane	ND	4.7	0.50	ug/kg	
98-82-8	Isopropylbenzene	ND	4.7	0.14	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	ND	4.7	0.15	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	4.7	0.21	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	100%		59-130%
17060-07-0	1,2-Dichloroethane-D4	94%		65-123%
2037-26-5	Toluene-D8	105%		80-124%
460-00-4	4-Bromofluorobenzene	104%		71-132%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-142-0-2		
Lab Sample ID:	JB52677-1	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	92.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	6P2222.D	1	11/21/13	EP	11/11/13	OP70564	E6P91
Run #2							

	Initial Weight	Final Volume
Run #1	32.3 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	170	57	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	670	41	ug/kg	
95-48-7	2-Methylphenol	ND	67	38	ug/kg	
	3&4-Methylphenol	ND	67	43	ug/kg	
100-02-7	4-Nitrophenol	ND	340	57	ug/kg	
108-95-2	Phenol	ND	67	35	ug/kg	
83-32-9	Acenaphthene	ND	34	9.8	ug/kg	
120-12-7	Anthracene	66.5	34	12	ug/kg	
56-55-3	Benzo(a)anthracene	301	34	11	ug/kg	
50-32-8	Benzo(a)pyrene	305	34	10	ug/kg	
205-99-2	Benzo(b)fluoranthene	348	34	11	ug/kg	
191-24-2	Benzo(g,h,i)perylene	217	34	13	ug/kg	
207-08-9	Benzo(k)fluoranthene	120	34	13	ug/kg	
92-52-4	1,1'-Biphenyl	ND	67	3.9	ug/kg	
218-01-9	Chrysene	326	34	11	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	64.0	34	11	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	67	7.5	ug/kg	
84-66-2	Diethyl phthalate	ND	67	11	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	67	30	ug/kg	
206-44-0	Fluoranthene	519	34	15	ug/kg	
86-73-7	Fluorene	ND	34	11	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	177	34	12	ug/kg	
91-57-6	2-Methylnaphthalene	23.7	67	19	ug/kg	J
91-20-3	Naphthalene	ND	34	9.2	ug/kg	
85-01-8	Phenanthrene	186	34	15	ug/kg	
129-00-0	Pyrene	426	34	13	ug/kg	
110-86-1	Pyridine	ND	67	13	ug/kg	
91-22-5	Quinoline	ND	170	32	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	79%		13-110%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-142-0-2		
Lab Sample ID:	JB52677-1	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	92.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	74%		15-110%
118-79-6	2,4,6-Tribromophenol	73%		20-123%
4165-60-0	Nitrobenzene-d5	81%		10-110%
321-60-8	2-Fluorobiphenyl	72%		17-110%
1718-51-0	Terphenyl-d14	70%		30-124%

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-142-0-2		
Lab Sample ID:	JB52677-1	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	92.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BB52470.D	1	11/14/13	AMA	11/13/13	M:OP35717	M:GBB3074
Run #2							

	Initial Weight	Final Volume
Run #1	30.3 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	2.7	0.99	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	111%		61-167%
460-00-4	Bromofluorobenzene (S)	109%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-142-0-2		
Lab Sample ID:	JB52677-1	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
		Percent Solids:	92.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	4.7 B	5.2	0.049	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	83.3	1.0	0.18	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	13.0	4.2	0.046	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	72.5	1.0	0.14	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	169	2.1	0.17	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16479
(2) Prep QC Batch: M:MP22123

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	AOI-8-N-141-10-10.5		
Lab Sample ID:	JB52677-3	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8260B	**Percent Solids:**	89.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	E209691.D	1	11/15/13	DP	n/a	n/a	VE9201
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	6.0 g	10.0 ml	100 ul
Run #2			

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	99	13	ug/kg	
108-88-3	Toluene	ND	99	14	ug/kg	
100-41-4	Ethylbenzene	ND	99	17	ug/kg	
1330-20-7	Xylene (total)	ND	99	18	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	99	34	ug/kg	
135-98-8	sec-Butylbenzene	121	500	18	ug/kg	J
98-06-6	tert-Butylbenzene	ND	500	16	ug/kg	
110-82-7	Cyclohexane	ND	500	26	ug/kg	
107-06-2	1,2-Dichloroethane	ND	99	32	ug/kg	
110-54-3	Hexane	ND	500	54	ug/kg	
98-82-8	Isopropylbenzene	31.2	500	15	ug/kg	J
95-63-6	1,2,4-Trimethylbenzene	ND	500	16	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	ND	500	22	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	99%		59-130%
17060-07-0	1,2-Dichloroethane-D4	85%		65-123%
2037-26-5	Toluene-D8	100%		80-124%
460-00-4	4-Bromofluorobenzene	105%		71-132%

(a) Dilution required due to matrix interference.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-141-10-10.5		
Lab Sample ID:	JB52677-3	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	89.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	6P2221.D	1	11/21/13	EP	11/11/13	OP70564	E6P91
Run #2							

	Initial Weight	Final Volume
Run #1	33.4 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	170	56	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	670	41	ug/kg	
95-48-7	2-Methylphenol	ND	67	38	ug/kg	
	3&4-Methylphenol	ND	67	43	ug/kg	
100-02-7	4-Nitrophenol	ND	340	57	ug/kg	
108-95-2	Phenol	ND	67	35	ug/kg	
83-32-9	Acenaphthene	124	34	9.7	ug/kg	
120-12-7	Anthracene	155	34	12	ug/kg	
56-55-3	Benzo(a)anthracene	53.9	34	11	ug/kg	
50-32-8	Benzo(a)pyrene	19.7	34	10	ug/kg	J
205-99-2	Benzo(b)fluoranthene	ND	34	11	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	34	12	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	34	13	ug/kg	
92-52-4	1,1'-Biphenyl	ND	67	3.9	ug/kg	
218-01-9	Chrysene	93.0	34	11	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	34	11	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	67	7.4	ug/kg	
84-66-2	Diethyl phthalate	ND	67	11	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	114	67	30	ug/kg	
206-44-0	Fluoranthene	43.9	34	15	ug/kg	
86-73-7	Fluorene	338	34	11	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	34	12	ug/kg	
91-57-6	2-Methylnaphthalene	ND	67	19	ug/kg	
91-20-3	Naphthalene	ND	34	9.2	ug/kg	
85-01-8	Phenanthrene	947	34	15	ug/kg	
129-00-0	Pyrene	191	34	13	ug/kg	
110-86-1	Pyridine	ND	67	13	ug/kg	
91-22-5	Quinoline	ND	170	32	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	84%		13-110%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-141-10-10.5		
Lab Sample ID:	JB52677-3	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	89.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	80%		15-110%
118-79-6	2,4,6-Tribromophenol	80%		20-123%
4165-60-0	Nitrobenzene-d5	83%		10-110%
321-60-8	2-Fluorobiphenyl	81%		17-110%
1718-51-0	Terphenyl-d14	90%		30-124%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-141-10-10.5		
Lab Sample ID:	JB52677-3	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	89.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BB52472.D	1	11/14/13	AMA	11/13/13	M:OP35717	M:GBB3074
Run #2							

	Initial Weight	Final Volume
Run #1	30.5 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	2.8	1.0	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	84%		61-167%
460-00-4	Bromofluorobenzene (S)	86%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-141-10-10.5		
Lab Sample ID:	JB52677-3	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
		Percent Solids:	89.2
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	7.8	5.5	0.051	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	5.0	1.1	0.18	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	13.3	4.4	0.048	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	15.5	1.1	0.14	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	41.9	2.2	0.18	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16479
(2) Prep QC Batch: M:MP22123

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	AOI-8-N-146-17-18		
Lab Sample ID:	JB52677-4	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8260B	**Percent Solids:**	83.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	E209705.D	1	11/15/13	DP	n/a	n/a	VE9201
Run #2							

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	5.8 g	10.0 ml	100 ul
Run #2			

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	110	14	ug/kg	
108-88-3	Toluene	ND	110	16	ug/kg	
100-41-4	Ethylbenzene	ND	110	20	ug/kg	
1330-20-7	Xylene (total)	ND	110	20	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	110	39	ug/kg	
135-98-8	sec-Butylbenzene	395	570	20	ug/kg	J
98-06-6	tert-Butylbenzene	312	570	19	ug/kg	J
110-82-7	Cyclohexane	622	570	29	ug/kg	
107-06-2	1,2-Dichloroethane	ND	110	36	ug/kg	
110-54-3	Hexane	ND	570	61	ug/kg	
98-82-8	Isopropylbenzene	562	570	17	ug/kg	J
95-63-6	1,2,4-Trimethylbenzene	150	570	18	ug/kg	J
108-67-8	1,3,5-Trimethylbenzene	ND	570	25	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	99%		59-130%
17060-07-0	1,2-Dichloroethane-D4	88%		65-123%
2037-26-5	Toluene-D8	104%		80-124%
460-00-4	4-Bromofluorobenzene	106%		71-132%

(a) Dilution required due to matrix interference.

ND = Not detected   MDL - Method Detection Limit   J = Indicates an estimated value
RL = Reporting Limit   B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range   N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-17-18		
Lab Sample ID:	JB52677-4	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	83.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	6P2223.D	1	11/21/13	EP	11/11/13	OP70564	E6P91
Run #2							

	Initial Weight	Final Volume
Run #1	32.9 g	1.0 ml
Run #2		

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	180	61	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	730	45	ug/kg	
95-48-7	2-Methylphenol	ND	73	42	ug/kg	
	3&4-Methylphenol	ND	73	46	ug/kg	
100-02-7	4-Nitrophenol	ND	360	62	ug/kg	
108-95-2	Phenol	ND	73	38	ug/kg	
83-32-9	Acenaphthene	294	36	11	ug/kg	
120-12-7	Anthracene	526	36	13	ug/kg	
56-55-3	Benzo(a)anthracene	640	36	12	ug/kg	
50-32-8	Benzo(a)pyrene	487	36	11	ug/kg	
205-99-2	Benzo(b)fluoranthene	523	36	12	ug/kg	
191-24-2	Benzo(g,h,i)perylene	404	36	14	ug/kg	
207-08-9	Benzo(k)fluoranthene	108	36	14	ug/kg	
92-52-4	1,1'-Biphenyl	ND	73	4.2	ug/kg	
218-01-9	Chrysene	1090	36	12	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	154	36	12	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	73	8.1	ug/kg	
84-66-2	Diethyl phthalate	ND	73	12	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	73	32	ug/kg	
206-44-0	Fluoranthene	1040	36	16	ug/kg	
86-73-7	Fluorene	1050	36	12	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	245	36	13	ug/kg	
91-57-6	2-Methylnaphthalene	ND	73	20	ug/kg	
91-20-3	Naphthalene	ND	36	10	ug/kg	
85-01-8	Phenanthrene	3210	36	17	ug/kg	
129-00-0	Pyrene	1210	36	14	ug/kg	
110-86-1	Pyridine	ND	73	15	ug/kg	
91-22-5	Quinoline	ND	180	34	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	92%		13-110%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-17-18		
Lab Sample ID:	JB52677-4	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	83.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	91%		15-110%
118-79-6	2,4,6-Tribromophenol	99%		20-123%
4165-60-0	Nitrobenzene-d5	95%		10-110%
321-60-8	2-Fluorobiphenyl	81%		17-110%
1718-51-0	Terphenyl-d14	94%		30-124%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-17-18		
Lab Sample ID:	JB52677-4	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	83.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BB52473.D	1	11/14/13	AMA	11/13/13	M:OP35717	M:GBB3074
Run #2							

	Initial Weight	Final Volume
Run #1	30.3 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	3.0	1.1	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	97%		61-167%
460-00-4	Bromofluorobenzene (S)	96%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-146-17-18		
Lab Sample ID:	JB52677-4	**Date Sampled:**	11/07/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
		Percent Solids:	83.3
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	13.3	5.6	0.053	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	31.9	1.1	0.19	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	20.2	4.5	0.049	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	24.5	1.1	0.15	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	75.0	2.3	0.18	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16479
(2) Prep QC Batch: M:MP22123

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	AOI-8-N-145-8-10		
Lab Sample ID:	JB52677-5	**Date Sampled:**	11/08/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8260B	**Percent Solids:**	80.5
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	E209706.D	1	11/15/13	DP	n/a	n/a	VE9201
Run #2	E209721.D	1	11/15/13	DP	n/a	n/a	VE9202

	Initial Weight	Final Volume	Methanol Aliquot
Run #1	4.0 g	10.0 ml	100 ul
Run #2	4.0 g	5.0 ml	10.0 ul

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	20300	170	21	ug/kg	
108-88-3	Toluene	6740	170	24	ug/kg	
100-41-4	Ethylbenzene	2300	170	29	ug/kg	
1330-20-7	Xylene (total)	4730	170	30	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	170	57	ug/kg	
135-98-8	sec-Butylbenzene	1330	840	30	ug/kg	
98-06-6	tert-Butylbenzene	745	840	27	ug/kg	J
110-82-7	Cyclohexane	33900 [a]	4500	230	ug/kg	
107-06-2	1,2-Dichloroethane	ND	170	54	ug/kg	
110-54-3	Hexane	56300 [a]	4500	480	ug/kg	
98-82-8	Isopropylbenzene	20000	840	25	ug/kg	
95-63-6	1,2,4-Trimethylbenzene	4310	840	27	ug/kg	
108-67-8	1,3,5-Trimethylbenzene	1900	840	37	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	97%	102%	59-130%
17060-07-0	1,2-Dichloroethane-D4	95%	97%	65-123%
2037-26-5	Toluene-D8	107%	100%	80-124%
460-00-4	4-Bromofluorobenzene	119%	110%	71-132%

(a) Result is from Run# 2

ND = Not detected　MDL - Method Detection Limit　J = Indicates an estimated value
RL = Reporting Limit　B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range　N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-145-8-10		
Lab Sample ID:	JB52677-5	**Date Sampled:**	11/08/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	80.5
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	6P2224.D	1	11/21/13	EP	11/11/13	OP70564	E6P91
Run #2	6P2249.D	10	11/22/13	EP	11/11/13	OP70564	E6P93

	Initial Weight	Final Volume
Run #1	31.8 g	5.0 ml
Run #2	31.8 g	5.0 ml

ABN Special List

CAS No.	Compound	Result	RL	MDL	Units	Q
105-67-9	2,4-Dimethylphenol	ND	980	330	ug/kg	
51-28-5	2,4-Dinitrophenol	ND	3900	240	ug/kg	
95-48-7	2-Methylphenol	ND	390	220	ug/kg	
	3&4-Methylphenol	ND	390	250	ug/kg	
100-02-7	4-Nitrophenol	ND	2000	330	ug/kg	
108-95-2	Phenol	ND	390	210	ug/kg	
83-32-9	Acenaphthene	7370	200	57	ug/kg	
120-12-7	Anthracene	11500	200	68	ug/kg	
56-55-3	Benzo(a)anthracene	2940	200	64	ug/kg	
50-32-8	Benzo(a)pyrene	1690	200	60	ug/kg	
205-99-2	Benzo(b)fluoranthene	1650	200	65	ug/kg	
191-24-2	Benzo(g,h,i)perylene	2250	200	73	ug/kg	
207-08-9	Benzo(k)fluoranthene	350	200	73	ug/kg	
92-52-4	1,1'-Biphenyl	1540	390	23	ug/kg	
218-01-9	Chrysene	6100	200	66	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	820	200	67	ug/kg	
84-74-2	Di-n-butyl phthalate	ND	390	43	ug/kg	
84-66-2	Diethyl phthalate	ND	390	67	ug/kg	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	390	170	ug/kg	
206-44-0	Fluoranthene	4050	200	86	ug/kg	
86-73-7	Fluorene	18700	200	64	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	1090	200	68	ug/kg	
91-57-6	2-Methylnaphthalene	105000 [b]	3900	1100	ug/kg	
91-20-3	Naphthalene	7080	200	53	ug/kg	
85-01-8	Phenanthrene	41400 [b]	2000	890	ug/kg	
129-00-0	Pyrene	18300 [b]	2000	750	ug/kg	
110-86-1	Pyridine	ND	390	78	ug/kg	
91-22-5	Quinoline	ND	980	180	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	66%	65%	13-110%

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-145-8-10		
Lab Sample ID:	JB52677-5	**Date Sampled:**	11/08/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8270D SW846 3550C	**Percent Solids:**	80.5
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

ABN Special List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
4165-62-2	Phenol-d5	91%	77%	15-110%
118-79-6	2,4,6-Tribromophenol	151% c	116%	20-123%
4165-60-0	Nitrobenzene-d5	99%	0% d	10-110%
321-60-8	2-Fluorobiphenyl	112% e	0% d	17-110%
1718-51-0	Terphenyl-d14	154% c	100%	30-124%

(a) Elevated detection limit due to high final volume of viscous extract.
(b) Result is from Run# 2
(c) Outside control limits due to matrix interference.
(d) Outside control limits due to dilution.
(e) Outside of in house control limits, but within reasonable method recovery limits.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-145-8-10		
Lab Sample ID:	JB52677-5	**Date Sampled:**	11/08/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
Method:	SW846 8011 SW846 3550B	**Percent Solids:**	80.5
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BB52474.D	1	11/14/13	AMA	11/13/13	M:OP35717	M:GBB3074
Run #2							

	Initial Weight	Final Volume
Run #1	30.4 g	50.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	3.1	1.1	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	102%		61-167%
460-00-4	Bromofluorobenzene (S)	92%		61-167%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AOI-8-N-145-8-10		
Lab Sample ID:	JB52677-5	**Date Sampled:**	11/08/13
Matrix:	SO - Soil	**Date Received:**	11/08/13
		Percent Solids:	80.5
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed	By	Method	Prep Method
Cobalt [a]	7.6	6.0	0.057	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Lead [a]	379	1.2	0.20	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Nickel [a]	26.7	4.8	0.053	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Vanadium [a]	22.1	1.2	0.16	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]
Zinc [a]	415	2.4	0.19	mg/kg	1	11/25/13	11/28/13	AMA	SW846 6010C [1]	SW846 3050B [2]

(1) Instrument QC Batch: M:MA16479
(2) Prep QC Batch: M:MP22123

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

RL = Reporting Limit
MDL = Method Detection Limit

U = Indicates a result < MDL
B = Indicates a result > = MDL but < RL

Report of Analysis

Client Sample ID:	TB110813		
Lab Sample ID:	JB52677-6	**Date Sampled:**	11/08/13
Matrix:	AQ - Trip Blank Soil	**Date Received:**	11/08/13
Method:	SW846 8260B	**Percent Solids:**	n/a
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3V4794.D	1	11/16/13	YXC	n/a	n/a	V3V199
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Leaded Gasoline and Aviation Gas List

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.28	ug/l	
108-88-3	Toluene	ND	1.0	0.44	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.21	ug/l	
1330-20-7	Xylene (total)	ND	1.0	0.19	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	0.29	ug/l	
135-98-8	sec-Butylbenzene	ND	5.0	0.48	ug/l	
98-06-6	tert-Butylbenzene	ND	5.0	0.25	ug/l	
110-82-7	Cyclohexane	ND	5.0	0.18	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	0.22	ug/l	
110-54-3	Hexane	ND	5.0	1.1	ug/l	
98-82-8	Isopropylbenzene	ND	2.0	0.22	ug/l	
95-63-6	1,2,4-Trimethylbenzene	ND	2.0	0.23	ug/l	
108-67-8	1,3,5-Trimethylbenzene	ND	2.0	0.43	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	92%		79-117%
17060-07-0	1,2-Dichloroethane-D4	95%		72-123%
2037-26-5	Toluene-D8	92%		82-118%
460-00-4	4-Bromofluorobenzene	93%		75-118%

ND = Not detected   MDL - Method Detection Limit   J = Indicates an estimated value
RL = Reporting Limit   B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range   N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	TB110813		
Lab Sample ID:	JB52677-6	**Date Sampled:**	11/08/13
Matrix:	AQ - Trip Blank Soil	**Date Received:**	11/08/13
Method:	SW846 8011 SW846 8011	**Percent Solids:**	n/a
Project:	Sunoco, Philadelphia Refinery, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	BK32032.D	1	11/13/13	AMA	11/13/13	M:OP35711	M:GBK1056
Run #2							

	Initial Volume	Final Volume
Run #1	35.6 ml	2.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
106-93-4	1,2-Dibromoethane	ND	0.015	0.011	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	Bromofluorobenzene (S)	116%		36-173%
460-00-4	Bromofluorobenzene (S)	117%		36-173%

(a) Analysis performed at Accutest Laboratories, Marlborough, MA.

ND = Not detected MDL - Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

New Jersey
ACCUTEST
LABORATORIES

5

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody
- Chain of Custody (Accutest Labs of New England, Inc.)

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CHAIN OF CUSTODY

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TEL. 732-329-0200 FAX: 732-329-3499/3480
www.accutest.com

PAGE 1 OF 1

FED-EX Tracking # | Bottle Order Control #
Accutest Quote # | Accutest Job # JB52677

Client / Reporting Information

Company Name: Stantec
Street Address: 1060 Andrew Drive
City / State / Zip: West Chester PA 19380
Project Contact / E-mail: Jennifer.Menges@stantec.com
Phone #: 610-840-2500
Fax #:
Sampler(s) Name(s): Jenny DeBoer, Jeremy Richter
Phone #: 610-209-2511

Project Information

Project Name: Sunoco Philadelphia Refinery AOI-8
Street:
City / State:
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)
Company Name:
Street Address:
City / State / Zip:
Attention:

Requested Analysis (see TEST CODE sheet): V8260 SL2 | V8011EDB | A 3827OSL | CO, NI, PB, V, ZN

Matrix Codes: DW - Drinking Water, GW - Ground Water, WW - Water, SW - Surface Water, SO - Soil, SL- Sludge, SED-Sediment, OI - Oil, LIQ - Other Liquid, AIR - Air, SOL - Other Solid, WP - Wipe, FB-Field Blank, EB-Equipment Blank, RB- Rinse Blank, TB-Trip Blank

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Date	Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	V8260SL2	V8011EDB	A3827OSL	CO,NI,PB,V,ZN		LAB USE ONLY
1	AOI-8-N-142-0-2	6480/6517 6518	11/7/13	0855	JR	SO	5					2	2	1		X	X	X	X		SUB
2	AOI-8-N-142-4-6	8120/8661 8662	11/7/13	1010	JR	SO	5					2	2	1		X	X	X	X	HOLD	
3	AOI-8-N-141-10-10.5	6481/6519 6520	11/7/13	1030	JD	SO	5					2	2	1		X	X	X	X		B15
4	AOI-8-N-146-17-18	8097/8642 8641	~~11/8/1~~ 11/7/13	1415	JD	SO	5					2	2	1		X	X	X	X		14F3
5	AOI-8-N-145-8-10	8112/8649 8650	11/8/13	1500	JD	SO	5					2	2	1		X	X	X	X		4958
6	TB 110813		11/8/13	1500	JD	TB	4	4								X	X				801

D.I. slurry voc vials frozen storage
Date: 11/8 Time: 2235 Initials: JMS

Turnaround Time (Business days)

- [x] Std. 10 Business Days
- [ ] 5 Day RUSH
- [ ] 3 Day EMERGENCY
- [ ] 2 Day EMERGENCY
- [ ] 1 Day EMERGENCY
- [ ] other

Emergency & Rush T/A data available VIA Lablink

Approved By (Accutest PM): / Date:
Rec'd at Exton Service Center
JJ/JS

Data Deliverable Information

- [ ] Commercial "A" (Level 1)
- [x] Commercial "B" (Level 2)
- [ ] FULLT1 (Level 3+4)
- [ ] NJ Reduced
- [ ] Commercial "C"
- [ ] NYASP Category A
- [ ] NYASP Category B
- [ ] State Forms
- [ ] EDD Format
- [ ] Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

Analyze for comprehensive COC list for Sunoco characterizations (attached)
Hold samples indicated pending further instruction

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 [signature]	11/8/13 1530	1 [signature]	2 [signature]	11/8/13 1705	2 [signature]
3 Relinquished by Sampler: [signature]	11/8/13 1935	3 [signature]	4		4
5 Relinquished by:	Date Time:	5 Received By:	Custody Seal #	☐ Intact ☐ Not intact	Preserved where applicable ☐ / On Ice ☑ / Cooler Temp. 1.2 C/IG

JB52677: Chain of Custody
Page 1 of 3

JB52677

Comprehensive COC List for Sunoco Characterizations (Sept. 2013)

VOCs by EPA Method 8260	CAS No.
Benzene	71-43-2
Butylbenzene, sec-	135-98-8
Butylbenzene, tert-	98-06-6
Cumene	98-82-8
Cyclohexane	110-82-7
Dichloroethane, 1,2-	107-06-2
Ethylbenzene	100-41-4
Hexane	110-54-3
Methyl tert butyl ether	1634-04-4
Toluene	108-88-3
Trimethylbenzene, 1,2,4-	95-63-6
Trimethylbenzene, 1,3,5-	108-67-8
Xylenes	1330-20-7

EDB by EPA Method 8011	CAS No.
Ethylene Dibromide	106-93-4

Metals by Method 6010/6020	CAS No.
Cobalt	7440-48-4
Lead	7439-92-1
Nickel	7440-02-0
Vanadium	7440-62-2
Zinc	7440-66-6

SVOCs by EPA Method 8270	CAS No.
Acenaphthene	83-32-9
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluroranthene	205-99-2
Benzo(g,h,i)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Biphenyl, 1,1-	92-52-4
Bis(2-ethylhexyl) phthalate	117-81-7
Chrysene	218-01-9
Cresol, m- (3-methylphenol)	108-39-4
Cresol, o- (2-methylphenol)	95-48-7
Cresol, p- (4-methylphenol)	106-44-5
Dibenz(a,h)anthracene	53-70-3
Diethyl phthalate	84-66-2
Dimethylphenol, 2,4-	105-67-9
Dibutyl phthalate, n-	84-74-2
Dinitrophenol, 2,4-	51-28-5
Fluoranthene	206-44-0
Fluorene	86-73-7
Indeno(1,2,3-cd)pyrene	193-39-5
Methylnaphthalene, 2-	91-57-6
Naphthalene	91-20-3
Nitrophenol, 4-	100-02-7
Phenanthrene	85-01-8
Phenol	108-95-2
Pyrene	129-00-0
Pyridine	110-86-1
Quinoline	91-22-5

List from PADEP SERO Crude Oil Parameters for Corrective Action (CDB | SERO | PA DEP | 9 Aug 2013) combined with PADEP Petroleum Shortlist (leaded and unleaded gasoline and No. 2, 4, 5, 6 Fuel Oils).

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: JB52677 **Client:** **Project:**

Date / Time Received: 11/8/2013 **Delivery Method:** **Airbill #'s:**

Cooler Temps (Initial/Adjusted): #1: (1.2/1.2); 0

Cooler Security	Y	N		Y	N
1. Custody Seals Present:	☑	☐	3. COC Present:	☑	☐
2. Custody Seals Intact:	☑	☐	4. Smpl Dates/Time OK	☑	☐

Cooler Temperature	Y	N
1. Temp criteria achieved:	☑	☐
2. Cooler temp verification:	IR Gun	
3. Cooler media:	Ice (Bag)	
4. No. Coolers:	1	

Quality Control Preservatio	Y	N	N/A
1. Trip Blank present / cooler:	☑	☐	☐
2. Trip Blank listed on COC:	☑	☐	☐
3. Samples preserved properly:	☑	☐	
4. VOCs headspace free:	☑	☐	☐

Sample Integrity - Documentation	Y	N
1. Sample labels present on bottles:	☑	☐
2. Container labeling complete:	☑	☐
3. Sample container label / COC agree:	☑	☐

Sample Integrity - Condition	Y	N
1. Sample recvd within HT:	☑	☐
2. All containers accounted for:	☑	☐
3. Condition of sample:	Intact	

Sample Integrity - Instructions	Y	N	N/A
1. Analysis requested is clear:	☑	☐	
2. Bottles received for unspecified tests	☐	☑	
3. Sufficient volume recvd for analysis:	☑	☐	
4. Compositing instructions clear:	☐	☐	☑
5. Filtering instructions clear:	☐	☐	☑

Comments

JB52677: Chain of Custody
Page 3 of 3

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

Page 1 of 1 NE/

2235 Route 130, Dayton, NJ 08810
TEL. 732-329-0200 FAX: 732-329-3499/3480
www.accutest.com

FED-EX Tracking #	Bottle Order Control #
Accutest Quote #	Accutest Job # JB52677

Client / Reporting Information

Company Name: Accutest Laboratories
Street Address: 2235 Route 130
City: Dayton State: NJ Zip: 08810
Project Contact: KristinB E-mail: KristinB@accutest.com
Phone #: 732-329-0200 Fax #:
Sampler(s) Name(s): JR Phone:

Project Information

Project Name: Sunoco, Philadelphia Refinery, Philadelphia, PA
Street:
City: State:
Project #:
Client Purchase Order #:
Project Manager:

Billing Information (if different from Report to)
Company Name:
Street Address:
City: State: Zip:
Attention:

Requested Analysis (see TEST CODE sheet)

Accutest Sample #	Field ID / Point of Collection	MEOH/DI Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	NONE	DI Water	MEOH	ENCORE	CO, NI, PB, V, V8011EDB, ZN,	V8011EDB,	LAB USE ONLY
1	AOI-8-N-142-0-2		11/7/13	8:55:00 AM	JR	SO	2					X				X		
2	AOI-8-N-142-4-6		11/7/13	10:10:00 AM	JR	SO	2					X				X		
3	AOI-8-N-141-10-10.5		11/7/13	10:30:00 AM	JR	SO	2					X				X		
4	AOI-8-N-146-17-18		11/7/13	2:15:00 PM	JR	SO	2					X				X		
5	AOI-8-N-145-8-10		11/8/13	3:00:00 PM	JR	SO	2					X				X		
6	TB110813		11/8/13	3:00:00 PM	JR	AQ	2	X									X	
																		3D2,9C

Matrix Codes: DW - Drinking Water, GW - Ground Water, WW - Water, SW - Surface Water, SO - Soil, SL- Sludge, SED-Sediment, OI - Oil, LIQ - Other Liquid, AIR - Air, SOL - Other Solid, WP - Wipe, FB-Field Blank, EB-Equipment Blank, RB- Rinse Blank, TB-Trip Blank

Turnaround Time (Business days)

Approved By (Accutest PM): / Date:

- ☐ Std. 10 Business Days
- ☐ 5 Day RUSH
- ☐ 3 Day EMERGENCY
- ☐ 2 Day EMERGENCY
- ☐ 1 Day EMERGENCY
- ☒ other Due 11/22/2013

Emergency & Rush T/A data available VIA Lablink

Data Deliverable Information

- ☐ Commercial "A" (Level 1)
- ☐ Commercial "B" (Level 2)
- ☐ FULLT1 (Level 3+4)
- ☐ NJ Reduced
- ☐ Commercial "C"
- ☐ NYASP Category A
- ☐ NYASP Category B
- ☐ State Forms
- ☐ EDD Format
- ☒ Other REDT2

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

Samples -1 thru -5 aliquot 2 oz jar from 300ml bottle on shelf B15 for ~~V8011EDB~~ METALS
Data due 11/22/13

Sample Custody must be documented below each time samples change possession, including courier delivery.

Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1 Fernando	11-11-13 17:00	1 FEDEX	2 FX	11-12-13 930	2 B[illegible]
Relinquished by Sampler: 3	Date Time:	Received By: 3	Relinquished By: 4	Date Time:	Received By: 4
Relinquished by: 5	Date Time:	Received By: 5	Custody Seal # 319	☐ Intact ☐ Not intact	Preserved where applicable ☐ On Ice ☐ Cooler Temp. 2.2°C

JB52677: Chain of Custody
Page 1 of 2
Accutest Labs of New England, Inc.

Accutest Laboratories Sample Receipt Summary

Accutest Job Number: JB52677 **Client:** ACNJ **Immediate Client Services Action Required:** No

Date / Time Received: 11/12/2013 **Delivery Method:** **Client Service Action Required at Login:** No

Project: SUB **No. Coolers:** 1 **Airbill #'s:**

Cooler Security	Y	N		Y	N
1. Custody Seals Present:	✔	☐	3. COC Present:	✔	☐
2. Custody Seals Intact:	✔	☐	4. Smpl Dates/Time OK	✔	☐

Cooler Temperature	Y	N
1. Temp criteria achieved:	✔	☐
2. Cooler temp verification:	Infared gun	
3. Cooler media:	Ice (bag)	

Quality Control Preservation	Y	N	N/A
1. Trip Blank present / cooler:	☐	☐	✔
2. Trip Blank listed on COC:	☐	☐	✔
3. Samples preserved properly:	✔	☐	
4. VOCs headspace free:	☐	☐	✔

Sample Integrity - Documentation	Y	N
1. Sample labels present on bottles:	✔	☐
2. Container labeling complete:	✔	☐
3. Sample container label / COC agree:	✔	☐

Sample Integrity - Condition	Y	N
1. Sample recvd within HT:	✔	☐
2. All containers accounted for:	✔	☐
3. Condition of sample:	Intact	

Sample Integrity - Instructions	Y	N	N/A
1. Analysis requested is clear:	✔	☐	
2. Bottles received for unspecified tests	☐	✔	
3. Sufficient volume recvd for analysis:	✔	☐	
4. Compositing instructions clear:	☐	☐	✔
5. Filtering instructions clear:	☐	☐	✔

Comments

JB52677: Chain of Custody
Page 2 of 2

ANALYTICAL REPORT

July 20, 2016

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L846809
Samples Received:	07/13/2016
Project Number:	
Description:	PH Ref AOI-8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Jarred Willis
Technical Service Representative

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

TABLE OF CONTENTS

	Collected by	Collected date/time	Received date/time
AOI8-N-154-0-2-20160711 L846809-01 Solid	Luke M.	07/11/16 10:00	07/13/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG888603	5	07/14/16 11:25	07/14/16 22:39	LTB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG888618	50	07/14/16 13:10	07/18/16 14:57	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG888618	50	07/14/16 13:10	07/19/16 13:28	JF
Total Solids by Method 2540 G-2011	WG888742	1	07/14/16 12:59	07/14/16 13:09	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG889038	20.25	07/14/16 23:33	07/16/16 05:52	DWR

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jarred Willis

Jarred Willis
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	68.0		1	07/14/2016 13:09	WG888742

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	ND		7.35	5	07/14/2016 22:39	WG888603
Lead	5890		3.67	5	07/14/2016 22:39	WG888603
Nickel	ND		14.7	5	07/14/2016 22:39	WG888603
Vanadium	24.1		14.7	5	07/14/2016 22:39	WG888603
Zinc	2220		36.7	5	07/14/2016 22:39	WG888603

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
sec-Butylbenzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
tert-Butylbenzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
Cyclohexane	ND		0.0298	20.25	07/16/2016 05:52	WG889038
1,2-Dibromoethane	ND		0.0298	20.25	07/16/2016 05:52	WG889038
n-Hexane	ND		0.298	20.25	07/16/2016 05:52	WG889038
1,2-Dichloroethane	ND		0.0298	20.25	07/16/2016 05:52	WG889038
Ethylbenzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
Isopropylbenzene	ND		0.298	20.25	07/16/2016 05:52	WG889038
2-Butanone (MEK)	ND		0.298	20.25	07/16/2016 05:52	WG889038
Methyl tert-butyl ether	ND		0.0298	20.25	07/16/2016 05:52	WG889038
Toluene	ND		0.149	20.25	07/16/2016 05:52	WG889038
1,2,4-Trimethylbenzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
1,3,5-Trimethylbenzene	ND		0.0298	20.25	07/16/2016 05:52	WG889038
Xylenes, Total	ND		0.0893	20.25	07/16/2016 05:52	WG889038
(S) Toluene-d8	*102*		*88.7-115*		*07/16/2016 05:52*	WG889038
(S) Dibromofluoromethane	*101*		*76.3-123*		*07/16/2016 05:52*	WG889038
(S) a,a,a-Trifluorotoluene	*108*		*87.2-117*		*07/16/2016 05:52*	WG889038
(S) 4-Bromofluorobenzene	*87.8*		*69.7-129*		*07/16/2016 05:52*	WG889038

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		2.43	50	07/18/2016 14:57	WG888618
Anthracene	ND		2.43	50	07/18/2016 14:57	WG888618
Benzo(a)anthracene	ND		2.43	50	07/18/2016 14:57	WG888618
Benzo(b)fluoranthene	2.85		2.43	50	07/18/2016 14:57	WG888618
Benzo(k)fluoranthene	ND		2.43	50	07/18/2016 14:57	WG888618
Benzo(g,h,i)perylene	ND		2.43	50	07/18/2016 14:57	WG888618
Benzo(a)pyrene	3.55		2.43	50	07/18/2016 14:57	WG888618
Biphenyl	ND		24.5	50	07/18/2016 14:57	WG888618
Chrysene	4.16		2.43	50	07/18/2016 14:57	WG888618
Dibenz(a,h)anthracene	ND		2.43	50	07/18/2016 14:57	WG888618
Fluoranthene	ND	J4	2.43	50	07/18/2016 14:57	WG888618
Fluorene	ND		2.43	50	07/18/2016 14:57	WG888618
Indeno(1,2,3-cd)pyrene	ND		2.43	50	07/18/2016 14:57	WG888618
2-Methylnaphthalene	ND		2.43	50	07/18/2016 14:57	WG888618
Naphthalene	ND		2.43	50	07/18/2016 14:57	WG888618
Phenanthrene	ND		2.43	50	07/18/2016 14:57	WG888618
Pyridine	ND		24.5	50	07/18/2016 14:57	WG888618

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		24.5	50	07/18/2016 14:57	WG888618
Di-n-butyl phthalate	ND		24.5	50	07/18/2016 14:57	WG888618
Diethyl phthalate	ND		24.5	50	07/18/2016 14:57	WG888618
Pyrene	ND		2.43	50	07/18/2016 14:57	WG888618
2,4-Dimethylphenol	ND		24.5	50	07/18/2016 14:57	WG888618
2,4-Dinitrophenol	ND		24.5	50	07/18/2016 14:57	WG888618
2-Methylphenol	ND		24.5	50	07/18/2016 14:57	WG888618
3&4-Methyl Phenol	ND		24.5	50	07/18/2016 14:57	WG888618
4-Nitrophenol	ND		24.5	50	07/18/2016 14:57	WG888618
Phenol	ND		24.5	50	07/18/2016 14:57	WG888618
Quinoline	ND	J4	24.5	50	07/19/2016 13:28	WG888618
(S) 2-Fluorophenol	*38.5*	J7	*21.1-116*		*07/18/2016 14:57*	WG888618
(S) Phenol-d5	*31.6*	J7	*26.3-121*		*07/18/2016 14:57*	WG888618
(S) Nitrobenzene-d5	*46.6*	J7	*21.9-129*		*07/18/2016 14:57*	WG888618
(S) 2-Fluorobiphenyl	*33.3*	J7	*34.9-129*		*07/18/2016 14:57*	WG888618
(S) 2,4,6-Tribromophenol	*30.5*	J7	*21.6-142*		*07/18/2016 14:57*	WG888618
(S) p-Terphenyl-d14	*60.6*	J7	*21.5-128*		*07/18/2016 14:57*	WG888618

Sample Narrative:

8270C L846809-01 WG888618: Dilution due to matrix

Method Blank (MB)

(MB) R3149875-1 07/14/16 13:09

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000300			

L846813-04 Original Sample (OS) • Duplicate (DUP)

(OS) L846813-04 07/14/16 13:09 • (DUP) R3149875-3 07/14/16 13:09

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	88.9	88.0	1	1.11		5

Laboratory Control Sample (LCS)

(LCS) R3149875-2 07/14/16 13:09

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3149828-1 07/14/16 18:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Cobalt	U		0.23	1.00
Lead	0.28	J	0.19	0.500
Nickel	U		0.49	2.00
Vanadium	U		0.24	2.00
Zinc	1.3	J	0.59	5.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3149828-2 07/14/16 18:12 • (LCSD) R3149828-3 07/14/16 18:15

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Cobalt	100	95.5	98.8	96	99	80-120			3	20
Lead	100	96.2	99.6	96	100	80-120			3	20
Nickel	100	93.9	97.3	94	97	80-120			4	20
Vanadium	100	98.0	102	98	102	80-120			4	20
Zinc	100	93.3	97.1	93	97	80-120			4	20

L846780-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L846780-01 07/14/16 18:17 • (MS) R3149828-6 07/14/16 18:25 • (MSD) R3149828-7 07/14/16 18:28

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Cobalt	129	9.93	122	131	87	93	1	75-125			7	20
Lead	129	396	385	417	0	16	1	75-125	J6	J6	8	20
Nickel	129	28.3	134	146	82	91	1	75-125			9	20
Vanadium	129	56.9	161	168	80	85	1	75-125			4	20
Zinc	129	248	322	338	58	70	1	75-125	J6	J6	5	20

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3150104-3 07/15/16 12:08

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000270	0.00100
sec-Butylbenzene	U		0.000201	0.00100
tert-Butylbenzene	U		0.000206	0.00100
Cyclohexane	U		0.000350	0.00100
1,2-Dibromoethane	U		0.000343	0.00100
1,2-Dichloroethane	U		0.000265	0.00100
Ethylbenzene	U		0.000297	0.00100
n-Hexane	U		0.000290	0.0100
Isopropylbenzene	U		0.000243	0.0100
2-Butanone (MEK)	U		0.00468	0.0100
Methyl tert-butyl ether	U		0.000212	0.00100
Toluene	U		0.000434	0.00500
1,2,4-Trimethylbenzene	U		0.000211	0.00100
1,3,5-Trimethylbenzene	U		0.000266	0.00100
Xylenes, Total	U		0.000698	0.00300
(S) Toluene-d8	*99.8*			*88.7-115*
(S) Dibromofluoromethane	*104*			*76.3-123*
(S) a,a,a-Trifluorotoluene	*106*			*87.2-117*
(S) 4-Bromofluorobenzene	*107*			*69.7-129*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3150104-1 07/15/16 11:10 • (LCSD) R3150104-2 07/15/16 11:30

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0234	0.0235	93.7	94.2	72.6-120			0.520	20
sec-Butylbenzene	0.0250	0.0265	0.0270	106	108	77.8-129			1.84	20
tert-Butylbenzene	0.0250	0.0274	0.0280	110	112	77.2-129			2.13	20
1,2-Dibromoethane	0.0250	0.0261	0.0265	104	106	78.7-123			1.52	20
1,2-Dichloroethane	0.0250	0.0224	0.0230	89.7	91.8	67.2-121			2.34	20
Ethylbenzene	0.0250	0.0271	0.0269	108	108	78.6-124			0.480	20
n-Hexane	0.0250	0.0222	0.0223	89.0	89.1	59.9-125			0.0800	20
Isopropylbenzene	0.0250	0.0259	0.0264	104	106	79.4-126			2.04	20
2-Butanone (MEK)	0.125	0.0786	0.0813	62.9	65.0	44.5-154			3.33	21.3
Methyl tert-butyl ether	0.0250	0.0216	0.0217	86.3	86.9	70.2-122			0.680	20
Toluene	0.0250	0.0250	0.0251	99.9	100	76.7-116			0.360	20
1,2,4-Trimethylbenzene	0.0250	0.0261	0.0263	105	105	77.1-124			0.460	20
1,3,5-Trimethylbenzene	0.0250	0.0265	0.0269	106	108	79.0-125			1.34	20
Xylenes, Total	0.0750	0.0787	0.0787	105	105	78.1-123			0.0200	20

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3150104-1 07/15/16 11:10 • (LCSD) R3150104-2 07/15/16 11:30

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) Toluene-d8				*103*	*104*	*88.7-115*				
(S) Dibromofluoromethane				*101*	*101*	*76.3-123*				
(S) a,a,a-Trifluorotoluene				*108*	*108*	*87.2-117*				
(S) 4-Bromofluorobenzene				*107*	*107*	*69.7-129*				

L846371-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L846371-01 07/15/16 16:02 • (MS) R3150104-4 07/15/16 16:22 • (MSD) R3150104-5 07/15/16 16:41

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	ND	0.204	0.423	44.8	92.8	18.25	47.8-131	J6	J3	69.9	22.8
sec-Butylbenzene	0.0250	0.141	0.202	0.392	13.3	55.1	18.25	31.0-142	J6	J3	64.2	34.7
tert-Butylbenzene	0.0250	ND	0.165	0.316	36.1	69.2	18.25	36.9-142	J6	J3	62.9	31.7
1,2-Dibromoethane	0.0250	ND	0.226	0.446	49.6	97.8	18.25	50.2-133	J6	J3	65.3	23.6
1,2-Dichloroethane	0.0250	ND	0.200	0.399	43.8	87.5	18.25	47.1-129	J6	J3	66.6	22.7
Ethylbenzene	0.0250	0.189	0.304	0.610	25.2	92.2	18.25	44.8-135	J6	J3	66.9	26.9
n-Hexane	0.0250	ND	0.105	0.222	23.1	48.8	18.25	26.0-123	J6	J3	71.3	40
Isopropylbenzene	0.0250	0.0734	0.217	0.428	31.6	77.7	18.25	41.9-139	J6	J3	65.2	29.3
2-Butanone (MEK)	0.125	ND	0.752	1.49	33.0	65.4	18.25	23.9-170		J3	65.9	28.3
Methyl tert-butyl ether	0.0250	ND	0.195	0.382	41.3	82.2	18.25	50.4-131	J6	J3	64.6	24.8
Toluene	0.0250	0.270	0.329	0.684	12.9	90.8	18.25	47.8-127	J6	J3	70.2	24.3
1,2,4-Trimethylbenzene	0.0250	3.22	1.66	3.22	0.000	0.716	18.25	32.9-139	V	J3 V	64.2	30.6
1,3,5-Trimethylbenzene	0.0250	0.832	0.546	1.05	0.000	48.5	18.25	37.1-138	J6	J3	63.4	30.6
Xylenes, Total	0.0750	1.43	1.28	2.51	0.000	78.8	18.25	42.7-135	J6	J3	64.7	26.6
(S) Toluene-d8					*101*	*103*		*88.7-115*				
(S) Dibromofluoromethane					*101*	*98.7*		*76.3-123*				
(S) a,a,a-Trifluorotoluene					*106*	*106*		*87.2-117*				
(S) 4-Bromofluorobenzene					*109*	*108*		*69.7-129*				

Method Blank (MB)

(MB) R3150330-3 07/17/16 15:08

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00642	0.0330
Anthracene	U		0.00632	0.0330
Benzo(a)anthracene	U		0.00428	0.0330
Benzo(b)fluoranthene	U		0.00695	0.0330
Benzo(k)fluoranthene	U		0.00582	0.0330
Benzo(g,h,i)perylene	U		0.00721	0.0330
Benzo(a)pyrene	U		0.00548	0.0330
Biphenyl	U		0.00588	0.333
Chrysene	U		0.00555	0.0330
Dibenz(a,h)anthracene	U		0.00821	0.0330
Fluoranthene	U		0.00496	0.0330
Fluorene	U		0.00682	0.0330
Indeno(1,2,3-cd)pyrene	U		0.00772	0.0330
2-Methylnaphthalene	U		0.00861	0.0330
Naphthalene	U		0.00889	0.0330
Phenanthrene	U		0.00528	0.0330
Bis(2-ethylhexyl)phthalate	U		0.0120	0.333
Di-n-butyl phthalate	U		0.0109	0.333
Diethyl phthalate	U		0.00691	0.333
Pyrene	U		0.0123	0.0330
Pyridine	U		0.0628	0.333
2-Methylphenol	U		0.00986	0.333
3&4-Methyl Phenol	U		0.00783	0.333
2,4-Dimethylphenol	U		0.0471	0.333
2,4-Dinitrophenol	U		0.0980	0.333
4-Nitrophenol	U		0.0525	0.333
Phenol	U		0.00695	0.333
(S) Nitrobenzene-d5	*51.3*			*21.9-129*
(S) 2-Fluorobiphenyl	*55.7*			*34.9-129*
(S) p-Terphenyl-d14	*59.0*			*21.5-128*
(S) Phenol-d5	*45.1*			*26.3-121*
(S) 2-Fluorophenol	*47.7*			*21.1-116*
(S) 2,4,6-Tribromophenol	*48.1*			*21.6-142*

Method Blank (MB)

(MB) R3150992-2 07/19/16 12:19

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Quinoline	U		0.0574	0.333

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3150330-1 07/17/16 14:21 • (LCSD) R3150330-2 07/17/16 14:44

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.667	0.392	0.374	58.7	56.1	48.9-107			4.50	20
Anthracene	0.667	0.392	0.372	58.8	55.7	52.0-112			5.28	20
Benzo(a)anthracene	0.667	0.389	0.363	58.3	54.5	52.3-106			6.73	20
Benzo(b)fluoranthene	0.667	0.390	0.378	58.4	56.6	51.3-106			3.14	20
Benzo(k)fluoranthene	0.667	0.372	0.361	55.7	54.1	52.9-107			2.97	20
Benzo(g,h,i)perylene	0.667	0.410	0.389	61.5	58.4	45.8-108			5.20	20
Benzo(a)pyrene	0.667	0.385	0.378	57.7	56.6	51.9-106			1.94	20
Biphenyl	0.667	0.377	0.358	56.5	53.6	45.6-103			5.23	20
Chrysene	0.667	0.385	0.367	57.8	55.0	54.4-110			4.95	20
Dibenz(a,h)anthracene	0.667	0.406	0.380	60.9	57.0	45.7-111			6.61	20
Fluoranthene	0.667	0.367	0.356	55.0	53.4	53.7-110		J4	2.99	20
Fluorene	0.667	0.394	0.381	59.0	57.1	51.1-109			3.28	20
Indeno(1,2,3-cd)pyrene	0.667	0.413	0.388	61.9	58.2	47.5-109			6.14	20
2-Methylnaphthalene	0.667	0.369	0.354	55.4	53.1	48.0-101			4.11	20
Naphthalene	0.667	0.346	0.340	51.9	51.0	43.4-103			1.84	20
Phenanthrene	0.667	0.377	0.358	56.6	53.7	51.6-107			5.14	20
Bis(2-ethylhexyl)phthalate	0.667	0.439	0.415	65.8	62.3	48.1-116			5.49	20.5
Di-n-butyl phthalate	0.667	0.390	0.374	58.5	56.1	49.7-113			4.10	20
Diethyl phthalate	0.667	0.435	0.411	65.2	61.5	52.0-112			5.74	20
Pyrene	0.667	0.433	0.395	64.9	59.2	47.1-108			9.21	20
Pyridine	0.667	0.129	0.126	19.4	18.8	10.0-90.0			2.92	38.3
2-Methylphenol	0.667	0.320	0.328	47.9	49.1	42.4-100			2.44	20
3&4-Methyl Phenol	0.667	0.359	0.358	53.9	53.7	50.5-115			0.310	20
2,4-Dimethylphenol	0.667	0.306	0.308	45.9	46.2	42.2-110			0.600	20
2,4-Dinitrophenol	0.667	0.273	0.276	40.9	41.4	10.0-105			1.23	36.5
4-Nitrophenol	0.667	0.402	0.388	60.3	58.2	34.8-109			3.55	20
Phenol	0.667	0.322	0.315	48.3	47.2	41.5-106			2.34	20
(S) Nitrobenzene-d5				*55.7*	*52.5*	*21.9-129*				
(S) 2-Fluorobiphenyl				*59.0*	*54.0*	*34.9-129*				
(S) p-Terphenyl-d14				*64.7*	*59.9*	*21.5-128*				
(S) Phenol-d5				*46.7*	*45.5*	*26.3-121*				
(S) 2-Fluorophenol				*51.2*	*50.3*	*21.1-116*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3150330-1 07/17/16 14:21 • (LCSD) R3150330-2 07/17/16 14:44

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) 2,4,6-Tribromophenol				*57.2*	*54.2*	*21.6-142*				

Laboratory Control Sample (LCS)

(LCS) R3150992-1 07/19/16 12:02

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Quinoline	0.667	0.343	51.4	60.0-140	J4

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
V	The sample concentration is too high to evaluate accurate spike recoveries.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
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California	01157CA
Colorado	TN00003
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Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05

Nevada	TN-03-2002-34
New Hampshire	2975
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New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1,4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
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Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

Third Party & Federal Accreditations

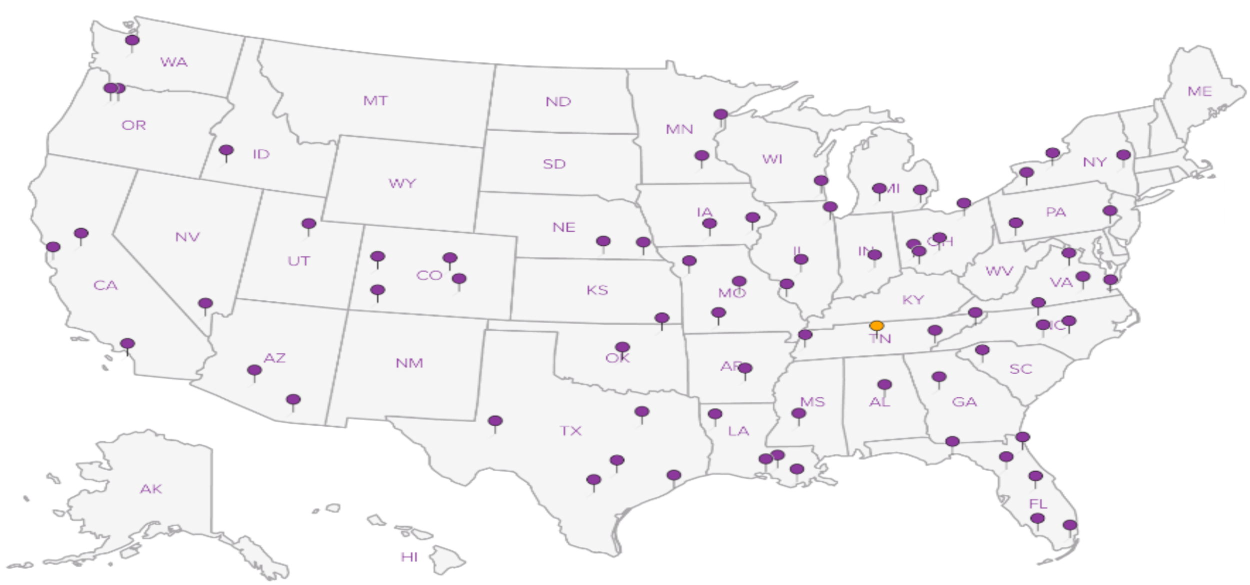
A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003

AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Chain of Custody Page 2 of 3

ESC LAB SCIENCES
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L846809
J154

Company Name/Address: AQUATERRA 122 South Church St West Chester PA 19382

Billing Information: AQUATERRA

Report to: MS@aquaterra-tech.com michael.newton@...

Email To: Michael Sciarretta ... Michael Newton

Project Description: PH REF AOI 8

City/State Collected: PA

Phone: 610 431 5733

Fax:

Client Project #

Lab Project #

Collected by (print): Luke Mokrzycki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No ___Yes
FAX? ___No ___Yes

Analysis / Container / Preservative: EVERGREEN COMP.

Acctnum:
Template:
Prelogin:
TSR:
PB:
Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREEN COMP.	Rem./Contaminant	Sample # (lab only)
AOI8-N-154-0-2-20160711		SS	0-2	7/11	1000	5	X		-01

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other ______

Remarks: TS Tube = Lot E16023PE

pH ______ Temp ______

Flow ______ Other ______

6617 3604 0327

Hold #

Samples returned via: ☐ UPS ☑ FedEx ☐ Courier ☐ ______

Condition: (lab use only) NB9

Relinquished by: (Signature)	Date: 7/12	Time: 1200	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)

Temp: 2.8 °C Bottles Received: 5

COC Seal Intact: ___Y ___N ___NA

Date: 7-13-16 Time: 0900

pH Checked:

NCF:

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ANALYTICAL REPORT

November 07, 2016

myESC
REAL TIME DATA ACCESS

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L852559
Samples Received:	08/10/2016
Project Number:	PH REF AOI-8
Description:	AOI-8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

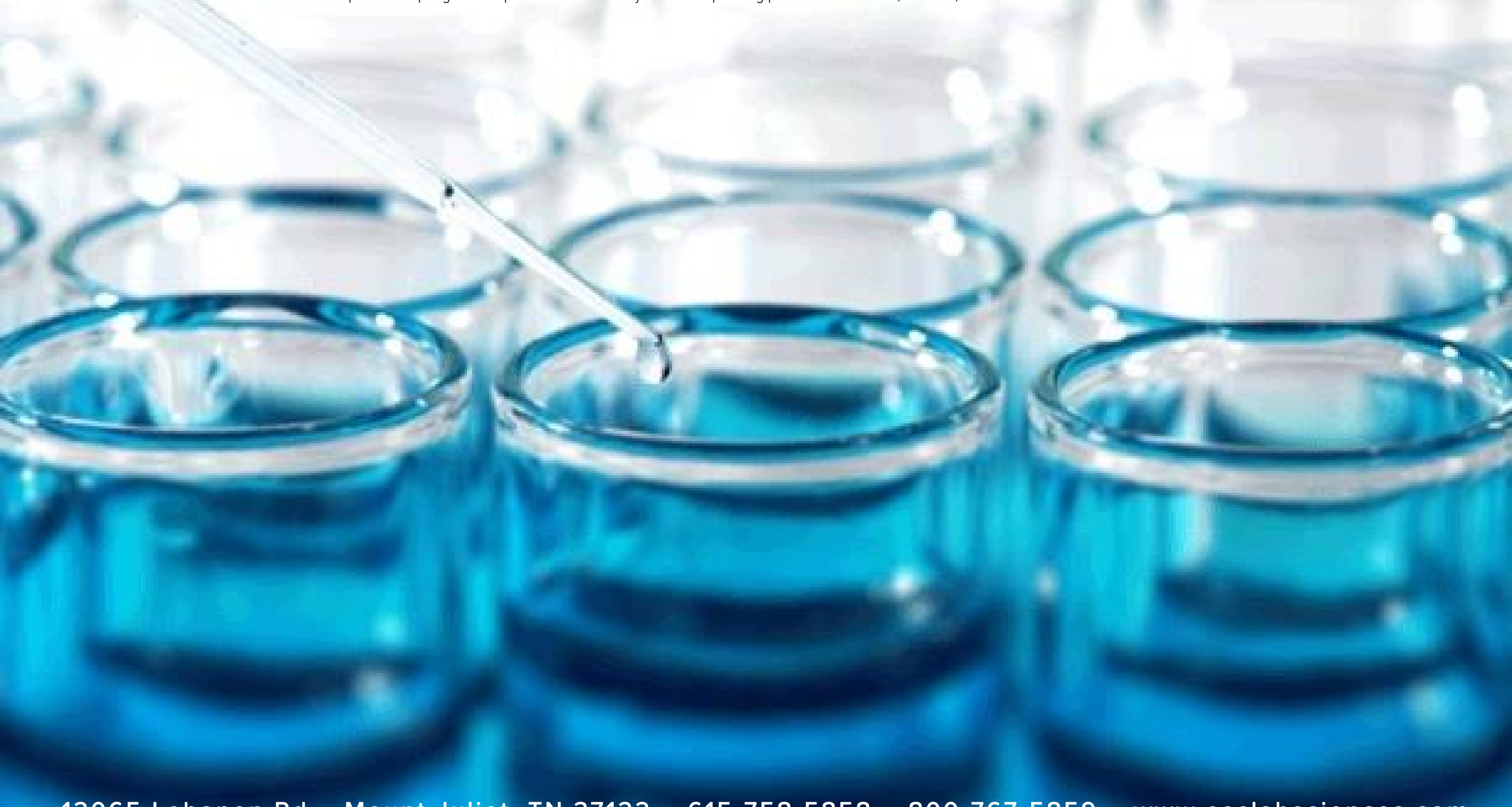


TABLE OF CONTENTS

AOI8-BH-16-042-0-2-20160808 L852559-01 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/08/16 08:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 14:53	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 17:42	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/16/16 13:29	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 03:41	JHH

AOI8-BH-16-042-8-10-20160808 L852559-02 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/08/16 09:30	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 14:56	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 22:32	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	5	08/15/16 11:32	08/16/16 14:52	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 04:02	JHH

AOI8-BH-16-041-0-2-20160808 L852559-03 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/08/16 10:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:04	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 16:15	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 16:30	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 04:24	JHH

AOI8-BH-16-041-8-10-20160808 L852559-04 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/08/16 12:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:07	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 20:56	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	20	08/15/16 11:32	08/16/16 14:12	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	18	08/16/16 19:02	08/17/16 04:45	JHH

AOI8-BH-16-040-0-2-20160808 L852559-05 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/08/16 13:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:10	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 22:56	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	5	08/15/16 11:32	08/16/16 14:13	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	5	08/15/16 11:32	08/16/16 15:11	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 05:07	JHH

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

AOI8-BH-16-040-8-10-20160808 L852559-06 Solid

Collected by: Luke M. | Collected date/time: 08/08/16 14:30 | Received date/time: 08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:12	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 23:21	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	20	08/15/16 11:32	08/16/16 14:37	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	20	08/15/16 11:32	08/16/16 15:31	SNR
Total Solids by Method 2540 G-2011	WG898069	1	08/12/16 09:23	08/12/16 09:32	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 05:28	CMJ

AOI8-EQUIPBLANK-20160808 L852559-07 GW

Collected by: Luke M. | Collected date/time: 08/08/16 15:00 | Received date/time: 08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
EDB / DBCP by Method 8011	WG898166	1	08/12/16 06:28	08/12/16 20:07	HMH
Metals (ICPMS) by Method 6020	WG897700	1	08/11/16 10:45	08/13/16 16:27	VSS
Metals (ICPMS) by Method 6020	WG897971	1	08/11/16 17:17	08/13/16 05:16	LAT
Semi Volatile Organic Compounds (GC/MS) by Method 8270 C-SIM	WG897600	1	08/11/16 14:05	08/12/16 04:13	FMB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG897796	1	08/14/16 17:28	08/15/16 10:18	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG897796	1	08/14/16 17:28	08/15/16 14:26	SNR
Volatile Organic Compounds (GC/MS) by Method 8260B	WG898501	1	08/15/16 18:12	08/15/16 18:12	DWR

AOI8-FIELDBLANK-20160808 L852559-08 GW

Collected by: Luke M. | Collected date/time: 08/08/16 15:30 | Received date/time: 08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
EDB / DBCP by Method 8011	WG898166	1	08/12/16 06:28	08/12/16 20:18	HMH
Metals (ICPMS) by Method 6020	WG897700	1	08/11/16 10:45	08/13/16 16:30	VSS
Metals (ICPMS) by Method 6020	WG897971	1	08/11/16 17:17	08/13/16 05:03	LAT
Semi Volatile Organic Compounds (GC/MS) by Method 8270 C-SIM	WG897600	1	08/11/16 14:05	08/12/16 04:34	FMB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG897796	1	08/14/16 17:28	08/15/16 10:41	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG897796	1	08/14/16 17:28	08/15/16 14:45	SNR
Volatile Organic Compounds (GC/MS) by Method 8260B	WG898501	1	08/15/16 18:35	08/15/16 18:35	DWR

AOI8-N-154-10-12-20160808 L852559-09 Solid

Collected by: Luke M. | Collected date/time: 08/08/16 14:25 | Received date/time: 08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:15	CCE
Metals (ICP) by Method 6010B	WG898167	50	08/12/16 09:31	08/15/16 12:11	LTB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	500	08/15/16 11:32	08/16/16 17:28	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	500	08/15/16 11:32	08/16/16 17:29	SNR
Total Solids by Method 2540 G-2011	WG898070	1	08/12/16 09:59	08/12/16 10:09	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 05:49	JHH

AOI8-BH-16-054-0-2-20160809 L852559-10 Solid

Collected by: Luke M. | Collected date/time: 08/09/16 10:00 | Received date/time: 08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:18	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 21:20	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	5	08/15/16 11:32	08/16/16 14:32	SNR
Total Solids by Method 2540 G-2011	WG898070	1	08/12/16 09:59	08/12/16 10:09	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 06:11	JHH

	Collected by	Collected date/time	Received date/time
AOI8-BH-16-054-10-12-20160809 L852559-11 Solid	Luke M.	08/09/16 12:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:20	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	1	08/15/16 11:32	08/15/16 18:06	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	5	08/15/16 11:32	08/16/16 13:49	SNR
Total Solids by Method 2540 G-2011	WG898070	1	08/12/16 09:59	08/12/16 10:09	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	1	08/16/16 19:02	08/17/16 06:32	JHH

	Collected by	Collected date/time	Received date/time
AOI8-BH-16-055-0-2-20160809 L852559-12 Solid	Luke M.	08/09/16 14:00	08/10/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG898167	1	08/12/16 09:31	08/12/16 15:23	CCE
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	100	08/15/16 11:32	08/16/16 15:51	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	100	08/15/16 11:32	08/16/16 16:11	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	50	08/15/16 11:32	08/16/16 00:33	SNR
Total Solids by Method 2540 G-2011	WG898070	1	08/12/16 09:59	08/12/16 10:09	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG899097	22.75	08/16/16 19:02	08/18/16 11:25	ACG

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	90.1		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	4.70		1.11	1	08/12/2016 14:53	WG898167
Lead	16.0		0.555	1	08/12/2016 14:53	WG898167
Nickel	5.35		2.22	1	08/12/2016 14:53	WG898167
Vanadium	13.3		2.22	1	08/12/2016 14:53	WG898167
Zinc	23.7		5.55	1	08/12/2016 14:53	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00111	1	08/17/2016 03:41	WG899097
sec-Butylbenzene	ND		0.00111	1	08/17/2016 03:41	WG899097
tert-Butylbenzene	ND		0.00111	1	08/17/2016 03:41	WG899097
Cyclohexane	ND		0.00111	1	08/17/2016 03:41	WG899097
1,2-Dibromoethane	ND		0.00111	1	08/17/2016 03:41	WG899097
n-Hexane	ND		0.0111	1	08/17/2016 03:41	WG899097
1,2-Dichloroethane	ND		0.00111	1	08/17/2016 03:41	WG899097
Ethylbenzene	ND		0.00111	1	08/17/2016 03:41	WG899097
Isopropylbenzene	ND		0.0111	1	08/17/2016 03:41	WG899097
2-Butanone (MEK)	ND		0.0111	1	08/17/2016 03:41	WG899097
Methyl tert-butyl ether	ND		0.00111	1	08/17/2016 03:41	WG899097
Toluene	ND		0.00555	1	08/17/2016 03:41	WG899097
1,2,4-Trimethylbenzene	ND		0.00111	1	08/17/2016 03:41	WG899097
1,3,5-Trimethylbenzene	ND		0.00111	1	08/17/2016 03:41	WG899097
Xylenes, Total	ND		0.00333	1	08/17/2016 03:41	WG899097
(S) Toluene-d8	*107*		*88.7-115*		*08/17/2016 03:41*	WG899097
(S) Dibromofluoromethane	*106*		*76.3-123*		*08/17/2016 03:41*	WG899097
(S) a,a,a-Trifluorotoluene	*99.3*		*87.2-117*		*08/17/2016 03:41*	WG899097
(S) 4-Bromofluorobenzene	*86.9*		*69.7-129*		*08/17/2016 03:41*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0366	1	08/15/2016 17:42	WG898448
Anthracene	ND		0.0366	1	08/15/2016 17:42	WG898448
Benzo(a)anthracene	ND		0.0366	1	08/15/2016 17:42	WG898448
Benzo(b)fluoranthene	ND		0.0366	1	08/15/2016 17:42	WG898448
Benzo(k)fluoranthene	ND		0.0366	1	08/15/2016 17:42	WG898448
Benzo(g,h,i)perylene	ND		0.0366	1	08/15/2016 17:42	WG898448
Benzo(a)pyrene	ND		0.0366	1	08/15/2016 17:42	WG898448
Biphenyl	ND		0.369	1	08/15/2016 17:42	WG898448
Chrysene	ND		0.0366	1	08/15/2016 17:42	WG898448
Dibenz(a,h)anthracene	ND		0.0366	1	08/15/2016 17:42	WG898448
Fluoranthene	ND		0.0366	1	08/15/2016 17:42	WG898448
Fluorene	ND		0.0366	1	08/15/2016 17:42	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.0366	1	08/15/2016 17:42	WG898448
2-Methylnaphthalene	ND		0.0366	1	08/15/2016 17:42	WG898448
Naphthalene	ND		0.0366	1	08/15/2016 17:42	WG898448
Phenanthrene	ND		0.0366	1	08/15/2016 17:42	WG898448
Pyridine	ND		0.369	1	08/15/2016 17:42	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		0.369	1	08/15/2016 17:42	WG898448
Di-n-butyl phthalate	ND		0.369	1	08/15/2016 17:42	WG898448
Diethyl phthalate	ND		0.369	1	08/15/2016 17:42	WG898448
Pyrene	ND		0.0366	1	08/15/2016 17:42	WG898448
2,4-Dimethylphenol	ND		0.369	1	08/15/2016 17:42	WG898448
2,4-Dinitrophenol	ND		0.369	1	08/15/2016 17:42	WG898448
2-Methylphenol	ND		0.369	1	08/15/2016 17:42	WG898448
3&4-Methyl Phenol	ND		0.369	1	08/15/2016 17:42	WG898448
4-Nitrophenol	ND		0.369	1	08/15/2016 17:42	WG898448
Phenol	ND		0.369	1	08/15/2016 17:42	WG898448
Quinoline	ND		0.369	1	08/16/2016 13:29	WG898448
(S) 2-Fluorophenol	*52.4*		*21.1-116*		*08/15/2016 17:42*	WG898448
(S) Phenol-d5	*47.8*		*26.3-121*		*08/15/2016 17:42*	WG898448
(S) Nitrobenzene-d5	*49.1*		*21.9-129*		*08/15/2016 17:42*	WG898448
(S) 2-Fluorobiphenyl	*51.4*		*34.9-129*		*08/15/2016 17:42*	WG898448
(S) 2,4,6-Tribromophenol	*36.4*		*21.6-142*		*08/15/2016 17:42*	WG898448
(S) p-Terphenyl-d14	*58.0*		*21.5-128*		*08/15/2016 17:42*	WG898448

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	79.3		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	6.28		1.26	1	08/12/2016 14:56	WG898167
Lead	265		0.631	1	08/12/2016 14:56	WG898167
Nickel	10.5		2.52	1	08/12/2016 14:56	WG898167
Vanadium	36.0		2.52	1	08/12/2016 14:56	WG898167
Zinc	216		6.31	1	08/12/2016 14:56	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00126	1	08/17/2016 04:02	WG899097
sec-Butylbenzene	ND		0.00126	1	08/17/2016 04:02	WG899097
tert-Butylbenzene	ND		0.00126	1	08/17/2016 04:02	WG899097
Cyclohexane	ND		0.00126	1	08/17/2016 04:02	WG899097
1,2-Dibromoethane	ND		0.00126	1	08/17/2016 04:02	WG899097
n-Hexane	ND		0.0126	1	08/17/2016 04:02	WG899097
1,2-Dichloroethane	ND		0.00126	1	08/17/2016 04:02	WG899097
Ethylbenzene	ND		0.00126	1	08/17/2016 04:02	WG899097
Isopropylbenzene	ND		0.0126	1	08/17/2016 04:02	WG899097
2-Butanone (MEK)	ND		0.0126	1	08/17/2016 04:02	WG899097
Methyl tert-butyl ether	ND		0.00126	1	08/17/2016 04:02	WG899097
Toluene	ND		0.00631	1	08/17/2016 04:02	WG899097
1,2,4-Trimethylbenzene	ND		0.00126	1	08/17/2016 04:02	WG899097
1,3,5-Trimethylbenzene	ND		0.00126	1	08/17/2016 04:02	WG899097
Xylenes, Total	ND		0.00378	1	08/17/2016 04:02	WG899097
(S) Toluene-d8	*107*		*88.7-115*		*08/17/2016 04:02*	WG899097
(S) Dibromofluoromethane	*106*		*76.3-123*		*08/17/2016 04:02*	WG899097
(S) a,a,a-Trifluorotoluene	*99.9*		*87.2-117*		*08/17/2016 04:02*	WG899097
(S) 4-Bromofluorobenzene	*86.5*		*69.7-129*		*08/17/2016 04:02*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0416	1	08/15/2016 22:32	WG898448
Anthracene	0.0743		0.0416	1	08/15/2016 22:32	WG898448
Benzo(a)anthracene	0.326		0.0416	1	08/15/2016 22:32	WG898448
Benzo(b)fluoranthene	0.639		0.0416	1	08/15/2016 22:32	WG898448
Benzo(k)fluoranthene	0.220		0.0416	1	08/15/2016 22:32	WG898448
Benzo(g,h,i)perylene	0.0606		0.0416	1	08/15/2016 22:32	WG898448
Benzo(a)pyrene	0.377		0.0416	1	08/15/2016 22:32	WG898448
Biphenyl	ND		0.420	1	08/15/2016 22:32	WG898448
Chrysene	0.377		0.0416	1	08/15/2016 22:32	WG898448
Dibenz(a,h)anthracene	ND		0.0416	1	08/15/2016 22:32	WG898448
Fluoranthene	0.576		0.0416	1	08/15/2016 22:32	WG898448
Fluorene	0.0491		0.0416	1	08/15/2016 22:32	WG898448
Indeno(1,2,3-cd)pyrene	0.0646		0.0416	1	08/15/2016 22:32	WG898448
2-Methylnaphthalene	0.118		0.0416	1	08/15/2016 22:32	WG898448
Naphthalene	0.143		0.0416	1	08/15/2016 22:32	WG898448
Phenanthrene	0.341		0.0416	1	08/15/2016 22:32	WG898448
Pyridine	ND		0.420	1	08/15/2016 22:32	WG898448

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		0.420	1	08/15/2016 22:32	WG898448
Di-n-butyl phthalate	ND		0.420	1	08/15/2016 22:32	WG898448
Diethyl phthalate	ND		0.420	1	08/15/2016 22:32	WG898448
Pyrene	0.547		0.0416	1	08/15/2016 22:32	WG898448
2,4-Dimethylphenol	ND		0.420	1	08/15/2016 22:32	WG898448
2,4-Dinitrophenol	ND		0.420	1	08/15/2016 22:32	WG898448
2-Methylphenol	ND		0.420	1	08/15/2016 22:32	WG898448
3&4-Methyl Phenol	ND		0.420	1	08/15/2016 22:32	WG898448
4-Nitrophenol	ND		0.420	1	08/15/2016 22:32	WG898448
Phenol	ND		0.420	1	08/15/2016 22:32	WG898448
Quinoline	ND		2.10	5	08/16/2016 14:52	WG898448
(S) 2-Fluorophenol	*45.2*		*21.1-116*		*08/15/2016 22:32*	WG898448
(S) Phenol-d5	*39.4*		*26.3-121*		*08/15/2016 22:32*	WG898448
(S) Nitrobenzene-d5	*38.1*		*21.9-129*		*08/15/2016 22:32*	WG898448
(S) 2-Fluorobiphenyl	*38.9*		*34.9-129*		*08/15/2016 22:32*	WG898448
(S) 2,4,6-Tribromophenol	*38.7*		*21.6-142*		*08/15/2016 22:32*	WG898448
(S) p-Terphenyl-d14	*54.7*		*21.5-128*		*08/15/2016 22:32*	WG898448

Sample Narrative:

8270C L852559-02 WG898448: Dilution due to matrix

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	89.7		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	4.97		1.12	1	08/12/2016 15:04	WG898167
Lead	21.1		0.558	1	08/12/2016 15:04	WG898167
Nickel	6.20		2.23	1	08/12/2016 15:04	WG898167
Vanadium	16.1		2.23	1	08/12/2016 15:04	WG898167
Zinc	33.0		5.58	1	08/12/2016 15:04	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00112	1	08/17/2016 04:24	WG899097
sec-Butylbenzene	ND		0.00112	1	08/17/2016 04:24	WG899097
tert-Butylbenzene	ND		0.00112	1	08/17/2016 04:24	WG899097
Cyclohexane	0.00144		0.00112	1	08/17/2016 04:24	WG899097
1,2-Dibromoethane	ND		0.00112	1	08/17/2016 04:24	WG899097
n-Hexane	ND		0.0112	1	08/17/2016 04:24	WG899097
1,2-Dichloroethane	ND		0.00112	1	08/17/2016 04:24	WG899097
Ethylbenzene	ND		0.00112	1	08/17/2016 04:24	WG899097
Isopropylbenzene	ND		0.0112	1	08/17/2016 04:24	WG899097
2-Butanone (MEK)	0.0120		0.0112	1	08/17/2016 04:24	WG899097
Methyl tert-butyl ether	ND		0.00112	1	08/17/2016 04:24	WG899097
Toluene	ND		0.00558	1	08/17/2016 04:24	WG899097
1,2,4-Trimethylbenzene	ND		0.00112	1	08/17/2016 04:24	WG899097
1,3,5-Trimethylbenzene	ND		0.00112	1	08/17/2016 04:24	WG899097
Xylenes, Total	ND		0.00335	1	08/17/2016 04:24	WG899097
(S) Toluene-d8	*103*		*88.7-115*		*08/17/2016 04:24*	WG899097
(S) Dibromofluoromethane	*109*		*76.3-123*		*08/17/2016 04:24*	WG899097
(S) a,a,a-Trifluorotoluene	*95.3*		*87.2-117*		*08/17/2016 04:24*	WG899097
(S) 4-Bromofluorobenzene	*82.9*		*69.7-129*		*08/17/2016 04:24*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		7.36	200	08/16/2016 16:15	WG898448
Anthracene	ND		7.36	200	08/16/2016 16:15	WG898448
Benzo(a)anthracene	ND		7.36	200	08/16/2016 16:15	WG898448
Benzo(b)fluoranthene	ND		7.36	200	08/16/2016 16:15	WG898448
Benzo(k)fluoranthene	ND		7.36	200	08/16/2016 16:15	WG898448
Benzo(g,h,i)perylene	ND		7.36	200	08/16/2016 16:15	WG898448
Benzo(a)pyrene	ND		7.36	200	08/16/2016 16:15	WG898448
Biphenyl	ND		74.3	200	08/16/2016 16:15	WG898448
Chrysene	ND		7.36	200	08/16/2016 16:15	WG898448
Dibenz(a,h)anthracene	ND		7.36	200	08/16/2016 16:15	WG898448
Fluoranthene	ND		7.36	200	08/16/2016 16:15	WG898448
Fluorene	ND		7.36	200	08/16/2016 16:15	WG898448
Indeno(1,2,3-cd)pyrene	ND		7.36	200	08/16/2016 16:15	WG898448
2-Methylnaphthalene	ND		7.36	200	08/16/2016 16:15	WG898448
Naphthalene	ND		7.36	200	08/16/2016 16:15	WG898448
Phenanthrene	ND		7.36	200	08/16/2016 16:15	WG898448
Pyridine	ND		74.3	200	08/16/2016 16:15	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		74.3	200	08/16/2016 16:15	WG898448
Di-n-butyl phthalate	ND		74.3	200	08/16/2016 16:15	WG898448
Diethyl phthalate	ND		74.3	200	08/16/2016 16:15	WG898448
Pyrene	ND		7.36	200	08/16/2016 16:15	WG898448
2,4-Dimethylphenol	ND		74.3	200	08/16/2016 16:15	WG898448
2,4-Dinitrophenol	ND		74.3	200	08/16/2016 16:15	WG898448
2-Methylphenol	ND		74.3	200	08/16/2016 16:15	WG898448
3&4-Methyl Phenol	ND		74.3	200	08/16/2016 16:15	WG898448
4-Nitrophenol	ND		74.3	200	08/16/2016 16:15	WG898448
Phenol	ND		74.3	200	08/16/2016 16:15	WG898448
Quinoline	ND		74.3	200	08/16/2016 16:30	WG898448
(S) 2-Fluorophenol	*56.2*	J7	*21.1-116*		*08/16/2016 16:15*	WG898448
(S) Phenol-d5	*59.3*	J7	*26.3-121*		*08/16/2016 16:15*	WG898448
(S) Nitrobenzene-d5	*63.5*	J7	*21.9-129*		*08/16/2016 16:15*	WG898448
(S) 2-Fluorobiphenyl	*89.8*	J7	*34.9-129*		*08/16/2016 16:15*	WG898448
(S) 2,4,6-Tribromophenol	*28.2*	J7	*21.6-142*		*08/16/2016 16:15*	WG898448
(S) p-Terphenyl-d14	*85.6*	J7	*21.5-128*		*08/16/2016 16:15*	WG898448

Sample Narrative:

8270C L852559-03 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	82.6		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	10.0		1.21	1	08/12/2016 15:07	WG898167
Lead	5.89		0.606	1	08/12/2016 15:07	WG898167
Nickel	6.01		2.42	1	08/12/2016 15:07	WG898167
Vanadium	13.1		2.42	1	08/12/2016 15:07	WG898167
Zinc	19.0	B	6.06	1	08/12/2016 15:07	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.0218	18	08/17/2016 04:45	WG899097
sec-Butylbenzene	0.117		0.0218	18	08/17/2016 04:45	WG899097
tert-Butylbenzene	0.0686		0.0218	18	08/17/2016 04:45	WG899097
Cyclohexane	ND		0.0218	18	08/17/2016 04:45	WG899097
1,2-Dibromoethane	ND		0.0218	18	08/17/2016 04:45	WG899097
n-Hexane	ND		0.218	18	08/17/2016 04:45	WG899097
1,2-Dichloroethane	ND		0.0218	18	08/17/2016 04:45	WG899097
Ethylbenzene	ND		0.0218	18	08/17/2016 04:45	WG899097
Isopropylbenzene	ND		0.218	18	08/17/2016 04:45	WG899097
2-Butanone (MEK)	ND		0.218	18	08/17/2016 04:45	WG899097
Methyl tert-butyl ether	ND		0.0218	18	08/17/2016 04:45	WG899097
Toluene	ND		0.109	18	08/17/2016 04:45	WG899097
1,2,4-Trimethylbenzene	ND		0.0218	18	08/17/2016 04:45	WG899097
1,3,5-Trimethylbenzene	ND		0.0218	18	08/17/2016 04:45	WG899097
Xylenes, Total	ND		0.0654	18	08/17/2016 04:45	WG899097
(S) Toluene-d8	*112*		*88.7-115*		*08/17/2016 04:45*	WG899097
(S) Dibromofluoromethane	*99.8*		*76.3-123*		*08/17/2016 04:45*	WG899097
(S) a,a,a-Trifluorotoluene	*98.6*		*87.2-117*		*08/17/2016 04:45*	WG899097
(S) 4-Bromofluorobenzene	*177*	J1	*69.7-129*		*08/17/2016 04:45*	WG899097

Sample Narrative:

8260B L852559-04 WG899097: Non-target compounds too high to run at a lower dilution.

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0400	1	08/15/2016 20:56	WG898448
Anthracene	ND		0.0400	1	08/15/2016 20:56	WG898448
Benzo(a)anthracene	ND		0.0400	1	08/15/2016 20:56	WG898448
Benzo(b)fluoranthene	ND		0.0400	1	08/15/2016 20:56	WG898448
Benzo(k)fluoranthene	ND		0.0400	1	08/15/2016 20:56	WG898448
Benzo(g,h,i)perylene	ND		0.0400	1	08/15/2016 20:56	WG898448
Benzo(a)pyrene	ND		0.0400	1	08/15/2016 20:56	WG898448
Biphenyl	ND		0.403	1	08/15/2016 20:56	WG898448
Chrysene	ND		0.0400	1	08/15/2016 20:56	WG898448
Dibenz(a,h)anthracene	ND		0.0400	1	08/15/2016 20:56	WG898448
Fluoranthene	0.116		0.0400	1	08/15/2016 20:56	WG898448
Fluorene	0.0732		0.0400	1	08/15/2016 20:56	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.0400	1	08/15/2016 20:56	WG898448
2-Methylnaphthalene	ND		0.0400	1	08/15/2016 20:56	WG898448

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		0.0400	1	08/15/2016 20:56	WG898448
Phenanthrene	ND		0.0400	1	08/15/2016 20:56	WG898448
Pyridine	ND		0.403	1	08/15/2016 20:56	WG898448
Bis(2-ethylhexyl)phthalate	ND		0.403	1	08/15/2016 20:56	WG898448
Di-n-butyl phthalate	ND		0.403	1	08/15/2016 20:56	WG898448
Diethyl phthalate	ND		0.403	1	08/15/2016 20:56	WG898448
Pyrene	0.0725		0.0400	1	08/15/2016 20:56	WG898448
2,4-Dimethylphenol	ND		0.403	1	08/15/2016 20:56	WG898448
2,4-Dinitrophenol	ND		0.403	1	08/15/2016 20:56	WG898448
2-Methylphenol	ND		0.403	1	08/15/2016 20:56	WG898448
3&4-Methyl Phenol	ND		0.403	1	08/15/2016 20:56	WG898448
4-Nitrophenol	ND		0.403	1	08/15/2016 20:56	WG898448
Phenol	ND		0.403	1	08/15/2016 20:56	WG898448
Quinoline	ND		8.07	20	08/16/2016 14:12	WG898448
(S) 2-Fluorophenol	*58.1*		*21.1-116*		*08/15/2016 20:56*	WG898448
(S) Phenol-d5	*56.3*		*26.3-121*		*08/15/2016 20:56*	WG898448
(S) Nitrobenzene-d5	*76.6*		*21.9-129*		*08/15/2016 20:56*	WG898448
(S) 2-Fluorobiphenyl	*62.1*		*34.9-129*		*08/15/2016 20:56*	WG898448
(S) 2,4,6-Tribromophenol	*76.4*		*21.6-142*		*08/15/2016 20:56*	WG898448
(S) p-Terphenyl-d14	*99.1*		*21.5-128*		*08/15/2016 20:56*	WG898448

Sample Narrative:

8270C L852559-04 WG898448: Dilution due to matrix

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	87.0		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	7.58		1.15	1	08/12/2016 15:10	WG898167
Lead	22.3		0.575	1	08/12/2016 15:10	WG898167
Nickel	8.92		2.30	1	08/12/2016 15:10	WG898167
Vanadium	27.5		2.30	1	08/12/2016 15:10	WG898167
Zinc	50.2		5.75	1	08/12/2016 15:10	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00204		0.00115	1	08/17/2016 05:07	WG899097
sec-Butylbenzene	ND		0.00115	1	08/17/2016 05:07	WG899097
tert-Butylbenzene	ND		0.00115	1	08/17/2016 05:07	WG899097
Cyclohexane	ND		0.00115	1	08/17/2016 05:07	WG899097
1,2-Dibromoethane	ND		0.00115	1	08/17/2016 05:07	WG899097
n-Hexane	ND		0.0115	1	08/17/2016 05:07	WG899097
1,2-Dichloroethane	ND		0.00115	1	08/17/2016 05:07	WG899097
Ethylbenzene	ND		0.00115	1	08/17/2016 05:07	WG899097
Isopropylbenzene	ND		0.0115	1	08/17/2016 05:07	WG899097
2-Butanone (MEK)	0.0117		0.0115	1	08/17/2016 05:07	WG899097
Methyl tert-butyl ether	ND		0.00115	1	08/17/2016 05:07	WG899097
Toluene	ND		0.00575	1	08/17/2016 05:07	WG899097
1,2,4-Trimethylbenzene	ND		0.00115	1	08/17/2016 05:07	WG899097
1,3,5-Trimethylbenzene	ND		0.00115	1	08/17/2016 05:07	WG899097
Xylenes, Total	ND		0.00345	1	08/17/2016 05:07	WG899097
(S) Toluene-d8	*108*		*88.7-115*		*08/17/2016 05:07*	WG899097
(S) Dibromofluoromethane	*105*		*76.3-123*		*08/17/2016 05:07*	WG899097
(S) a,a,a-Trifluorotoluene	*100*		*87.2-117*		*08/17/2016 05:07*	WG899097
(S) 4-Bromofluorobenzene	*87.2*		*69.7-129*		*08/17/2016 05:07*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0379	1	08/15/2016 22:56	WG898448
Anthracene	0.0401		0.0379	1	08/15/2016 22:56	WG898448
Benzo(a)anthracene	0.102		0.0379	1	08/15/2016 22:56	WG898448
Benzo(b)fluoranthene	ND		0.190	5	08/16/2016 14:13	WG898448
Benzo(k)fluoranthene	ND		0.190	5	08/16/2016 14:13	WG898448
Benzo(g,h,i)perylene	ND		0.190	5	08/16/2016 14:13	WG898448
Benzo(a)pyrene	ND		0.190	5	08/16/2016 14:13	WG898448
Biphenyl	ND		0.383	1	08/15/2016 22:56	WG898448
Chrysene	0.0969		0.0379	1	08/15/2016 22:56	WG898448
Dibenz(a,h)anthracene	ND		0.190	5	08/16/2016 14:13	WG898448
Fluoranthene	0.193		0.0379	1	08/15/2016 22:56	WG898448
Fluorene	ND		0.0379	1	08/15/2016 22:56	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.190	5	08/16/2016 14:13	WG898448
2-Methylnaphthalene	ND		0.0379	1	08/15/2016 22:56	WG898448
Naphthalene	ND		0.0379	1	08/15/2016 22:56	WG898448
Phenanthrene	0.134		0.0379	1	08/15/2016 22:56	WG898448
Pyridine	ND		0.383	1	08/15/2016 22:56	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		0.383	1	08/15/2016 22:56	WG898448
Di-n-butyl phthalate	ND		0.383	1	08/15/2016 22:56	WG898448
Diethyl phthalate	ND		0.383	1	08/15/2016 22:56	WG898448
Pyrene	0.176		0.0379	1	08/15/2016 22:56	WG898448
2,4-Dimethylphenol	ND		0.383	1	08/15/2016 22:56	WG898448
2,4-Dinitrophenol	ND		0.383	1	08/15/2016 22:56	WG898448
2-Methylphenol	ND		0.383	1	08/15/2016 22:56	WG898448
3&4-Methyl Phenol	ND		0.383	1	08/15/2016 22:56	WG898448
4-Nitrophenol	ND		0.383	1	08/15/2016 22:56	WG898448
Phenol	ND		0.383	1	08/15/2016 22:56	WG898448
Quinoline	ND		1.91	5	08/16/2016 15:11	WG898448
(S) 2-Fluorophenol	*66.2*		*21.1-116*		*08/15/2016 22:56*	WG898448
(S) 2-Fluorophenol	*64.2*		*21.1-116*		*08/16/2016 14:13*	WG898448
(S) Phenol-d5	*61.5*		*26.3-121*		*08/16/2016 14:13*	WG898448
(S) Phenol-d5	*64.1*		*26.3-121*		*08/15/2016 22:56*	WG898448
(S) Nitrobenzene-d5	*67.1*		*21.9-129*		*08/15/2016 22:56*	WG898448
(S) Nitrobenzene-d5	*64.6*		*21.9-129*		*08/16/2016 14:13*	WG898448
(S) 2-Fluorobiphenyl	*67.6*		*34.9-129*		*08/16/2016 14:13*	WG898448
(S) 2-Fluorobiphenyl	*69.4*		*34.9-129*		*08/15/2016 22:56*	WG898448
(S) 2,4,6-Tribromophenol	*65.1*		*21.6-142*		*08/15/2016 22:56*	WG898448
(S) 2,4,6-Tribromophenol	*52.1*		*21.6-142*		*08/16/2016 14:13*	WG898448
(S) p-Terphenyl-d14	*76.7*		*21.5-128*		*08/16/2016 14:13*	WG898448
(S) p-Terphenyl-d14	*93.2*		*21.5-128*		*08/15/2016 22:56*	WG898448

Sample Narrative:

8270C L852559-05 WG898448: IS/SURR failed on lower dilution.

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	80.3		1	08/12/2016 09:32	WG898069

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	4.06		1.24	1	08/12/2016 15:12	WG898167
Lead	50.5		0.622	1	08/12/2016 15:12	WG898167
Nickel	7.86		2.49	1	08/12/2016 15:12	WG898167
Vanadium	19.4		2.49	1	08/12/2016 15:12	WG898167
Zinc	66.1		6.22	1	08/12/2016 15:12	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00124	1	08/17/2016 05:28	WG899097
sec-Butylbenzene	ND		0.00124	1	08/17/2016 05:28	WG899097
tert-Butylbenzene	ND		0.00124	1	08/17/2016 05:28	WG899097
Cyclohexane	ND		0.00124	1	08/17/2016 05:28	WG899097
1,2-Dibromoethane	ND		0.00124	1	08/17/2016 05:28	WG899097
n-Hexane	ND		0.0124	1	08/17/2016 05:28	WG899097
1,2-Dichloroethane	ND		0.00124	1	08/17/2016 05:28	WG899097
Ethylbenzene	ND		0.00124	1	08/17/2016 05:28	WG899097
Isopropylbenzene	ND		0.0124	1	08/17/2016 05:28	WG899097
2-Butanone (MEK)	ND		0.0124	1	08/17/2016 05:28	WG899097
Methyl tert-butyl ether	ND		0.00124	1	08/17/2016 05:28	WG899097
Toluene	ND		0.00622	1	08/17/2016 05:28	WG899097
1,2,4-Trimethylbenzene	ND		0.00124	1	08/17/2016 05:28	WG899097
1,3,5-Trimethylbenzene	ND		0.00124	1	08/17/2016 05:28	WG899097
Xylenes, Total	ND		0.00373	1	08/17/2016 05:28	WG899097
(S) Toluene-d8	*107*		*88.7-115*		*08/17/2016 05:28*	WG899097
(S) Dibromofluoromethane	*104*		*76.3-123*		*08/17/2016 05:28*	WG899097
(S) a,a,a-Trifluorotoluene	*99.2*		*87.2-117*		*08/17/2016 05:28*	WG899097
(S) 4-Bromofluorobenzene	*127*		*69.7-129*		*08/17/2016 05:28*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0411	1	08/15/2016 23:21	WG898448
Anthracene	ND		0.0411	1	08/15/2016 23:21	WG898448
Benzo(a)anthracene	0.0597		0.0411	1	08/15/2016 23:21	WG898448
Benzo(b)fluoranthene	ND		0.821	20	08/16/2016 14:37	WG898448
Benzo(k)fluoranthene	ND		0.821	20	08/16/2016 14:37	WG898448
Benzo(g,h,i)perylene	ND		0.821	20	08/16/2016 14:37	WG898448
Benzo(a)pyrene	ND		0.821	20	08/16/2016 14:37	WG898448
Biphenyl	ND		0.414	1	08/15/2016 23:21	WG898448
Chrysene	0.0940		0.0411	1	08/15/2016 23:21	WG898448
Dibenz(a,h)anthracene	ND		0.821	20	08/16/2016 14:37	WG898448
Fluoranthene	0.121		0.0411	1	08/15/2016 23:21	WG898448
Fluorene	ND		0.0411	1	08/15/2016 23:21	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.821	20	08/16/2016 14:37	WG898448
2-Methylnaphthalene	ND		0.0411	1	08/15/2016 23:21	WG898448
Naphthalene	ND		0.0411	1	08/15/2016 23:21	WG898448
Phenanthrene	ND		0.0411	1	08/15/2016 23:21	WG898448
Pyridine	ND		0.414	1	08/15/2016 23:21	WG898448

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Bis(2-ethylhexyl)phthalate	ND		0.414	1	08/15/2016 23:21	WG898448
Di-n-butyl phthalate	ND		0.414	1	08/15/2016 23:21	WG898448
Diethyl phthalate	ND		0.414	1	08/15/2016 23:21	WG898448
Pyrene	0.325		0.0411	1	08/15/2016 23:21	WG898448
2,4-Dimethylphenol	ND		0.414	1	08/15/2016 23:21	WG898448
2,4-Dinitrophenol	ND		0.414	1	08/15/2016 23:21	WG898448
2-Methylphenol	ND		0.414	1	08/15/2016 23:21	WG898448
3&4-Methyl Phenol	ND		0.414	1	08/15/2016 23:21	WG898448
4-Nitrophenol	ND		0.414	1	08/15/2016 23:21	WG898448
Phenol	ND		0.414	1	08/15/2016 23:21	WG898448
Quinoline	ND		8.29	20	08/16/2016 15:31	WG898448
(S) 2-Fluorophenol	*57.0*		*21.1-116*		*08/15/2016 23:21*	WG898448
(S) 2-Fluorophenol	*59.1*	J7	*21.1-116*		*08/16/2016 14:37*	WG898448
(S) Phenol-d5	*55.6*	J7	*26.3-121*		*08/16/2016 14:37*	WG898448
(S) Phenol-d5	*52.8*		*26.3-121*		*08/15/2016 23:21*	WG898448
(S) Nitrobenzene-d5	*62.9*		*21.9-129*		*08/15/2016 23:21*	WG898448
(S) Nitrobenzene-d5	*74.5*	J7	*21.9-129*		*08/16/2016 14:37*	WG898448
(S) 2-Fluorobiphenyl	*73.0*	J7	*34.9-129*		*08/16/2016 14:37*	WG898448
(S) 2-Fluorobiphenyl	*55.3*		*34.9-129*		*08/15/2016 23:21*	WG898448
(S) 2,4,6-Tribromophenol	*55.7*		*21.6-142*		*08/15/2016 23:21*	WG898448
(S) 2,4,6-Tribromophenol	*40.9*	J7	*21.6-142*		*08/16/2016 14:37*	WG898448
(S) p-Terphenyl-d14	*73.3*	J7	*21.5-128*		*08/16/2016 14:37*	WG898448
(S) p-Terphenyl-d14	*96.6*		*21.5-128*		*08/15/2016 23:21*	WG898448

Sample Narrative:

8270C L852559-06 WG898448: IS/SURR failed on lower dilution.

8270C L852559-06 WG898448: Dilution due to matrix

Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Cobalt,Dissolved	ND		2.00	1	08/13/2016 05:16	WG897971
Lead,Dissolved	ND		2.00	1	08/13/2016 16:27	WG897700
Nickel,Dissolved	16.7		2.00	1	08/13/2016 16:27	WG897700
Vanadium,Dissolved	ND		5.00	1	08/13/2016 16:27	WG897700
Zinc,Dissolved	33.9		25.0	1	08/13/2016 16:27	WG897700

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	ND		50.0	1	08/15/2016 18:12	WG898501
Benzene	ND		1.00	1	08/15/2016 18:12	WG898501
Bromochloromethane	ND		1.00	1	08/15/2016 18:12	WG898501
Bromodichloromethane	ND		1.00	1	08/15/2016 18:12	WG898501
Bromoform	ND		1.00	1	08/15/2016 18:12	WG898501
Bromomethane	ND		5.00	1	08/15/2016 18:12	WG898501
Carbon disulfide	ND		1.00	1	08/15/2016 18:12	WG898501
Carbon tetrachloride	ND		1.00	1	08/15/2016 18:12	WG898501
Chlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
Chlorodibromomethane	ND		1.00	1	08/15/2016 18:12	WG898501
Chloroethane	ND		5.00	1	08/15/2016 18:12	WG898501
Chloroform	ND		5.00	1	08/15/2016 18:12	WG898501
Chloromethane	ND		2.50	1	08/15/2016 18:12	WG898501
Cyclohexane	ND		1.00	1	08/15/2016 18:12	WG898501
1,2-Dibromo-3-Chloropropane	ND		5.00	1	08/15/2016 18:12	WG898501
1,2-Dibromoethane	ND		1.00	1	08/15/2016 18:12	WG898501
1,2-Dichlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
1,3-Dichlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
1,4-Dichlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
Dichlorodifluoromethane	ND		5.00	1	08/15/2016 18:12	WG898501
1,1-Dichloroethane	ND		1.00	1	08/15/2016 18:12	WG898501
1,2-Dichloroethane	ND		1.00	1	08/15/2016 18:12	WG898501
1,1-Dichloroethene	ND		1.00	1	08/15/2016 18:12	WG898501
cis-1,2-Dichloroethene	ND		1.00	1	08/15/2016 18:12	WG898501
trans-1,2-Dichloroethene	ND		1.00	1	08/15/2016 18:12	WG898501
1,2-Dichloropropane	ND		1.00	1	08/15/2016 18:12	WG898501
cis-1,3-Dichloropropene	ND		1.00	1	08/15/2016 18:12	WG898501
trans-1,3-Dichloropropene	ND		1.00	1	08/15/2016 18:12	WG898501
Ethylbenzene	ND		1.00	1	08/15/2016 18:12	WG898501
2-Hexanone	ND		10.0	1	08/15/2016 18:12	WG898501
Isopropylbenzene	ND		1.00	1	08/15/2016 18:12	WG898501
2-Butanone (MEK)	ND		10.0	1	08/15/2016 18:12	WG898501
Methyl Acetate	ND		20.0	1	08/15/2016 18:12	WG898501
Methyl Cyclohexane	ND		1.00	1	08/15/2016 18:12	WG898501
Methylene Chloride	ND		5.00	1	08/15/2016 18:12	WG898501
4-Methyl-2-pentanone (MIBK)	ND		10.0	1	08/15/2016 18:12	WG898501
Methyl tert-butyl ether	ND		1.00	1	08/15/2016 18:12	WG898501
Styrene	ND		1.00	1	08/15/2016 18:12	WG898501
1,1,2,2-Tetrachloroethane	ND		1.00	1	08/15/2016 18:12	WG898501
Tetrachloroethene	ND		1.00	1	08/15/2016 18:12	WG898501
Toluene	ND		5.00	1	08/15/2016 18:12	WG898501
1,2,3-Trichlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
1,2,4-Trichlorobenzene	ND		1.00	1	08/15/2016 18:12	WG898501
1,1,1-Trichloroethane	ND		1.00	1	08/15/2016 18:12	WG898501
1,1,2-Trichloroethane	ND		1.00	1	08/15/2016 18:12	WG898501
Trichloroethene	ND		1.00	1	08/15/2016 18:12	WG898501

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		5.00	1	08/15/2016 18:12	WG898501
1,1,2-Trichlorotrifluoroethane	ND		1.00	1	08/15/2016 18:12	WG898501
Vinyl chloride	ND		1.00	1	08/15/2016 18:12	WG898501
Xylenes, Total	ND		3.00	1	08/15/2016 18:12	WG898501
(S) Toluene-d8	*98.2*		*90.0-115*		*08/15/2016 18:12*	WG898501
(S) Dibromofluoromethane	*90.9*		*79.0-121*		*08/15/2016 18:12*	WG898501
(S) a,a,a-Trifluorotoluene	*98.4*		*90.4-116*		*08/15/2016 18:12*	WG898501
(S) 4-Bromofluorobenzene	*91.7*		*80.1-120*		*08/15/2016 18:12*	WG898501

EDB / DBCP by Method 8011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0100	1	08/12/2016 20:07	WG898166
1,2-Dibromo-3-Chloropropane	ND		0.0200	1	08/12/2016 20:07	WG898166

Semi Volatile Organic Compounds (GC/MS) by Method 8270 C-SIM

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Anthracene	ND		0.0500	1	08/12/2016 04:13	WG897600
Acenaphthene	ND		0.0500	1	08/12/2016 04:13	WG897600
Benzo(a)anthracene	ND		0.0500	1	08/12/2016 04:13	WG897600
Benzo(a)pyrene	ND		0.0500	1	08/12/2016 04:13	WG897600
Benzo(b)fluoranthene	ND		0.0500	1	08/12/2016 04:13	WG897600
Benzo(g,h,i)perylene	ND		0.0500	1	08/12/2016 04:13	WG897600
Benzo(k)fluoranthene	ND		0.0500	1	08/12/2016 04:13	WG897600
Chrysene	ND		0.0500	1	08/12/2016 04:13	WG897600
Dibenz(a,h)anthracene	ND		0.0500	1	08/12/2016 04:13	WG897600
Fluoranthene	ND		0.0500	1	08/12/2016 04:13	WG897600
Fluorene	ND		0.0500	1	08/12/2016 04:13	WG897600
Indeno(1,2,3-cd)pyrene	ND		0.0500	1	08/12/2016 04:13	WG897600
Naphthalene	ND		0.250	1	08/12/2016 04:13	WG897600
Phenanthrene	ND		0.0500	1	08/12/2016 04:13	WG897600
Pyrene	ND		0.0500	1	08/12/2016 04:13	WG897600
2-Methylnaphthalene	ND		0.250	1	08/12/2016 04:13	WG897600
(S) Nitrobenzene-d5	*99.8*		*18.0-137*		*08/12/2016 04:13*	WG897600
(S) 2-Fluorobiphenyl	*99.8*		*38.8-115*		*08/12/2016 04:13*	WG897600
(S) p-Terphenyl-d14	*93.0*		*33.9-128*		*08/12/2016 04:13*	WG897600

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Biphenyl	ND		10.0	1	08/15/2016 10:18	WG897796
Bis(2-Ethylhexyl)phthalate	ND		3.00	1	08/15/2016 10:18	WG897796
Di-n-butyl phthalate	ND		3.00	1	08/15/2016 10:18	WG897796
Diethyl phthalate	ND		3.00	1	08/15/2016 10:18	WG897796
Pyridine	ND		10.0	1	08/15/2016 10:18	WG897796
Quinoline	ND		50.0	1	08/15/2016 14:26	WG897796
2,4-Dimethylphenol	ND		10.0	1	08/15/2016 10:18	WG897796
2,4-Dinitrophenol	ND		10.0	1	08/15/2016 10:18	WG897796
2-Methylphenol	ND		10.0	1	08/15/2016 10:18	WG897796
3&4-Methyl Phenol	ND		10.0	1	08/15/2016 10:18	WG897796
4-Nitrophenol	ND		10.0	1	08/15/2016 10:18	WG897796
Phenol	ND		10.0	1	08/15/2016 10:18	WG897796
(S) 2-Fluorophenol	*65.9*		*10.0-77.9*		*08/15/2016 10:18*	WG897796
(S) Phenol-d5	*47.4*		*5.00-70.1*		*08/15/2016 10:18*	WG897796

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
(S) Nitrobenzene-d5	*85.2*		*21.8-123*		*08/15/2016 10:18*	WG897796
(S) 2-Fluorobiphenyl	*90.7*		*29.5-131*		*08/15/2016 10:18*	WG897796
(S) 2,4,6-Tribromophenol	*126*		*11.2-130*		*08/15/2016 10:18*	WG897796
(S) p-Terphenyl-d14	*97.2*		*29.3-137*		*08/15/2016 10:18*	WG897796

Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Cobalt,Dissolved	ND		2.00	1	08/13/2016 05:03	WG897971
Lead,Dissolved	ND		2.00	1	08/13/2016 16:30	WG897700
Nickel,Dissolved	ND		2.00	1	08/13/2016 16:30	WG897700
Vanadium,Dissolved	ND		5.00	1	08/13/2016 16:30	WG897700
Zinc,Dissolved	32.7		25.0	1	08/13/2016 16:30	WG897700

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Acetone	ND		50.0	1	08/15/2016 18:35	WG898501
Benzene	ND		1.00	1	08/15/2016 18:35	WG898501
Bromochloromethane	ND		1.00	1	08/15/2016 18:35	WG898501
Bromodichloromethane	ND		1.00	1	08/15/2016 18:35	WG898501
Bromoform	ND		1.00	1	08/15/2016 18:35	WG898501
Bromomethane	ND		5.00	1	08/15/2016 18:35	WG898501
Carbon disulfide	ND		1.00	1	08/15/2016 18:35	WG898501
Carbon tetrachloride	ND		1.00	1	08/15/2016 18:35	WG898501
Chlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
Chlorodibromomethane	ND		1.00	1	08/15/2016 18:35	WG898501
Chloroethane	ND		5.00	1	08/15/2016 18:35	WG898501
Chloroform	ND		5.00	1	08/15/2016 18:35	WG898501
Chloromethane	ND		2.50	1	08/15/2016 18:35	WG898501
Cyclohexane	ND		1.00	1	08/15/2016 18:35	WG898501
1,2-Dibromo-3-Chloropropane	ND		5.00	1	08/15/2016 18:35	WG898501
1,2-Dibromoethane	ND		1.00	1	08/15/2016 18:35	WG898501
1,2-Dichlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
1,3-Dichlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
1,4-Dichlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
Dichlorodifluoromethane	ND		5.00	1	08/15/2016 18:35	WG898501
1,1-Dichloroethane	ND		1.00	1	08/15/2016 18:35	WG898501
1,2-Dichloroethane	ND		1.00	1	08/15/2016 18:35	WG898501
1,1-Dichloroethene	ND		1.00	1	08/15/2016 18:35	WG898501
cis-1,2-Dichloroethene	ND		1.00	1	08/15/2016 18:35	WG898501
trans-1,2-Dichloroethene	ND		1.00	1	08/15/2016 18:35	WG898501
1,2-Dichloropropane	ND		1.00	1	08/15/2016 18:35	WG898501
cis-1,3-Dichloropropene	ND		1.00	1	08/15/2016 18:35	WG898501
trans-1,3-Dichloropropene	ND		1.00	1	08/15/2016 18:35	WG898501
Ethylbenzene	ND		1.00	1	08/15/2016 18:35	WG898501
2-Hexanone	ND		10.0	1	08/15/2016 18:35	WG898501
Isopropylbenzene	ND		1.00	1	08/15/2016 18:35	WG898501
2-Butanone (MEK)	ND		10.0	1	08/15/2016 18:35	WG898501
Methyl Acetate	ND		20.0	1	08/15/2016 18:35	WG898501
Methyl Cyclohexane	ND		1.00	1	08/15/2016 18:35	WG898501
Methylene Chloride	ND		5.00	1	08/15/2016 18:35	WG898501
4-Methyl-2-pentanone (MIBK)	ND		10.0	1	08/15/2016 18:35	WG898501
Methyl tert-butyl ether	ND		1.00	1	08/15/2016 18:35	WG898501
Styrene	ND		1.00	1	08/15/2016 18:35	WG898501
1,1,2,2-Tetrachloroethane	ND		1.00	1	08/15/2016 18:35	WG898501
Tetrachloroethene	ND		1.00	1	08/15/2016 18:35	WG898501
Toluene	ND		5.00	1	08/15/2016 18:35	WG898501
1,2,3-Trichlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
1,2,4-Trichlorobenzene	ND		1.00	1	08/15/2016 18:35	WG898501
1,1,1-Trichloroethane	ND		1.00	1	08/15/2016 18:35	WG898501
1,1,2-Trichloroethane	ND		1.00	1	08/15/2016 18:35	WG898501
Trichloroethene	ND		1.00	1	08/15/2016 18:35	WG898501

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Trichlorofluoromethane	ND		5.00	1	08/15/2016 18:35	WG898501
1,1,2-Trichlorotrifluoroethane	ND		1.00	1	08/15/2016 18:35	WG898501
Vinyl chloride	ND		1.00	1	08/15/2016 18:35	WG898501
Xylenes, Total	ND		3.00	1	08/15/2016 18:35	WG898501
(S) Toluene-d8	*97.9*		*90.0-115*		*08/15/2016 18:35*	WG898501
(S) Dibromofluoromethane	*93.3*		*79.0-121*		*08/15/2016 18:35*	WG898501
(S) a,a,a-Trifluorotoluene	*98.3*		*90.4-116*		*08/15/2016 18:35*	WG898501
(S) 4-Bromofluorobenzene	*93.0*		*80.1-120*		*08/15/2016 18:35*	WG898501

EDB / DBCP by Method 8011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0100	1	08/12/2016 20:18	WG898166
1,2-Dibromo-3-Chloropropane	ND		0.0200	1	08/12/2016 20:18	WG898166

Semi Volatile Organic Compounds (GC/MS) by Method 8270 C-SIM

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Anthracene	ND		0.0500	1	08/12/2016 04:34	WG897600
Acenaphthene	ND		0.0500	1	08/12/2016 04:34	WG897600
Benzo(a)anthracene	ND		0.0500	1	08/12/2016 04:34	WG897600
Benzo(a)pyrene	ND		0.0500	1	08/12/2016 04:34	WG897600
Benzo(b)fluoranthene	ND		0.0500	1	08/12/2016 04:34	WG897600
Benzo(g,h,i)perylene	ND		0.0500	1	08/12/2016 04:34	WG897600
Benzo(k)fluoranthene	ND		0.0500	1	08/12/2016 04:34	WG897600
Chrysene	ND		0.0500	1	08/12/2016 04:34	WG897600
Dibenz(a,h)anthracene	ND		0.0500	1	08/12/2016 04:34	WG897600
Fluoranthene	ND		0.0500	1	08/12/2016 04:34	WG897600
Fluorene	ND		0.0500	1	08/12/2016 04:34	WG897600
Indeno(1,2,3-cd)pyrene	ND		0.0500	1	08/12/2016 04:34	WG897600
Naphthalene	ND		0.250	1	08/12/2016 04:34	WG897600
Phenanthrene	ND		0.0500	1	08/12/2016 04:34	WG897600
Pyrene	ND		0.0500	1	08/12/2016 04:34	WG897600
2-Methylnaphthalene	ND		0.250	1	08/12/2016 04:34	WG897600
(S) Nitrobenzene-d5	*92.8*		*18.0-137*		*08/12/2016 04:34*	WG897600
(S) 2-Fluorobiphenyl	*93.2*		*38.8-115*		*08/12/2016 04:34*	WG897600
(S) p-Terphenyl-d14	*87.0*		*33.9-128*		*08/12/2016 04:34*	WG897600

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Biphenyl	ND		10.0	1	08/15/2016 10:41	WG897796
Bis(2-Ethylhexyl)phthalate	ND		3.00	1	08/15/2016 10:41	WG897796
Di-n-butyl phthalate	ND		3.00	1	08/15/2016 10:41	WG897796
Diethyl phthalate	ND		3.00	1	08/15/2016 10:41	WG897796
Pyridine	ND		10.0	1	08/15/2016 10:41	WG897796
Quinoline	ND		50.0	1	08/15/2016 14:45	WG897796
2,4-Dimethylphenol	ND		10.0	1	08/15/2016 10:41	WG897796
2,4-Dinitrophenol	ND		10.0	1	08/15/2016 10:41	WG897796
2-Methylphenol	ND		10.0	1	08/15/2016 10:41	WG897796
3&4-Methyl Phenol	ND		10.0	1	08/15/2016 10:41	WG897796
4-Nitrophenol	ND		10.0	1	08/15/2016 10:41	WG897796
Phenol	ND		10.0	1	08/15/2016 10:41	WG897796
(S) 2-Fluorophenol	*61.5*		*10.0-77.9*		*08/15/2016 10:41*	WG897796
(S) Phenol-d5	*43.0*		*5.00-70.1*		*08/15/2016 10:41*	WG897796

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
(S) Nitrobenzene-d5	*76.8*		*21.8-123*		*08/15/2016 10:41*	WG897796
(S) 2-Fluorobiphenyl	*84.5*		*29.5-131*		*08/15/2016 10:41*	WG897796
(S) 2,4,6-Tribromophenol	*118*		*11.2-130*		*08/15/2016 10:41*	WG897796
(S) p-Terphenyl-d14	*93.0*		*29.3-137*		*08/15/2016 10:41*	WG897796

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	79.5		1	08/12/2016 10:09	WG898070

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	8.65		1.26	1	08/12/2016 15:15	WG898167
Lead	327		0.629	1	08/12/2016 15:15	WG898167
Nickel	35.4		2.51	1	08/12/2016 15:15	WG898167
Vanadium	47.0		2.51	1	08/12/2016 15:15	WG898167
Zinc	12200		314	50	08/15/2016 12:11	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00126	1	08/17/2016 05:49	WG899097
sec-Butylbenzene	ND		0.00126	1	08/17/2016 05:49	WG899097
tert-Butylbenzene	ND		0.00126	1	08/17/2016 05:49	WG899097
Cyclohexane	ND		0.00126	1	08/17/2016 05:49	WG899097
1,2-Dibromoethane	ND		0.00126	1	08/17/2016 05:49	WG899097
n-Hexane	ND		0.0126	1	08/17/2016 05:49	WG899097
1,2-Dichloroethane	ND		0.00126	1	08/17/2016 05:49	WG899097
Ethylbenzene	ND		0.00126	1	08/17/2016 05:49	WG899097
Isopropylbenzene	ND		0.0126	1	08/17/2016 05:49	WG899097
Methyl tert-butyl ether	ND		0.00126	1	08/17/2016 05:49	WG899097
Toluene	ND		0.00629	1	08/17/2016 05:49	WG899097
1,2,4-Trimethylbenzene	ND		0.00126	1	08/17/2016 05:49	WG899097
1,3,5-Trimethylbenzene	ND		0.00126	1	08/17/2016 05:49	WG899097
Xylenes, Total	ND		0.00377	1	08/17/2016 05:49	WG899097
(S) Toluene-d8	*105*		*88.7-115*		*08/17/2016 05:49*	WG899097
(S) Dibromofluoromethane	*106*		*76.3-123*		*08/17/2016 05:49*	WG899097
(S) a,a,a-Trifluorotoluene	*96.6*		*87.2-117*		*08/17/2016 05:49*	WG899097
(S) 4-Bromofluorobenzene	*84.8*		*69.7-129*		*08/17/2016 05:49*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		20.7	500	08/16/2016 17:28	WG898448
Anthracene	ND		20.7	500	08/16/2016 17:28	WG898448
Benzo(a)anthracene	26.9		20.7	500	08/16/2016 17:28	WG898448
Benzo(b)fluoranthene	32.0		20.7	500	08/16/2016 17:28	WG898448
Benzo(k)fluoranthene	ND		20.7	500	08/16/2016 17:28	WG898448
Benzo(g,h,i)perylene	ND		20.7	500	08/16/2016 17:28	WG898448
Benzo(a)pyrene	22.3		20.7	500	08/16/2016 17:28	WG898448
Biphenyl	ND		209	500	08/16/2016 17:28	WG898448
Chrysene	26.3		20.7	500	08/16/2016 17:28	WG898448
Dibenz(a,h)anthracene	ND		20.7	500	08/16/2016 17:28	WG898448
Fluoranthene	64.0		20.7	500	08/16/2016 17:28	WG898448
Fluorene	ND		20.7	500	08/16/2016 17:28	WG898448
Indeno(1,2,3-cd)pyrene	ND		20.7	500	08/16/2016 17:28	WG898448
2-Methylnaphthalene	ND		20.7	500	08/16/2016 17:28	WG898448
Naphthalene	ND		20.7	500	08/16/2016 17:28	WG898448
Phenanthrene	56.4		20.7	500	08/16/2016 17:28	WG898448
Pyridine	ND		209	500	08/16/2016 17:28	WG898448
Bis(2-ethylhexyl)phthalate	ND		209	500	08/16/2016 17:28	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		209	500	08/16/2016 17:28	WG898448
Diethyl phthalate	ND		209	500	08/16/2016 17:28	WG898448
Pyrene	51.7		20.7	500	08/16/2016 17:28	WG898448
2,4-Dimethylphenol	ND		209	500	08/16/2016 17:28	WG898448
2,4-Dinitrophenol	ND		209	500	08/16/2016 17:28	WG898448
2-Methylphenol	ND		209	500	08/16/2016 17:28	WG898448
3&4-Methyl Phenol	ND		209	500	08/16/2016 17:28	WG898448
4-Nitrophenol	ND		209	500	08/16/2016 17:28	WG898448
Phenol	ND		209	500	08/16/2016 17:28	WG898448
Quinoline	ND		209	500	08/16/2016 17:29	WG898448
(S) 2-Fluorophenol	*76.7*	J7	*21.1-116*		*08/16/2016 17:28*	WG898448
(S) Phenol-d5	*51.7*	J7	*26.3-121*		*08/16/2016 17:28*	WG898448
(S) Nitrobenzene-d5	*59.7*	J7	*21.9-129*		*08/16/2016 17:28*	WG898448
(S) 2-Fluorobiphenyl	*71.8*	J7	*34.9-129*		*08/16/2016 17:28*	WG898448
(S) 2,4,6-Tribromophenol	*16.6*	J7	*21.6-142*		*08/16/2016 17:28*	WG898448
(S) p-Terphenyl-d14	*146*	J7	*21.5-128*		*08/16/2016 17:28*	WG898448

Sample Narrative:

8270C L852559-09 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	80.9		1	08/12/2016 10:09	WG898070

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	5.70		1.24	1	08/12/2016 15:18	WG898167
Lead	95.9		0.618	1	08/12/2016 15:18	WG898167
Nickel	14.7		2.47	1	08/12/2016 15:18	WG898167
Vanadium	36.8		2.47	1	08/12/2016 15:18	WG898167
Zinc	109		6.18	1	08/12/2016 15:18	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00134		0.00124	1	08/17/2016 06:11	WG899097
sec-Butylbenzene	0.00128		0.00124	1	08/17/2016 06:11	WG899097
tert-Butylbenzene	ND		0.00124	1	08/17/2016 06:11	WG899097
Cyclohexane	ND		0.00124	1	08/17/2016 06:11	WG899097
1,2-Dibromoethane	ND		0.00124	1	08/17/2016 06:11	WG899097
n-Hexane	ND		0.0124	1	08/17/2016 06:11	WG899097
1,2-Dichloroethane	ND		0.00124	1	08/17/2016 06:11	WG899097
Ethylbenzene	ND		0.00124	1	08/17/2016 06:11	WG899097
Isopropylbenzene	ND		0.0124	1	08/17/2016 06:11	WG899097
Methyl tert-butyl ether	ND		0.00124	1	08/17/2016 06:11	WG899097
Toluene	ND		0.00618	1	08/17/2016 06:11	WG899097
1,2,4-Trimethylbenzene	ND		0.00124	1	08/17/2016 06:11	WG899097
1,3,5-Trimethylbenzene	ND		0.00124	1	08/17/2016 06:11	WG899097
Xylenes, Total	ND		0.00371	1	08/17/2016 06:11	WG899097
(S) Toluene-d8	*99.9*		*88.7-115*		*08/17/2016 06:11*	WG899097
(S) Dibromofluoromethane	*112*		*76.3-123*		*08/17/2016 06:11*	WG899097
(S) a,a,a-Trifluorotoluene	*87.1*	J2	*87.2-117*		*08/17/2016 06:11*	WG899097
(S) 4-Bromofluorobenzene	*81.9*		*69.7-129*		*08/17/2016 06:11*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	0.184		0.0408	1	08/15/2016 21:20	WG898448
Anthracene	0.0588		0.0408	1	08/15/2016 21:20	WG898448
Benzo(a)anthracene	ND		0.0408	1	08/15/2016 21:20	WG898448
Benzo(b)fluoranthene	ND		0.0408	1	08/15/2016 21:20	WG898448
Benzo(k)fluoranthene	ND		0.0408	1	08/15/2016 21:20	WG898448
Benzo(g,h,i)perylene	ND		0.0408	1	08/15/2016 21:20	WG898448
Benzo(a)pyrene	ND		0.0408	1	08/15/2016 21:20	WG898448
Biphenyl	ND		0.412	1	08/15/2016 21:20	WG898448
Chrysene	0.0668		0.0408	1	08/15/2016 21:20	WG898448
Dibenz(a,h)anthracene	ND		0.0408	1	08/15/2016 21:20	WG898448
Fluoranthene	0.0590		0.0408	1	08/15/2016 21:20	WG898448
Fluorene	0.181		0.0408	1	08/15/2016 21:20	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.0408	1	08/15/2016 21:20	WG898448
2-Methylnaphthalene	0.189		0.0408	1	08/15/2016 21:20	WG898448
Naphthalene	ND		0.0408	1	08/15/2016 21:20	WG898448
Phenanthrene	0.417		0.0408	1	08/15/2016 21:20	WG898448
Pyridine	ND		0.412	1	08/15/2016 21:20	WG898448
Bis(2-ethylhexyl)phthalate	ND		0.412	1	08/15/2016 21:20	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		0.412	1	08/15/2016 21:20	WG898448
Diethyl phthalate	ND		0.412	1	08/15/2016 21:20	WG898448
Pyrene	0.130		0.0408	1	08/15/2016 21:20	WG898448
2,4-Dimethylphenol	ND		0.412	1	08/15/2016 21:20	WG898448
2,4-Dinitrophenol	ND		0.412	1	08/15/2016 21:20	WG898448
2-Methylphenol	ND		0.412	1	08/15/2016 21:20	WG898448
3&4-Methyl Phenol	ND		0.412	1	08/15/2016 21:20	WG898448
4-Nitrophenol	ND		0.412	1	08/15/2016 21:20	WG898448
Phenol	ND		0.412	1	08/15/2016 21:20	WG898448
Quinoline	ND		2.06	5	08/16/2016 14:32	WG898448
(S) 2-Fluorophenol	*64.2*		*21.1-116*		*08/15/2016 21:20*	WG898448
(S) Phenol-d5	*60.8*		*26.3-121*		*08/15/2016 21:20*	WG898448
(S) Nitrobenzene-d5	*66.7*		*21.9-129*		*08/15/2016 21:20*	WG898448
(S) 2-Fluorobiphenyl	*58.9*		*34.9-129*		*08/15/2016 21:20*	WG898448
(S) 2,4,6-Tribromophenol	*69.9*		*21.6-142*		*08/15/2016 21:20*	WG898448
(S) p-Terphenyl-d14	*71.2*		*21.5-128*		*08/15/2016 21:20*	WG898448

Sample Narrative:

8270C L852559-10 WG898448: Dilution due to matrix

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	81.8		1	08/12/2016 10:09	WG898070

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	3.32		1.22	1	08/12/2016 15:20	WG898167
Lead	4.36		0.611	1	08/12/2016 15:20	WG898167
Nickel	5.96		2.45	1	08/12/2016 15:20	WG898167
Vanadium	10.5		2.45	1	08/12/2016 15:20	WG898167
Zinc	19.2	B	6.11	1	08/12/2016 15:20	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00122	1	08/17/2016 06:32	WG899097
sec-Butylbenzene	0.00561		0.00122	1	08/17/2016 06:32	WG899097
tert-Butylbenzene	ND		0.00122	1	08/17/2016 06:32	WG899097
Cyclohexane	0.00236		0.00122	1	08/17/2016 06:32	WG899097
1,2-Dibromoethane	ND		0.00122	1	08/17/2016 06:32	WG899097
n-Hexane	ND		0.0122	1	08/17/2016 06:32	WG899097
1,2-Dichloroethane	ND		0.00122	1	08/17/2016 06:32	WG899097
Ethylbenzene	ND		0.00122	1	08/17/2016 06:32	WG899097
Isopropylbenzene	ND		0.0122	1	08/17/2016 06:32	WG899097
Methyl tert-butyl ether	ND		0.00122	1	08/17/2016 06:32	WG899097
Toluene	ND		0.00611	1	08/17/2016 06:32	WG899097
1,2,4-Trimethylbenzene	ND		0.00122	1	08/17/2016 06:32	WG899097
1,3,5-Trimethylbenzene	ND		0.00122	1	08/17/2016 06:32	WG899097
Xylenes, Total	ND		0.00367	1	08/17/2016 06:32	WG899097
(S) Toluene-d8	*105*		*88.7-115*		*08/17/2016 06:32*	WG899097
(S) Dibromofluoromethane	*106*		*76.3-123*		*08/17/2016 06:32*	WG899097
(S) a,a,a-Trifluorotoluene	*96.3*		*87.2-117*		*08/17/2016 06:32*	WG899097
(S) 4-Bromofluorobenzene	*85.8*		*69.7-129*		*08/17/2016 06:32*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	0.0900		0.0404	1	08/15/2016 18:06	WG898448
Anthracene	0.129		0.0404	1	08/15/2016 18:06	WG898448
Benzo(a)anthracene	0.124		0.0404	1	08/15/2016 18:06	WG898448
Benzo(b)fluoranthene	ND		0.0404	1	08/15/2016 18:06	WG898448
Benzo(k)fluoranthene	ND		0.0404	1	08/15/2016 18:06	WG898448
Benzo(g,h,i)perylene	ND		0.0404	1	08/15/2016 18:06	WG898448
Benzo(a)pyrene	ND		0.0404	1	08/15/2016 18:06	WG898448
Biphenyl	ND		0.407	1	08/15/2016 18:06	WG898448
Chrysene	0.206		0.0404	1	08/15/2016 18:06	WG898448
Dibenz(a,h)anthracene	ND		0.0404	1	08/15/2016 18:06	WG898448
Fluoranthene	0.184		0.0404	1	08/15/2016 18:06	WG898448
Fluorene	0.159		0.0404	1	08/15/2016 18:06	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.0404	1	08/15/2016 18:06	WG898448
2-Methylnaphthalene	0.877		0.0404	1	08/15/2016 18:06	WG898448
Naphthalene	ND		0.0404	1	08/15/2016 18:06	WG898448
Phenanthrene	1.07		0.0404	1	08/15/2016 18:06	WG898448
Pyridine	ND		0.407	1	08/15/2016 18:06	WG898448
Bis(2-ethylhexyl)phthalate	ND		0.407	1	08/15/2016 18:06	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		0.407	1	08/15/2016 18:06	WG898448
Diethyl phthalate	ND		0.407	1	08/15/2016 18:06	WG898448
Pyrene	0.579		0.0404	1	08/15/2016 18:06	WG898448
2,4-Dimethylphenol	ND		0.407	1	08/15/2016 18:06	WG898448
2,4-Dinitrophenol	ND		0.407	1	08/15/2016 18:06	WG898448
2-Methylphenol	ND		0.407	1	08/15/2016 18:06	WG898448
3&4-Methyl Phenol	ND		0.407	1	08/15/2016 18:06	WG898448
4-Nitrophenol	ND		0.407	1	08/15/2016 18:06	WG898448
Phenol	ND		0.407	1	08/15/2016 18:06	WG898448
Quinoline	ND		2.04	5	08/16/2016 13:49	WG898448
(S) 2-Fluorophenol	*73.8*		*21.1-116*		*08/15/2016 18:06*	WG898448
(S) Phenol-d5	*69.9*		*26.3-121*		*08/15/2016 18:06*	WG898448
(S) Nitrobenzene-d5	*72.5*		*21.9-129*		*08/15/2016 18:06*	WG898448
(S) 2-Fluorobiphenyl	*70.8*		*34.9-129*		*08/15/2016 18:06*	WG898448
(S) 2,4,6-Tribromophenol	*63.8*		*21.6-142*		*08/15/2016 18:06*	WG898448
(S) p-Terphenyl-d14	*75.1*		*21.5-128*		*08/15/2016 18:06*	WG898448

Sample Narrative:

8270C L852559-11 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	82.9		1	08/12/2016 10:09	WG898070

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	11.2		1.21	1	08/12/2016 15:23	WG898167
Lead	625		0.603	1	08/12/2016 15:23	WG898167
Nickel	44.6		2.41	1	08/12/2016 15:23	WG898167
Vanadium	83.1		2.41	1	08/12/2016 15:23	WG898167
Zinc	317		6.03	1	08/12/2016 15:23	WG898167

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.397		0.0274	22.75	08/18/2016 11:25	WG899097
sec-Butylbenzene	0.111		0.0274	22.75	08/18/2016 11:25	WG899097
tert-Butylbenzene	0.681		0.0274	22.75	08/18/2016 11:25	WG899097
Cyclohexane	ND		0.0274	22.75	08/18/2016 11:25	WG899097
1,2-Dibromoethane	ND		0.0274	22.75	08/18/2016 11:25	WG899097
n-Hexane	ND		0.274	22.75	08/18/2016 11:25	WG899097
1,2-Dichloroethane	ND		0.0274	22.75	08/18/2016 11:25	WG899097
Ethylbenzene	0.0852		0.0274	22.75	08/18/2016 11:25	WG899097
Isopropylbenzene	ND		0.274	22.75	08/18/2016 11:25	WG899097
Methyl tert-butyl ether	ND		0.0274	22.75	08/18/2016 11:25	WG899097
Toluene	0.196		0.137	22.75	08/18/2016 11:25	WG899097
1,2,4-Trimethylbenzene	0.179		0.0274	22.75	08/18/2016 11:25	WG899097
1,3,5-Trimethylbenzene	ND		0.0274	22.75	08/18/2016 11:25	WG899097
Xylenes, Total	0.346		0.0823	22.75	08/18/2016 11:25	WG899097
(S) Toluene-d8	*106*		*88.7-115*		*08/18/2016 11:25*	WG899097
(S) Dibromofluoromethane	*104*		*76.3-123*		*08/18/2016 11:25*	WG899097
(S) a,a,a-Trifluorotoluene	*103*		*87.2-117*		*08/18/2016 11:25*	WG899097
(S) 4-Bromofluorobenzene	*89.5*		*69.7-129*		*08/18/2016 11:25*	WG899097

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	3.50		1.99	50	08/16/2016 00:33	WG898448
Anthracene	ND		1.99	50	08/16/2016 00:33	WG898448
Benzo(a)anthracene	2.65		1.99	50	08/16/2016 00:33	WG898448
Benzo(b)fluoranthene	ND		3.98	100	08/16/2016 15:51	WG898448
Benzo(k)fluoranthene	ND		3.98	100	08/16/2016 15:51	WG898448
Benzo(g,h,i)perylene	ND		3.98	100	08/16/2016 15:51	WG898448
Benzo(a)pyrene	ND		3.98	100	08/16/2016 15:51	WG898448
Biphenyl	ND		20.1	50	08/16/2016 00:33	WG898448
Chrysene	3.67		1.99	50	08/16/2016 00:33	WG898448
Dibenz(a,h)anthracene	ND		3.98	100	08/16/2016 15:51	WG898448
Fluoranthene	4.99		1.99	50	08/16/2016 00:33	WG898448
Fluorene	5.95		1.99	50	08/16/2016 00:33	WG898448
Indeno(1,2,3-cd)pyrene	ND		3.98	100	08/16/2016 15:51	WG898448
2-Methylnaphthalene	2.09		1.99	50	08/16/2016 00:33	WG898448
Naphthalene	ND		1.99	50	08/16/2016 00:33	WG898448
Phenanthrene	ND		1.99	50	08/16/2016 00:33	WG898448
Pyridine	ND		20.1	50	08/16/2016 00:33	WG898448
Bis(2-ethylhexyl)phthalate	ND		20.1	50	08/16/2016 00:33	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		20.1	50	08/16/2016 00:33	WG898448
Diethyl phthalate	ND		20.1	50	08/16/2016 00:33	WG898448
Pyrene	11.8		1.99	50	08/16/2016 00:33	WG898448
2,4-Dimethylphenol	ND		20.1	50	08/16/2016 00:33	WG898448
2,4-Dinitrophenol	ND		20.1	50	08/16/2016 00:33	WG898448
2-Methylphenol	ND		20.1	50	08/16/2016 00:33	WG898448
3&4-Methyl Phenol	ND		20.1	50	08/16/2016 00:33	WG898448
4-Nitrophenol	ND		20.1	50	08/16/2016 00:33	WG898448
Phenol	ND		20.1	50	08/16/2016 00:33	WG898448
Quinoline	ND		40.2	100	08/16/2016 16:11	WG898448
(S) 2-Fluorophenol	*73.2*	J7	*21.1-116*		*08/16/2016 00:33*	WG898448
(S) 2-Fluorophenol	*72.5*	J7	*21.1-116*		*08/16/2016 15:51*	WG898448
(S) Phenol-d5	*77.2*	J7	*26.3-121*		*08/16/2016 15:51*	WG898448
(S) Phenol-d5	*86.4*	J7	*26.3-121*		*08/16/2016 00:33*	WG898448
(S) Nitrobenzene-d5	*380*	J7	*21.9-129*		*08/16/2016 00:33*	WG898448
(S) Nitrobenzene-d5	*481*	J7	*21.9-129*		*08/16/2016 15:51*	WG898448
(S) 2-Fluorobiphenyl	*87.4*	J7	*34.9-129*		*08/16/2016 15:51*	WG898448
(S) 2-Fluorobiphenyl	*96.0*	J7	*34.9-129*		*08/16/2016 00:33*	WG898448
(S) 2,4,6-Tribromophenol	*66.4*	J7	*21.6-142*		*08/16/2016 00:33*	WG898448
(S) 2,4,6-Tribromophenol	*42.7*	J7	*21.6-142*		*08/16/2016 15:51*	WG898448
(S) p-Terphenyl-d14	*93.3*	J7	*21.5-128*		*08/16/2016 15:51*	WG898448
(S) p-Terphenyl-d14	*13.8*	J7	*21.5-128*		*08/16/2016 00:33*	WG898448

Sample Narrative:

8270C L852559-12 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3156570-1 08/12/16 09:32

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.00140			

L852559-06 Original Sample (OS) • Duplicate (DUP)

(OS) L852559-06 08/12/16 09:32 • (DUP) R3156570-3 08/12/16 09:32

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	80.3	81.8	1	1.81		5

Laboratory Control Sample (LCS)

(LCS) R3156570-2 08/12/16 09:32

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	99.9	85.0-115	

Method Blank (MB)

(MB) R3156573-1 08/12/16 10:09

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.00110			

L852572-01 Original Sample (OS) • Duplicate (DUP)

(OS) L852572-01 08/12/16 10:09 • (DUP) R3156573-3 08/12/16 10:09

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	88.6	85.8	1	3.26		5

Laboratory Control Sample (LCS)

(LCS) R3156573-2 08/12/16 10:09

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	99.9	85.0-115	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3156642-1 08/12/16 14:33

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Cobalt	U		0.23	1.00
Lead	U		0.19	0.500
Nickel	U		0.49	2.00
Vanadium	U		0.24	2.00
Zinc	1.59	J	0.59	5.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156642-2 08/12/16 14:35 • (LCSD) R3156642-3 08/12/16 14:38

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Cobalt	100	106	107	106	107	80-120			1	20
Lead	100	106	107	106	107	80-120			1	20
Nickel	100	103	105	103	105	80-120			2	20
Vanadium	100	106	108	106	108	80-120			2	20
Zinc	100	104	105	104	105	80-120			1	20

L852572-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852572-04 08/12/16 14:40 • (MS) R3156642-6 08/12/16 14:48 • (MSD) R3156642-7 08/12/16 14:51

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Cobalt	120	4.56	137	132	111	107	1	75-125			3	20
Lead	120	11.5	144	148	111	114	1	75-125			3	20
Nickel	120	22.8	152	145	108	102	1	75-125			5	20
Vanadium	120	31.0	154	141	103	92	1	75-125			9	20
Zinc	120	66.4	182	170	97	86	1	75-125			7	20

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3156622-1 08/13/16 15:57

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Lead,Dissolved	U		0.240	2.00
Nickel,Dissolved	U		0.350	2.00
Vanadium,Dissolved	U		0.180	5.00
Zinc,Dissolved	U		2.56	25.0

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156622-2 08/13/16 15:59 • (LCSD) R3156622-3 08/13/16 16:01

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead,Dissolved	50.0	51.9	53.5	104	107	80-120			3	20
Nickel,Dissolved	50.0	57.0	55.2	114	110	80-120			3	20
Vanadium,Dissolved	50.0	53.4	51.8	107	104	80-120			3	20
Zinc,Dissolved	50.0	50.2	52.0	100	104	80-120			4	20

L852290-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852290-02 08/13/16 16:03 • (MS) R3156622-5 08/13/16 16:08 • (MSD) R3156622-6 08/13/16 16:10

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Lead,Dissolved	50.0	0.498	51.8	53.3	103	106	1	75-125			3	20
Nickel,Dissolved	50.0	10.1	62.8	63.5	105	107	1	75-125			1	20
Vanadium,Dissolved	50.0		59.7	57.8	105	101	1	75-125			3	20
Zinc,Dissolved	50.0	14.4	63.5	60.7	98	93	1	75-125			5	20

Method Blank (MB)

(MB) R3156550-1 08/13/16 04:56

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Cobalt,Dissolved	U		0.260	2.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156550-2 08/13/16 04:58 • (LCSD) R3156550-3 08/13/16 05:01

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Cobalt,Dissolved	50.0	51.7	51.9	103	104	80-120			0	20

L852559-08 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852559-08 08/13/16 05:03 • (MS) R3156550-5 08/13/16 05:07 • (MSD) R3156550-6 08/13/16 05:10

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Cobalt,Dissolved	50.0	ND	52.0	51.1	104	102	1	75-125			2	20

Method Blank (MB)

(MB) R3157111-3 08/15/16 15:09

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acetone	U		10.0	50.0
Benzene	U		0.331	1.00
Bromodichloromethane	U		0.380	1.00
Bromochloromethane	U		0.520	1.00
Bromoform	U		0.469	1.00
Bromomethane	U		0.866	5.00
Carbon disulfide	U		0.275	1.00
Carbon tetrachloride	U		0.379	1.00
Chlorobenzene	U		0.348	1.00
Chlorodibromomethane	U		0.327	1.00
Chloroethane	U		0.453	5.00
Chloroform	U		0.324	5.00
Chloromethane	U		0.276	2.50
Cyclohexane	U		0.390	1.00
1,2-Dibromo-3-Chloropropane	U		1.33	5.00
1,2-Dibromoethane	U		0.381	1.00
1,2-Dichlorobenzene	U		0.349	1.00
1,3-Dichlorobenzene	U		0.220	1.00
1,4-Dichlorobenzene	U		0.274	1.00
Dichlorodifluoromethane	U		0.551	5.00
1,1-Dichloroethane	U		0.259	1.00
1,2-Dichloroethane	U		0.361	1.00
1,1-Dichloroethene	U		0.398	1.00
cis-1,2-Dichloroethene	U		0.260	1.00
trans-1,2-Dichloroethene	U		0.396	1.00
1,2-Dichloropropane	U		0.306	1.00
cis-1,3-Dichloropropene	U		0.418	1.00
trans-1,3-Dichloropropene	U		0.419	1.00
Ethylbenzene	U		0.384	1.00
2-Hexanone	U		3.82	10.0
Isopropylbenzene	U		0.326	1.00
2-Butanone (MEK)	U		3.93	10.0
Methyl Acetate	U		4.30	20.0
Methyl Cyclohexane	U		0.380	1.00
Methylene Chloride	U		1.00	5.00
4-Methyl-2-pentanone (MIBK)	U		2.14	10.0
Methyl tert-butyl ether	U		0.367	1.00
Styrene	U		0.307	1.00
1,1,2,2-Tetrachloroethane	U		0.130	1.00
Tetrachloroethene	U		0.372	1.00

Method Blank (MB)

(MB) R3157111-3 08/15/16 15:09

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Toluene	U		0.780	5.00
1,1,2-Trichlorotrifluoroethane	U		0.303	1.00
1,2,3-Trichlorobenzene	U		0.230	1.00
1,2,4-Trichlorobenzene	U		0.355	1.00
1,1,1-Trichloroethane	U		0.319	1.00
1,1,2-Trichloroethane	U		0.383	1.00
Trichloroethene	U		0.398	1.00
Trichlorofluoromethane	U		1.20	5.00
Vinyl chloride	U		0.259	1.00
Xylenes, Total	U		1.06	3.00
(S) Toluene-d8	*97.7*			*90.0-115*
(S) Dibromofluoromethane	*91.4*			*79.0-121*
(S) a,a,a-Trifluorotoluene	*98.2*			*90.4-116*
(S) 4-Bromofluorobenzene	*92.6*			*80.1-120*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157111-1 08/15/16 13:25 • (LCSD) R3157111-2 08/15/16 13:48

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	125	123	117	98.2	93.6	28.7-175			4.84	20.9
Benzene	25.0	21.7	20.6	86.9	82.2	73.0-122			5.51	20
Bromodichloromethane	25.0	22.6	21.7	90.6	86.7	75.5-121			4.37	20
Bromochloromethane	25.0	22.1	20.9	88.3	83.8	78.9-123			5.30	20
Bromoform	25.0	25.4	24.5	102	98.2	71.5-131			3.44	20
Bromomethane	25.0	12.6	12.1	50.6	48.3	22.4-187			4.52	20
Carbon disulfide	25.0	19.1	17.6	76.3	70.4	53.0-134			8.15	20
Carbon tetrachloride	25.0	23.2	19.9	92.9	79.5	70.9-129			15.5	20
Chlorobenzene	25.0	26.7	25.5	107	102	79.7-122			4.73	20
Chlorodibromomethane	25.0	26.8	25.6	107	102	78.2-124			4.47	20
Chloroethane	25.0	13.7	12.7	54.8	50.7	41.2-153			7.74	20
Chloroform	25.0	20.9	19.6	83.6	78.5	73.2-125			6.23	20
Chloromethane	25.0	22.5	21.2	90.2	84.9	55.8-134			6.05	20
1,2-Dibromo-3-Chloropropane	25.0	25.9	24.7	104	98.9	64.8-131			4.64	20
1,2-Dibromoethane	25.0	26.6	25.7	106	103	79.8-122			3.26	20
1,2-Dichlorobenzene	25.0	26.5	25.2	106	101	84.7-118			4.82	20
1,3-Dichlorobenzene	25.0	24.5	23.4	98.1	93.8	77.6-127			4.54	20
1,4-Dichlorobenzene	25.0	25.7	24.6	103	98.5	82.2-114			4.18	20
Dichlorodifluoromethane	25.0	25.7	23.9	103	95.8	56.0-134			7.02	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157111-1 08/15/16 13:25 • (LCSD) R3157111-2 08/15/16 13:48

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,1-Dichloroethane	25.0	21.1	19.8	84.4	79.1	71.7-127			6.47	20
1,2-Dichloroethane	25.0	21.0	20.2	83.8	80.8	65.3-126			3.69	20
1,1-Dichloroethene	25.0	21.6	19.8	86.5	79.3	59.9-137			8.77	20
cis-1,2-Dichloroethene	25.0	21.8	20.4	87.1	81.5	77.3-122			6.55	20
trans-1,2-Dichloroethene	25.0	21.5	19.8	85.9	79.1	72.6-125			8.27	20
1,2-Dichloropropane	25.0	23.3	22.8	93.2	91.1	77.4-125			2.22	20
cis-1,3-Dichloropropene	25.0	24.8	24.0	99.2	96.0	77.7-124			3.28	20
trans-1,3-Dichloropropene	25.0	24.4	23.6	97.4	94.6	73.5-127			2.95	20
Ethylbenzene	25.0	25.9	24.4	104	97.8	80.9-121			5.73	20
2-Hexanone	125	139	135	112	108	59.4-151			3.33	20
Isopropylbenzene	25.0	25.3	23.9	101	95.7	81.6-124			5.46	20
2-Butanone (MEK)	125	106	103	84.7	82.2	46.4-155			3.01	20
Methylene Chloride	25.0	26.3	24.8	105	99.1	69.5-120			6.04	20
4-Methyl-2-pentanone (MIBK)	125	119	116	94.8	93.0	63.3-138			2.00	20
Methyl tert-butyl ether	25.0	30.1	28.9	121	116	70.1-125			4.11	20
Styrene	25.0	27.7	26.4	111	106	79.9-124			4.67	20
1,1,2,2-Tetrachloroethane	25.0	23.6	22.6	94.5	90.5	79.3-123			4.26	20
Tetrachloroethene	25.0	27.1	25.7	109	103	73.5-130			5.33	20
Toluene	25.0	24.2	23.2	96.7	92.8	77.9-116			4.11	20
1,1,2-Trichlorotrifluoroethane	25.0	21.5	20.2	86.2	80.8	62.0-141			6.40	20
1,2,3-Trichlorobenzene	25.0	24.3	23.4	97.4	93.5	75.7-134			4.08	20
1,2,4-Trichlorobenzene	25.0	24.8	23.9	99.2	95.6	76.1-136			3.74	20
1,1,1-Trichloroethane	25.0	20.8	19.7	83.1	78.7	71.1-129			5.52	20
1,1,2-Trichloroethane	25.0	25.9	25.1	104	100	81.6-120			3.30	20
Trichloroethene	25.0	23.9	22.7	95.4	90.9	79.5-121			4.81	20
Trichlorofluoromethane	25.0	18.7	17.9	74.9	71.5	49.1-157			4.56	20
Vinyl chloride	25.0	20.7	19.0	82.7	76.0	61.5-134			8.38	20
Xylenes, Total	75.0	79.4	75.5	106	101	79.2-122			5.03	20
(S) Toluene-d8				*98.8*	*99.2*	*90.0-115*				
(S) Dibromofluoromethane				*89.4*	*88.2*	*79.0-121*				
(S) a,a,a-Trifluorotoluene				*98.9*	*99.3*	*90.4-116*				
(S) 4-Bromofluorobenzene				*93.7*	*94.0*	*80.1-120*				

L852351-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852351-01 08/18/16 13:34 • (MS) R3157801-1 08/18/16 12:32 • (MSD) R3157801-2 08/18/16 12:52

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acetone	125	ND	187	194	30.0	31.1	5	25.0-156			3.76	21.5
Benzene	25.0	ND	112	104	89.7	83.1	5	58.6-133			7.61	20
Bromodichloromethane	25.0	ND	122	112	97.6	89.3	5	69.2-127			8.83	20
Bromochloromethane	25.0	ND	120	109	96.3	87.2	5	74.4-128			9.89	20
Bromoform	25.0	ND	124	115	99.4	91.8	5	66.3-140			7.95	20
Bromomethane	25.0	ND	161	150	129	120	5	16.6-183			7.42	20.5
Carbon disulfide	25.0	ND	108	102	86.7	81.4	5	34.9-138			6.25	20
Carbon tetrachloride	25.0	ND	114	105	91.6	83.9	5	60.6-139			8.70	20
Chlorobenzene	25.0	ND	139	129	111	104	5	70.1-130			6.92	20
Chlorodibromomethane	25.0	ND	138	128	110	103	5	71.6-132			7.34	20
Chloroethane	25.0	ND	154	143	123	114	5	33.3-155			7.35	20
Chloroform	25.0	ND	112	104	89.5	83.2	5	66.1-133			7.27	20
Chloromethane	25.0	ND	108	99.3	86.5	79.5	5	40.7-139			8.49	20
1,2-Dibromo-3-Chloropropane	25.0	ND	114	102	90.9	81.4	5	63.9-142			10.9	20.2
1,2-Dibromoethane	25.0	ND	126	118	101	94.6	5	73.8-131			6.13	20
1,2-Dichlorobenzene	25.0	ND	124	120	99.2	96.1	5	77.4-127			3.21	20
1,3-Dichlorobenzene	25.0	ND	126	120	100	96.2	5	67.9-136			4.34	20
1,4-Dichlorobenzene	25.0	ND	121	116	97.2	92.5	5	74.4-123			4.94	20
Dichlorodifluoromethane	25.0	ND	147	134	118	108	5	42.2-146			8.91	20
1,1-Dichloroethane	25.0	ND	109	100	86.8	80.3	5	64.0-134			7.79	20
1,2-Dichloroethane	25.0	ND	111	102	89.0	81.8	5	60.7-132			8.52	20
1,1-Dichloroethene	25.0	ND	124	115	99.1	91.9	5	48.8-144			7.52	20
cis-1,2-Dichloroethene	25.0	ND	115	107	90.4	84.5	5	60.6-136			6.65	20
trans-1,2-Dichloroethene	25.0	ND	110	100	88.0	80.4	5	61.0-132			9.08	20
1,2-Dichloropropane	25.0	ND	121	111	97.0	88.7	5	69.7-130			8.94	20
cis-1,3-Dichloropropene	25.0	ND	128	117	103	93.4	5	71.1-129			9.39	20
trans-1,3-Dichloropropene	25.0	ND	129	118	103	94.8	5	66.3-136			8.18	20
Ethylbenzene	25.0	ND	134	124	107	99.3	5	62.7-136			7.27	20
2-Hexanone	125	ND	463	427	74.0	68.3	5	59.4-154			8.02	20.1
Isopropylbenzene	25.0	18.0	141	135	98.0	93.7	5	67.4-136			3.97	20
2-Butanone (MEK)	125	ND	332	313	53.1	50.0	5	45.0-156			5.91	20.8
Methylene Chloride	25.0	ND	99.7	89.7	79.8	71.8	5	61.5-125			10.5	20
4-Methyl-2-pentanone (MIBK)	125	ND	540	492	86.4	78.8	5	60.7-150			9.19	20
Methyl tert-butyl ether	25.0	ND	102	93.6	81.5	74.9	5	61.4-136			8.45	20
Styrene	25.0	ND	132	123	106	98.7	5	68.2-133			6.73	20
1,1,2,2-Tetrachloroethane	25.0	ND	111	103	89.2	82.5	5	64.9-145			7.74	20
Tetrachloroethene	25.0	ND	138	131	111	105	5	57.4-141			5.52	20
Toluene	25.0	ND	124	114	99.6	91.5	5	67.8-124			8.44	20
1,1,2-Trichlorotrifluoroethane	25.0	ND	133	126	107	101	5	53.7-150			6.01	20
1,2,3-Trichlorobenzene	25.0	ND	109	106	87.5	85.1	5	65.7-143			2.80	20

L852351-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852351-01 08/18/16 13:34 • (MS) R3157801-1 08/18/16 12:32 • (MSD) R3157801-2 08/18/16 12:52

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
1,2,4-Trichlorobenzene	25.0	ND	113	112	90.6	89.9	5	67.0-146			0.730	20
1,1,1-Trichloroethane	25.0	ND	119	109	95.5	87.5	5	58.7-134			8.79	20
1,1,2-Trichloroethane	25.0	ND	132	123	106	98.1	5	74.1-130			7.61	20
Trichloroethene	25.0	ND	131	120	105	96.3	5	48.9-148			8.38	20
Trichlorofluoromethane	25.0	ND	143	134	114	107	5	39.9-165			6.06	20
Vinyl chloride	25.0	ND	141	133	113	106	5	44.3-143			5.93	20
Xylenes, Total	75.0	ND	394	368	105	98.3	5	65.6-133			6.75	20
(S) Toluene-d8					*98.0*	*97.8*		*90.0-115*				
(S) Dibromofluoromethane					*91.2*	*90.8*		*79.0-121*				
(S) a,a,a-Trifluorotoluene					*100*	*99.6*		*90.4-116*				
(S) 4-Bromofluorobenzene					*94.3*	*94.4*		*80.1-120*				

Method Blank (MB)

(MB) R3157353-3 08/17/16 01:14

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000270	0.00100
sec-Butylbenzene	U		0.000201	0.00100
tert-Butylbenzene	U		0.000206	0.00100
Cyclohexane	U		0.000350	0.00100
1,2-Dibromoethane	U		0.000343	0.00100
1,2-Dichloroethane	U		0.000265	0.00100
Ethylbenzene	U		0.000297	0.00100
n-Hexane	U		0.000290	0.0100
Isopropylbenzene	U		0.000243	0.0100
2-Butanone (MEK)	U		0.00468	0.0100
Methyl tert-butyl ether	U		0.000212	0.00100
Toluene	U		0.000434	0.00500
1,2,4-Trimethylbenzene	U		0.000211	0.00100
1,3,5-Trimethylbenzene	U		0.000266	0.00100
Xylenes, Total	U		0.000698	0.00300
(S) Toluene-d8	*108*			*88.7-115*
(S) Dibromofluoromethane	*105*			*76.3-123*
(S) a,a,a-Trifluorotoluene	*102*			*87.2-117*
(S) 4-Bromofluorobenzene	*87.1*			*69.7-129*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157353-1 08/16/16 23:27 • (LCSD) R3157353-2 08/16/16 23:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0265	0.0267	106	107	72.6-120			0.790	20
sec-Butylbenzene	0.0250	0.0231	0.0228	92.5	91.4	77.8-129			1.22	20
tert-Butylbenzene	0.0250	0.0230	0.0226	91.8	90.5	77.2-129			1.43	20
1,2-Dibromoethane	0.0250	0.0235	0.0242	93.9	96.8	78.7-123			3.12	20
1,2-Dichloroethane	0.0250	0.0252	0.0260	101	104	67.2-121			3.27	20
Ethylbenzene	0.0250	0.0238	0.0239	95.0	95.6	78.6-124			0.640	20
n-Hexane	0.0250	0.0252	0.0256	101	102	59.9-125			1.66	20
Isopropylbenzene	0.0250	0.0227	0.0224	90.9	89.6	79.4-126			1.48	20
2-Butanone (MEK)	0.125	0.113	0.129	90.1	103	44.5-154			13.6	21.3
Methyl tert-butyl ether	0.0250	0.0233	0.0244	93.3	97.7	70.2-122			4.65	20
Toluene	0.0250	0.0250	0.0251	99.9	100	76.7-116			0.370	20
1,2,4-Trimethylbenzene	0.0250	0.0230	0.0225	92.0	90.2	77.1-124			1.99	20
1,3,5-Trimethylbenzene	0.0250	0.0231	0.0223	92.3	89.4	79.0-125			3.20	20
Xylenes, Total	0.0750	0.0702	0.0700	93.6	93.3	78.1-123			0.300	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157353-1 08/16/16 23:27 • (LCSD) R3157353-2 08/16/16 23:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) Toluene-d8				*104*	*105*	*88.7-115*				
(S) Dibromofluoromethane				*100*	*103*	*76.3-123*				
(S) a,a,a-Trifluorotoluene				*99.4*	*98.9*	*87.2-117*				
(S) 4-Bromofluorobenzene				*89.9*	*88.7*	*69.7-129*				

L852559-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852559-01 08/17/16 03:41 • (MS) R3157353-4 08/17/16 02:37 • (MSD) R3157353-5 08/17/16 02:58

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0277	ND	0.0265	0.0257	95.6	92.5	1	47.8-131			3.26	22.8
sec-Butylbenzene	0.0277	ND	0.0207	0.0184	74.5	66.2	1	31.0-142			11.7	34.7
tert-Butylbenzene	0.0277	ND	0.0210	0.0187	75.7	67.5	1	36.9-142			11.5	31.7
1,2-Dibromoethane	0.0277	ND	0.0255	0.0229	91.9	82.4	1	50.2-133			10.9	23.6
1,2-Dichloroethane	0.0277	ND	0.0266	0.0245	96.0	88.3	1	47.1-129			8.34	22.7
Ethylbenzene	0.0277	ND	0.0223	0.0208	80.3	75.0	1	44.8-135			6.91	26.9
n-Hexane	0.0277	ND	0.0258	0.0241	93.0	87.0	1	26.0-123			6.62	40
Isopropylbenzene	0.0277	ND	0.0211	0.0193	76.0	69.7	1	41.9-139			8.56	29.3
2-Butanone (MEK)	0.139	ND	0.143	0.131	103	94.1	1	23.9-170			9.36	28.3
Methyl tert-butyl ether	0.0277	ND	0.0259	0.0239	93.5	86.3	1	50.4-131			8.03	24.8
Toluene	0.0277	ND	0.0245	0.0234	88.4	84.3	1	47.8-127			4.73	24.3
1,2,4-Trimethylbenzene	0.0277	ND	0.0206	0.0183	74.1	66.1	1	32.9-139			11.5	30.6
1,3,5-Trimethylbenzene	0.0277	ND	0.0208	0.0187	75.1	67.4	1	37.1-138			10.8	30.6
Xylenes, Total	0.0832	ND	0.0660	0.0608	79.3	73.1	1	42.7-135			8.08	26.6
(S) Toluene-d8					*104*	*105*		*88.7-115*				
(S) Dibromofluoromethane					*105*	*107*		*76.3-123*				
(S) a,a,a-Trifluorotoluene					*97.8*	*97.9*		*87.2-117*				
(S) 4-Bromofluorobenzene					*86.2*	*86.7*		*69.7-129*				

Method Blank (MB)

(MB) R3156845-1 08/12/16 18:27

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Ethylene Dibromide	U		0.00240	0.0100
1,2-Dibromo-3-Chloropropane	U		0.00430	0.0200

L852817-01 Original Sample (OS) • Duplicate (DUP)

(OS) L852817-01 08/12/16 19:12 • (DUP) R3156845-3 08/12/16 19:01

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Ethylene Dibromide	ND	0.000	1	0.000		20
1,2-Dibromo-3-Chloropropane	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156845-4 08/12/16 20:51 • (LCSD) R3156845-5 08/12/16 22:41

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethylene Dibromide	0.250	0.255	0.276	102	110	60.0-140			7.86	20
1,2-Dibromo-3-Chloropropane	0.250	0.242	0.258	96.8	103	60.0-140			6.36	20

L852817-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L852817-02 08/12/16 18:50 • (MS) R3156845-2 08/12/16 18:38

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Ethylene Dibromide	0.100	ND	0.126	126	1	60.0-140	
1,2-Dibromo-3-Chloropropane	0.100	ND	0.111	111	1	60.0-140	

Method Blank (MB)

(MB) R3156993-3 08/12/16 02:29

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Anthracene	U		0.00800	0.0500
Acenaphthene	U		0.0100	0.0500
Benzo(a)anthracene	U		0.00830	0.0500
Benzo(a)pyrene	U		0.0158	0.0500
Benzo(b)fluoranthene	0.00679	J	0.00212	0.0500
Benzo(g,h,i)perylene	0.00833	J	0.00227	0.0500
Benzo(k)fluoranthene	U		0.0255	0.0500
Chrysene	U		0.0144	0.0500
Dibenz(a,h)anthracene	0.00572	J	0.00454	0.0500
Fluoranthene	U		0.0165	0.0500
Fluorene	U		0.00898	0.0500
Indeno(1,2,3-cd)pyrene	U		0.00739	0.0500
Naphthalene	0.0162	J	0.0120	0.250
Phenanthrene	U		0.0184	0.0500
Pyrene	U		0.0155	0.0500
2-Methylnaphthalene	U		0.0155	0.250
(S) Nitrobenzene-d5	*95.2*			*18.0-137*
(S) 2-Fluorobiphenyl	*97.5*			*38.8-115*
(S) p-Terphenyl-d14	*92.2*			*33.9-128*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156993-1 08/12/16 01:47 • (LCSD) R3156993-2 08/12/16 02:08

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	2.00	1.84	2.15	91.9	108	51.8-119			15.9	20
Acenaphthene	2.00	1.80	1.90	89.8	95.2	50.6-107			5.85	20
Benzo(a)anthracene	2.00	1.80	1.88	89.9	93.9	47.4-121			4.33	20
Benzo(a)pyrene	2.00	2.09	2.24	104	112	49.8-119			6.81	20
Benzo(b)fluoranthene	2.00	1.84	1.89	92.0	94.6	47.4-119			2.76	20.2
Benzo(g,h,i)perylene	2.00	2.10	2.18	105	109	37.2-129			3.60	21.3
Benzo(k)fluoranthene	2.00	1.90	1.99	94.8	99.6	47.5-122			4.98	20
Chrysene	2.00	1.93	2.07	96.4	103	48.6-126			6.90	20
Dibenz(a,h)anthracene	2.00	2.20	2.34	110	117	34.1-130			6.30	21
Fluoranthene	2.00	2.21	2.35	110	118	50.9-123			6.45	20
Fluorene	2.00	1.89	2.00	94.6	99.9	50.2-110			5.51	20
Indeno(1,2,3-cd)pyrene	2.00	2.14	2.26	107	113	45.3-125			5.43	20
Naphthalene	2.00	1.70	1.83	84.8	91.6	45.7-101			7.66	20
Phenanthrene	2.00	1.84	1.94	91.8	97.1	47.7-113			5.68	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156993-1 08/12/16 01:47 • (LCSD) R3156993-2 08/12/16 02:08

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Pyrene	2.00	1.84	1.96	91.8	97.8	44.5-125			6.28	20
2-Methylnaphthalene	2.00	1.85	2.00	92.6	100	46.7-107			7.74	20
(S) Nitrobenzene-d5				*90.2*	*103*	*18.0-137*				
(S) 2-Fluorobiphenyl				*93.4*	*101*	*38.8-115*				
(S) p-Terphenyl-d14				*84.8*	*91.9*	*33.9-128*				

Method Blank (MB)

(MB) R3156870-2 08/15/16 14:06

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Quinoline	U		6.78	50.0

Method Blank (MB)

(MB) R3156874-1 08/15/16 06:01

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Biphenyl	U		0.325	10.0
Bis(2-ethylhexyl)phthalate	U		0.709	3.00
Di-n-butyl phthalate	1.28	J	0.266	3.00
Diethyl phthalate	U		0.282	3.00
Pyridine	U		1.37	10.0
2-Methylphenol	U		0.312	10.0
3&4-Methyl Phenol	U		0.266	10.0
2,4-Dimethylphenol	U		0.624	10.0
2,4-Dinitrophenol	U		3.25	10.0
4-Nitrophenol	U		2.01	10.0
Phenol	U		0.334	10.0
(S) Nitrobenzene-d5	*72.6*			*21.8-123*
(S) 2-Fluorobiphenyl	*82.0*			*29.5-131*
(S) p-Terphenyl-d14	*91.4*			*29.3-137*
(S) Phenol-d5	*44.0*			*5.00-70.1*
(S) 2-Fluorophenol	*59.9*			*10.0-77.9*
(S) 2,4,6-Tribromophenol	*112*			*11.2-130*

Laboratory Control Sample (LCS)

(LCS) R3156870-1 08/15/16 13:46

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Quinoline	50.0	41.7	83.4	60.0-140	

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156874-2 08/15/16 04:51 • (LCSD) R3156874-3 08/15/16 05:38

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Biphenyl	50.0	38.1	37.3	76.3	74.5	38.0-103			2.32	20.1
Bis(2-ethylhexyl)phthalate	50.0	35.8	34.9	71.7	69.9	36.9-134			2.54	23.6

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3156874-2 08/15/16 04:51 • (LCSD) R3156874-3 08/15/16 05:38

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Di-n-butyl phthalate	50.0	43.4	40.2	86.8	80.3	41.8-120			7.78	20.2
Diethyl phthalate	50.0	41.8	41.2	83.5	82.3	36.5-129			1.46	20
Pyridine	50.0	17.8	15.0	35.6	30.0	13.5-58.9			16.9	32.5
2-Methylphenol	50.0	35.3	33.2	70.6	66.4	26.4-86.9			6.13	26.5
3&4-Methyl Phenol	50.0	36.4	35.8	72.8	71.7	27.9-92.0			1.53	27
2,4-Dimethylphenol	50.0	42.0	37.6	83.9	75.2	31.9-107			10.9	25.7
2,4-Dinitrophenol	50.0	37.6	33.6	75.2	67.2	24.2-128			11.3	20.5
4-Nitrophenol	50.0	24.0	22.2	48.1	44.5	10.0-52.7			7.85	40
Phenol	50.0	22.9	22.2	45.7	44.3	10.0-57.9			3.12	35
(S) Nitrobenzene-d5				*81.3*	*74.3*	*21.8-123*				
(S) 2-Fluorobiphenyl				*83.0*	*78.6*	*29.5-131*				
(S) p-Terphenyl-d14				*93.2*	*89.1*	*29.3-137*				
(S) Phenol-d5				*45.0*	*44.7*	*5.00-70.1*				
(S) 2-Fluorophenol				*61.7*	*59.5*	*10.0-77.9*				
(S) 2,4,6-Tribromophenol				*140*	*127*	*11.2-130*	J1			

Method Blank (MB)

(MB) R3157036-3 08/15/16 16:54

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00642	0.0330
Anthracene	U		0.00632	0.0330
Benzo(a)anthracene	U		0.00428	0.0330
Benzo(b)fluoranthene	U		0.00695	0.0330
Benzo(k)fluoranthene	U		0.00582	0.0330
Benzo(g,h,i)perylene	U		0.00721	0.0330
Benzo(a)pyrene	U		0.00548	0.0330
Biphenyl	U		0.00588	0.333
Chrysene	U		0.00555	0.0330
Dibenz(a,h)anthracene	U		0.00821	0.0330
Fluoranthene	U		0.00496	0.0330
Fluorene	U		0.00682	0.0330
Indeno(1,2,3-cd)pyrene	U		0.00772	0.0330
2-Methylnaphthalene	U		0.00861	0.0330
Naphthalene	U		0.00889	0.0330
Phenanthrene	U		0.00528	0.0330
Bis(2-ethylhexyl)phthalate	U		0.0120	0.333
Di-n-butyl phthalate	U		0.0109	0.333
Diethyl phthalate	U		0.00691	0.333
Pyrene	U		0.0123	0.0330
Pyridine	U		0.0628	0.333
2-Methylphenol	U		0.00986	0.333
3&4-Methyl Phenol	U		0.00783	0.333
2,4-Dimethylphenol	U		0.0471	0.333
2,4-Dinitrophenol	U		0.0980	0.333
4-Nitrophenol	U		0.0525	0.333
Phenol	U		0.00695	0.333
(S) Nitrobenzene-d5	*74.0*			*21.9-129*
(S) 2-Fluorobiphenyl	*78.4*			*34.9-129*
(S) p-Terphenyl-d14	*89.6*			*21.5-128*
(S) Phenol-d5	*73.1*			*26.3-121*
(S) 2-Fluorophenol	*73.4*			*21.1-116*
(S) 2,4,6-Tribromophenol	*57.9*			*21.6-142*

Method Blank (MB)

(MB) R3157320-2 08/16/16 13:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Quinoline	U		0.0574	0.333

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157036-1 08/15/16 16:05 • (LCSD) R3157036-2 08/15/16 16:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.667	0.530	0.524	79.5	78.6	48.9-107			1.14	20
Anthracene	0.667	0.557	0.542	83.5	81.2	52.0-112			2.75	20
Benzo(a)anthracene	0.667	0.549	0.540	82.3	80.9	52.3-106			1.72	20
Benzo(b)fluoranthene	0.667	0.525	0.518	78.8	77.6	51.3-106			1.50	20
Benzo(k)fluoranthene	0.667	0.565	0.539	84.7	80.8	52.9-107			4.69	20
Benzo(g,h,i)perylene	0.667	0.561	0.551	84.1	82.6	45.8-108			1.77	20
Benzo(a)pyrene	0.667	0.557	0.546	83.5	81.9	51.9-106			1.93	20
Biphenyl	0.667	0.495	0.494	74.3	74.0	45.6-103			0.330	20
Chrysene	0.667	0.552	0.536	82.7	80.4	54.4-110			2.88	20
Dibenz(a,h)anthracene	0.667	0.554	0.551	83.0	82.6	45.7-111			0.420	20
Fluoranthene	0.667	0.555	0.533	83.2	80.0	53.7-110			3.94	20
Fluorene	0.667	0.537	0.523	80.5	78.4	51.1-109			2.75	20
Indeno(1,2,3-cd)pyrene	0.667	0.558	0.556	83.7	83.4	47.5-109			0.310	20
2-Methylnaphthalene	0.667	0.499	0.515	74.8	77.3	48.0-101			3.30	20
Naphthalene	0.667	0.469	0.479	70.4	71.8	43.4-103			2.05	20
Phenanthrene	0.667	0.538	0.523	80.7	78.4	51.6-107			2.92	20
Bis(2-ethylhexyl)phthalate	0.667	0.581	0.566	87.2	84.8	48.1-116			2.76	20.5
Di-n-butyl phthalate	0.667	0.562	0.542	84.2	81.3	49.7-113			3.50	20
Diethyl phthalate	0.667	0.568	0.552	85.2	82.8	52.0-112			2.91	20
Pyrene	0.667	0.553	0.544	82.9	81.5	47.1-108			1.67	20
Pyridine	0.667	0.212	0.161	31.8	24.1	10.0-90.0			27.4	38.3
2-Methylphenol	0.667	0.464	0.456	69.6	68.4	42.4-100			1.73	20
3&4-Methyl Phenol	0.667	0.522	0.515	78.2	77.3	50.5-115			1.21	20
2,4-Dimethylphenol	0.667	0.454	0.445	68.1	66.7	42.2-110			1.97	20
2,4-Dinitrophenol	0.667	0.337	0.318	50.5	47.6	10.0-105			5.82	36.5
4-Nitrophenol	0.667	0.519	0.498	77.7	74.6	34.8-109			4.12	20
Phenol	0.667	0.465	0.465	69.6	69.7	41.5-106			0.0800	20
(S) Nitrobenzene-d5				*69.2*	*71.3*	*21.9-129*				
(S) 2-Fluorobiphenyl				*75.1*	*74.7*	*34.9-129*				
(S) p-Terphenyl-d14				*84.9*	*83.2*	*21.5-128*				
(S) Phenol-d5				*68.8*	*69.8*	*26.3-121*				
(S) 2-Fluorophenol				*71.1*	*70.1*	*21.1-116*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157036-1 08/15/16 16:05 • (LCSD) R3157036-2 08/15/16 16:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) 2,4,6-Tribromophenol				*76.7*	*72.2*	*21.6-142*				

Laboratory Control Sample (LCS)

(LCS) R3157320-1 08/16/16 12:50

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Quinoline	0.667	0.411	61.6	60.0-140	

L852572-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852572-01 08/15/16 18:31 • (MS) R3157036-4 08/15/16 18:55 • (MSD) R3157036-5 08/15/16 19:19

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.753	U	0.554	0.527	73.6	70.1	1	32.2-134			4.99	27.3
Anthracene	0.753	U	0.559	0.518	74.3	68.8	1	32.3-137			7.68	28.4
Benzo(a)anthracene	0.753	U	0.531	0.488	70.5	64.9	1	33.3-124			8.39	29
Benzo(b)fluoranthene	0.753	U	0.591	0.572	78.6	76.0	1	23.3-133			3.34	30.3
Benzo(k)fluoranthene	0.753	U	0.501	0.476	66.5	63.3	1	31.0-129			4.94	26.7
Benzo(g,h,i)perylene	0.753	U	0.333	0.260	44.2	34.6	1	10.0-127			24.4	31.9
Benzo(a)pyrene	0.753	U	0.535	0.492	71.0	65.4	1	28.2-128			8.22	28.4
Biphenyl	0.753	U	0.517	0.489	68.7	64.9	1	38.5-118			5.64	28.9
Chrysene	0.753	U	0.530	0.487	70.4	64.8	1	36.3-129			8.34	28
Dibenz(a,h)anthracene	0.753	U	0.370	0.300	49.1	39.9	1	10.5-128			20.8	29.5
Fluoranthene	0.753	U	0.573	0.560	76.2	74.4	1	27.9-138			2.31	26.9
Fluorene	0.753	U	0.564	0.522	74.9	69.4	1	34.0-133			7.66	27.1
Indeno(1,2,3-cd)pyrene	0.753	U	0.383	0.310	50.8	41.1	1	10.0-128			21.1	31.5
2-Methylnaphthalene	0.753	U	0.551	0.526	73.2	69.8	1	28.7-128			4.66	30.7
Naphthalene	0.753	U	0.501	0.492	66.6	65.4	1	36.4-121			1.80	27.2
Phenanthrene	0.753	U	0.543	0.498	72.2	66.2	1	30.8-137			8.68	26.5
Bis(2-ethylhexyl)phthalate	0.753	0.0614	0.625	0.590	74.9	70.3	1	21.8-141			5.76	35.2
Di-n-butyl phthalate	0.753	U	0.555	0.498	73.7	66.2	1	32.2-133			10.8	25.9
Diethyl phthalate	0.753	U	0.613	0.553	81.5	73.5	1	39.4-136			10.4	25.5
Pyrene	0.753	U	0.559	0.479	74.3	63.7	1	24.1-130			15.4	29.9
Pyridine	0.753	U	0.399	0.371	53.0	49.3	1	10.0-111			7.30	30.5
2-Methylphenol	0.753	U	0.509	0.497	67.7	66.0	1	30.3-118			2.53	25.1
3&4-Methyl Phenol	0.753	U	0.573	0.553	76.1	73.4	1	33.3-141			3.58	25.7
2,4-Dimethylphenol	0.753	U	0.520	0.520	69.1	69.0	1	12.3-149			0.100	32.3

L852572-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852572-01 08/15/16 18:31 • (MS) R3157036-4 08/15/16 18:55 • (MSD) R3157036-5 08/15/16 19:19

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,4-Dinitrophenol	0.753	U	0.271	0.244	36.1	32.5	1	10.0-121			10.5	39.4
4-Nitrophenol	0.753	U	0.553	0.512	73.5	68.0	1	20.0-133			7.78	30.2
Phenol	0.753	U	0.475	0.465	63.1	61.7	1	25.1-130			2.24	29.6
(S) Nitrobenzene-d5					*65.2*	*65.3*		*21.9-129*				
(S) 2-Fluorobiphenyl					*72.9*	*69.5*		*34.9-129*				
(S) p-Terphenyl-d14					*84.3*	*74.7*		*21.5-128*				
(S) Phenol-d5					*64.1*	*62.2*		*26.3-121*				
(S) 2-Fluorophenol					*64.9*	*63.0*		*21.1-116*				
(S) 2,4,6-Tribromophenol					*75.9*	*68.4*		*21.6-142*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.

ACCREDITATIONS & LOCATIONS

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1 4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

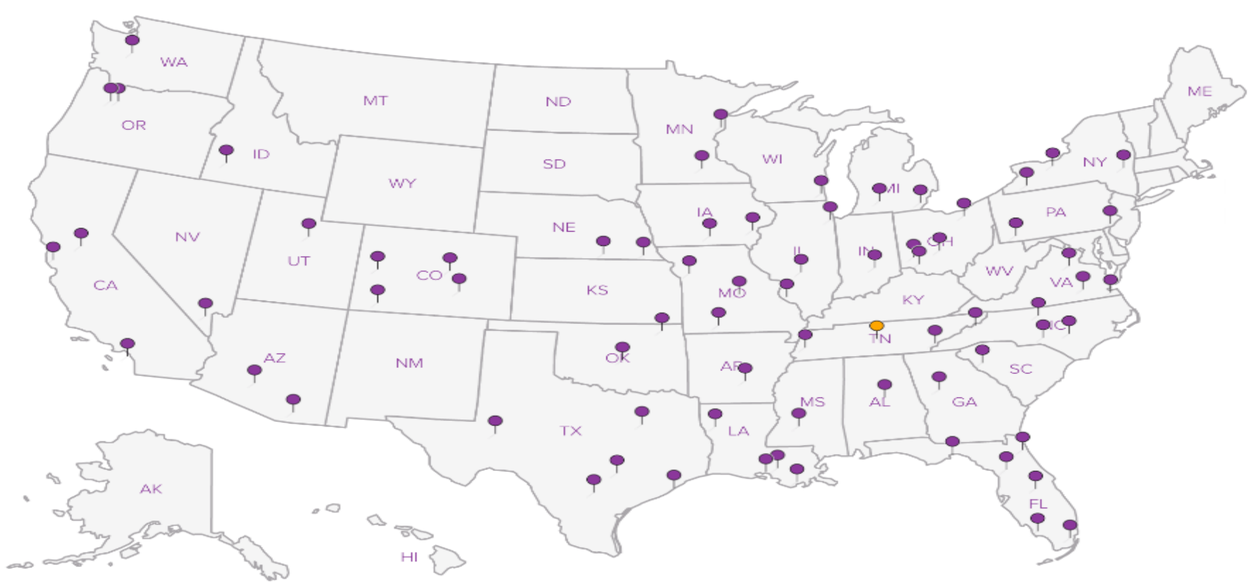
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Company Name/Address:	Billing Information:
Aquaterra Technologies - S/E 122 South Church Street West Chester, PA 19382	Accounts Payable 122 South Church Street West Chester, PA 19382
Report to: Michael Sarcinello / Andrew Klingbeila	Email To: ms@aquaterra-tech.com, andrew.kl

Project Description: AOI8

City/State Collected: PA

Phone: (610) 431-5733

Fax:

Client Project #: PH REF AOI-8

Lab Project #: SUNAQUA-AOI8

Collected by (print): Luke Mokrycki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)
____ Same Day 200%
____ Next Day 100%
____ Two Day 50%
____ Three Day 25%

Date Results Needed

Email? __No __Yes

FAX? __No __Yes

Analysis / Container / Preservative

Chain of Custody Page 1 of 2

ESC L·A·B S·C·I·E·N·C·E·S

YOUR LAB OF CHOICE

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# 852559

I021

Acctnum: SUNAQUA

Template: T113711

Prelogin: P561182

TSR: Mark Beasley

Cooler: 7-15-16

Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK- 3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz	Rem./Contaminant	Sample # (lab only)
AOI8-BH-16-042-0-2-20160808		SS	0-2'	8-8	0800	5		X			01
AOI8-BH-16-042-8-10-20160808		SS	8-10'	8-8	0930	5		X			02
AOI8-BH-16-041-0-2-20160808		SS	0-2'	8-8	1000	5		X			03
AOI8-BH-16-041-8-10-20160808		SS	8-10	8-8	1200	5		X			04
AOI8-BH-16-040-0-2-20160808		SS	0-2	8-8	1300	5		X			05
AOI8-BH-16-040-8-10-20160808		SS	8-10	8-8	1430	5		X			06
AOI8-EQUIPBLANK-20160808		~~SS~~ GW	—	8-8	1500	8	X				07
AOI8-FIELDBLANK-20160808		~~SS~~ GW	—	8-8	1530	8	X				08
AOI8-N-154-10-12-20160808		SS	10-12'	8-8	1425	5	X				09
AOI8-BH-16-050-0-2-20160809		SS	0-2'	8-9	1000	5	X				10

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other__________

pH ________ Temp ________

Flow ________ Other ________

6617 3604 0311

Hold #

Remarks:

Relinquished by : (Signature)	Date: 8/9/16	Time: 1434	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ____

Temp: 1.8 °C Bottles Received: 66+1TB

Date: 8-10-16 Time: 0900

Condition: 089 (lab use only)

COC Seal Intact: ____Y ____N ____NA

pH Checked:

NCF: X

Company Name/Address:	Billing information:	Analysis / Container / Preservative	Chain of Custody Page 2 of 2
Aquaterra Technologies - S/E 122 South Church Street West Chester, PA 19382	Accounts Payable 122 South Church Street West Chester, PA 19382		ESC LAB SCIENCES YOUR LAB OF CHOICE 12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859

Report to: Michael Sarcinello / ~~Michael Newton~~ Andrew Klingbeil	Email To: ms@aquaterra-tech.com, Michael.N Andrew.klingbeil@State...		L # 852859
Project Description: AOI8	City/State Collected: PA		Table #
Phone: (610) 431-5733 Fax:	Client Project #	Lab Project # SUNAQUA-AOI8	Acctnum: SUNAQUA
Collected by (print): Luke Mokrycki	Site/Facility ID #	P.O. #	Template: T113711
Collected by (signature): [signature] Immediately Packed on Ice N ___ Y ___	*Rush?* (Lab MUST Be Notified) ___ Same Day ....200% ___ Next Day ....100% ___ Two Day ....50% ___ Three Day 25%	Date Results Needed Email? ___No ___Yes FAX? ___No ___Yes	Prelogin: P560320 TSR: Mark Beasley Cooler: Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK- 3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz	Rem./Contaminant	Sample # (lab only)
AQTB-BH-16-054-10-12-20160809		SS	10-12'	8-9	1200	5	X				1
AQTB-BH-16-055-0-2-20160809		SS	8-9 ←→	0-2'	1400	5	X				2
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other__________

Remarks:

pH ________ Temp ________

Flow ________ Other ________

Hold #

Relinquished by : (Signature) [signature]	Date: 8/9/16	Time: 1435	Received by: (Signature)	Samples returned via: ☐ UPS ☒ FedEx ☐ Courier ☐ ____	Condition: (lab use only) OK9
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 1.8 °C Bottles Received: 6G+1TB	COC Seal Intact: ___Y ___N ✓ NA
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature) [signature]	Date: 8-10-16 Time: 0900	pH Checked: NCF: X

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

Cooler Receipt Checklist

Client: SUNAQUA SDG# 852555

Cooler Received/Opened On: 8-10-16 By Dakota Busby

Temperature Upon Receipt: 1.8 °c

Dakota Busby
(Signature)

Cooler Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?			✓
Were custody papers properly filled out (ink, signed, etc.)?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were correct preservatives used?			✓
Were all applicable sample containers checked for preservation?			✓
(Any samples not in accepted pH range noted on COC .)			
If applicable, was an observable VOA headspace present?			
Non Conformance Generated? (If yes see attached NCF)	✓	✓	

ANALYTICAL REPORT

August 23, 2016

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L853517
Samples Received:	08/13/2016
Project Number:	
Description:	AOI-8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

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

AO18-BH-16-059-0-2-20160811 L853517-01 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 08:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG899122	10	08/16/16 15:17	08/17/16 07:50	LTB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 16:39	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 16:50	SNR
Total Solids by Method 2540 G-2011	WG899371	1	08/16/16 15:28	08/16/16 15:40	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	1	08/20/16 18:38	08/21/16 06:40	JHH
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	1.37	08/20/16 18:38	08/22/16 20:31	ACG

AO18-BH-16-060-0-2-20160811 L853517-02 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 10:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG899122	1	08/16/16 15:17	08/17/16 01:22	LTB
Metals (ICP) by Method 6010B	WG899122	1	08/16/16 15:17	08/17/16 07:56	LTB
Metals (ICP) by Method 6010B	WG899122	10	08/16/16 15:17	08/17/16 07:59	LTB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	10	08/15/16 11:32	08/16/16 00:09	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	20	08/15/16 11:32	08/16/16 15:26	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	20	08/15/16 11:32	08/16/16 15:51	SNR
Total Solids by Method 2540 G-2011	WG899371	1	08/16/16 15:28	08/16/16 15:40	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	1	08/20/16 18:38	08/21/16 07:00	JHH
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	27.5	08/20/16 18:38	08/23/16 13:32	DWR

AO18-BH-16-061-0-2-20160811 L853517-03 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 12:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG899122	5	08/16/16 15:17	08/17/16 01:24	LTB
Metals (ICP) by Method 6010B	WG899122	5	08/16/16 15:17	08/17/16 08:01	LTB
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 17:03	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG898448	200	08/15/16 11:32	08/16/16 17:09	SNR
Total Solids by Method 2540 G-2011	WG899371	1	08/16/16 15:28	08/16/16 15:40	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	1.18	08/20/16 18:38	08/22/16 21:11	ACG
Volatile Organic Compounds (GC/MS) by Method 8260B	WG900675	1.56	08/20/16 18:38	08/21/16 07:20	JHH

AO18-BH-16-064-0-2-20160811 L853517-04 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 13:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG899508	20	08/17/16 04:36	08/18/16 09:48	KMP
Total Solids by Method 2540 G-2011	WG899372	1	08/16/16 15:11	08/16/16 15:25	KDW

AO18-BH-16-065-0-2-20160811 L853517-05 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 14:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG899508	20	08/17/16 04:36	08/18/16 09:04	KMP
Total Solids by Method 2540 G-2011	WG899372	1	08/16/16 15:11	08/16/16 15:25	KDW

AO18-BH-16-066-0-2-20160811 L853517-06 Solid

Collected by	Collected date/time	Received date/time
Luke M.	08/11/16 15:00	08/13/16 13:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG899508	5	08/17/16 04:36	08/18/16 07:15	KMP
Total Solids by Method 2540 G-2011	WG899372	1	08/16/16 15:11	08/16/16 15:25	KDW

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	75.0		1	08/16/2016 15:40	WG899371

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	20.3		13.3	10	08/17/2016 07:50	WG899122
Lead	95000		6.67	10	08/17/2016 07:50	WG899122
Nickel	211		26.7	10	08/17/2016 07:50	WG899122
Vanadium	47.5		26.7	10	08/17/2016 07:50	WG899122
Zinc	4510		66.7	10	08/17/2016 07:50	WG899122

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00183	1.37	08/22/2016 20:31	WG900675
sec-Butylbenzene	ND		0.00133	1	08/21/2016 06:40	WG900675
tert-Butylbenzene	ND		0.00133	1	08/21/2016 06:40	WG900675
Cyclohexane	ND		0.00133	1	08/21/2016 06:40	WG900675
1,2-Dibromoethane	ND		0.00133	1	08/21/2016 06:40	WG900675
n-Hexane	ND		0.0183	1.37	08/22/2016 20:31	WG900675
1,2-Dichloroethane	ND		0.00133	1	08/21/2016 06:40	WG900675
Ethylbenzene	ND		0.00183	1.37	08/22/2016 20:31	WG900675
Isopropylbenzene	ND		0.0133	1	08/21/2016 06:40	WG900675
Methyl tert-butyl ether	ND		0.00133	1	08/21/2016 06:40	WG900675
Toluene	ND		0.00914	1.37	08/22/2016 20:31	WG900675
1,2,4-Trimethylbenzene	ND		0.00183	1.37	08/22/2016 20:31	WG900675
1,3,5-Trimethylbenzene	ND		0.00133	1	08/21/2016 06:40	WG900675
Xylenes, Total	ND		0.00548	1.37	08/22/2016 20:31	WG900675
(S) Toluene-d8	*105*		*88.7-115*		*08/22/2016 20:31*	WG900675
(S) Toluene-d8	*106*		*88.7-115*		*08/21/2016 06:40*	WG900675
(S) Dibromofluoromethane	*108*		*76.3-123*		*08/21/2016 06:40*	WG900675
(S) Dibromofluoromethane	*105*		*76.3-123*		*08/22/2016 20:31*	WG900675
(S) a,a,a-Trifluorotoluene	*94.7*		*87.2-117*		*08/22/2016 20:31*	WG900675
(S) a,a,a-Trifluorotoluene	*97.7*		*87.2-117*		*08/21/2016 06:40*	WG900675
(S) 4-Bromofluorobenzene	*92.5*		*69.7-129*		*08/21/2016 06:40*	WG900675
(S) 4-Bromofluorobenzene	*91.9*		*69.7-129*		*08/22/2016 20:31*	WG900675

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		8.81	200	08/16/2016 16:39	WG898448
Anthracene	ND		8.81	200	08/16/2016 16:39	WG898448
Benzo(a)anthracene	ND		8.81	200	08/16/2016 16:39	WG898448
Benzo(b)fluoranthene	ND		8.81	200	08/16/2016 16:39	WG898448
Benzo(k)fluoranthene	ND		8.81	200	08/16/2016 16:39	WG898448
Benzo(g,h,i)perylene	ND		8.81	200	08/16/2016 16:39	WG898448
Benzo(a)pyrene	ND		8.81	200	08/16/2016 16:39	WG898448
Biphenyl	ND		88.9	200	08/16/2016 16:39	WG898448
Chrysene	ND		8.81	200	08/16/2016 16:39	WG898448
Dibenz(a,h)anthracene	ND		8.81	200	08/16/2016 16:39	WG898448
Fluoranthene	ND		8.81	200	08/16/2016 16:39	WG898448
Fluorene	ND		8.81	200	08/16/2016 16:39	WG898448
Indeno(1,2,3-cd)pyrene	ND		8.81	200	08/16/2016 16:39	WG898448
2-Methylnaphthalene	ND		8.81	200	08/16/2016 16:39	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		8.81	200	08/16/2016 16:39	WG898448
Phenanthrene	ND		8.81	200	08/16/2016 16:39	WG898448
Pyridine	ND		88.9	200	08/16/2016 16:39	WG898448
Bis(2-ethylhexyl)phthalate	ND		88.9	200	08/16/2016 16:39	WG898448
Di-n-butyl phthalate	ND		88.9	200	08/16/2016 16:39	WG898448
Diethyl phthalate	ND		88.9	200	08/16/2016 16:39	WG898448
Pyrene	ND		8.81	200	08/16/2016 16:39	WG898448
2,4-Dimethylphenol	ND		88.9	200	08/16/2016 16:39	WG898448
2,4-Dinitrophenol	ND		88.9	200	08/16/2016 16:39	WG898448
2-Methylphenol	ND		88.9	200	08/16/2016 16:39	WG898448
3&4-Methyl Phenol	ND		88.9	200	08/16/2016 16:39	WG898448
4-Nitrophenol	ND		88.9	200	08/16/2016 16:39	WG898448
Phenol	ND		88.9	200	08/16/2016 16:39	WG898448
Quinoline	ND		88.9	200	08/16/2016 16:50	WG898448
(S) 2-Fluorophenol	*51.4*	J7	*21.1-116*		*08/16/2016 16:39*	WG898448
(S) Phenol-d5	*55.9*	J7	*26.3-121*		*08/16/2016 16:39*	WG898448
(S) Nitrobenzene-d5	*59.3*	J7	*21.9-129*		*08/16/2016 16:39*	WG898448
(S) 2-Fluorobiphenyl	*60.2*	J7	*34.9-129*		*08/16/2016 16:39*	WG898448
(S) 2,4,6-Tribromophenol	*8.79*	J7	*21.6-142*		*08/16/2016 16:39*	WG898448
(S) p-Terphenyl-d14	*85.4*	J7	*21.5-128*		*08/16/2016 16:39*	WG898448

Sample Narrative:

8270C L853517-01 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	71.1		1	08/16/2016 15:40	WG899371

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	9.73		1.41	1	08/17/2016 01:22	WG899122
Lead	2650		0.703	1	08/17/2016 07:56	WG899122
Nickel	24.6		2.81	1	08/17/2016 01:22	WG899122
Vanadium	36.6		2.81	1	08/17/2016 01:22	WG899122
Zinc	2430		70.3	10	08/17/2016 07:59	WG899122

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.0387	27.5	08/23/2016 13:32	WG900675
sec-Butylbenzene	ND		0.00141	1	08/21/2016 07:00	WG900675
tert-Butylbenzene	ND		0.00141	1	08/21/2016 07:00	WG900675
Cyclohexane	ND		0.00141	1	08/21/2016 07:00	WG900675
1,2-Dibromoethane	ND		0.00141	1	08/21/2016 07:00	WG900675
n-Hexane	ND		0.387	27.5	08/23/2016 13:32	WG900675
1,2-Dichloroethane	ND		0.00141	1	08/21/2016 07:00	WG900675
Ethylbenzene	ND		0.0387	27.5	08/23/2016 13:32	WG900675
Isopropylbenzene	ND		0.0141	1	08/21/2016 07:00	WG900675
Methyl tert-butyl ether	ND		0.00141	1	08/21/2016 07:00	WG900675
Toluene	0.986		0.193	27.5	08/23/2016 13:32	WG900675
1,2,4-Trimethylbenzene	ND		0.00141	1	08/21/2016 07:00	WG900675
1,3,5-Trimethylbenzene	ND		0.00141	1	08/21/2016 07:00	WG900675
Xylenes, Total	ND		0.116	27.5	08/23/2016 13:32	WG900675
(S) Toluene-d8	*105*		*88.7-115*		*08/23/2016 13:32*	WG900675
(S) Toluene-d8	*107*		*88.7-115*		*08/21/2016 07:00*	WG900675
(S) Dibromofluoromethane	*109*		*76.3-123*		*08/21/2016 07:00*	WG900675
(S) Dibromofluoromethane	*100*		*76.3-123*		*08/23/2016 13:32*	WG900675
(S) a,a,a-Trifluorotoluene	*104*		*87.2-117*		*08/23/2016 13:32*	WG900675
(S) a,a,a-Trifluorotoluene	*96.9*		*87.2-117*		*08/21/2016 07:00*	WG900675
(S) 4-Bromofluorobenzene	*84.2*		*69.7-129*		*08/21/2016 07:00*	WG900675
(S) 4-Bromofluorobenzene	*82.0*		*69.7-129*		*08/23/2016 13:32*	WG900675

Sample Narrative:

8260B L853517-02 WG900675: No bisulfates remain for analysis.

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.464	10	08/16/2016 00:09	WG898448
Anthracene	ND		0.464	10	08/16/2016 00:09	WG898448
Benzo(a)anthracene	2.08		0.464	10	08/16/2016 00:09	WG898448
Benzo(b)fluoranthene	3.14		0.929	20	08/16/2016 15:26	WG898448
Benzo(k)fluoranthene	1.01		0.929	20	08/16/2016 15:26	WG898448
Benzo(g,h,i)perylene	ND		0.929	20	08/16/2016 15:26	WG898448
Benzo(a)pyrene	2.02		0.929	20	08/16/2016 15:26	WG898448
Biphenyl	ND		4.69	10	08/16/2016 00:09	WG898448
Chrysene	1.77		0.464	10	08/16/2016 00:09	WG898448
Dibenz(a,h)anthracene	ND		0.929	20	08/16/2016 15:26	WG898448
Fluoranthene	3.71		0.464	10	08/16/2016 00:09	WG898448

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Fluorene	ND		0.464	10	08/16/2016 00:09	WG898448
Indeno(1,2,3-cd)pyrene	ND		0.929	20	08/16/2016 15:26	WG898448
2-Methylnaphthalene	ND		0.464	10	08/16/2016 00:09	WG898448
Naphthalene	ND		0.464	10	08/16/2016 00:09	WG898448
Phenanthrene	1.94		0.464	10	08/16/2016 00:09	WG898448
Pyridine	ND		4.69	10	08/16/2016 00:09	WG898448
Bis(2-ethylhexyl)phthalate	ND		4.69	10	08/16/2016 00:09	WG898448
Di-n-butyl phthalate	ND		4.69	10	08/16/2016 00:09	WG898448
Diethyl phthalate	ND		4.69	10	08/16/2016 00:09	WG898448
Pyrene	3.70		0.464	10	08/16/2016 00:09	WG898448
2,4-Dimethylphenol	ND		4.69	10	08/16/2016 00:09	WG898448
2,4-Dinitrophenol	ND		4.69	10	08/16/2016 00:09	WG898448
2-Methylphenol	ND		4.69	10	08/16/2016 00:09	WG898448
3&4-Methyl Phenol	ND		4.69	10	08/16/2016 00:09	WG898448
4-Nitrophenol	ND		4.69	10	08/16/2016 00:09	WG898448
Phenol	ND		4.69	10	08/16/2016 00:09	WG898448
Quinoline	ND		9.37	20	08/16/2016 15:51	WG898448
(S) 2-Fluorophenol	*67.3*	J7	*21.1-116*		*08/16/2016 15:26*	WG898448
(S) 2-Fluorophenol	*62.1*		*21.1-116*		*08/16/2016 00:09*	WG898448
(S) Phenol-d5	*55.1*		*26.3-121*		*08/16/2016 00:09*	WG898448
(S) Phenol-d5	*60.5*	J7	*26.3-121*		*08/16/2016 15:26*	WG898448
(S) Nitrobenzene-d5	*65.7*	J7	*21.9-129*		*08/16/2016 15:26*	WG898448
(S) Nitrobenzene-d5	*63.6*		*21.9-129*		*08/16/2016 00:09*	WG898448
(S) 2-Fluorobiphenyl	*59.4*		*34.9-129*		*08/16/2016 00:09*	WG898448
(S) 2-Fluorobiphenyl	*68.0*	J7	*34.9-129*		*08/16/2016 15:26*	WG898448
(S) 2,4,6-Tribromophenol	*41.3*	J7	*21.6-142*		*08/16/2016 15:26*	WG898448
(S) 2,4,6-Tribromophenol	*41.3*		*21.6-142*		*08/16/2016 00:09*	WG898448
(S) p-Terphenyl-d14	*69.8*		*21.5-128*		*08/16/2016 00:09*	WG898448
(S) p-Terphenyl-d14	*61.9*	J7	*21.5-128*		*08/16/2016 15:26*	WG898448

Sample Narrative:

8270C L853517-02 WG898448: IS/SURR failed on lower dilution.

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	39.6		1	08/16/2016 15:40	WG899371

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	ND		12.6	5	08/17/2016 01:24	WG899122
Lead	1320		6.32	5	08/17/2016 08:01	WG899122
Nickel	36.9		25.3	5	08/17/2016 01:24	WG899122
Vanadium	30.4		25.3	5	08/17/2016 01:24	WG899122
Zinc	1550		63.2	5	08/17/2016 01:24	WG899122

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00394	1.56	08/21/2016 07:20	WG900675
sec-Butylbenzene	ND		0.00394	1.56	08/21/2016 07:20	WG900675
tert-Butylbenzene	ND		0.00394	1.56	08/21/2016 07:20	WG900675
Cyclohexane	ND		0.00394	1.56	08/21/2016 07:20	WG900675
1,2-Dibromoethane	ND		0.00394	1.56	08/21/2016 07:20	WG900675
n-Hexane	ND		0.0394	1.56	08/21/2016 07:20	WG900675
1,2-Dichloroethane	ND		0.00394	1.56	08/21/2016 07:20	WG900675
Ethylbenzene	ND		0.00298	1.18	08/22/2016 21:11	WG900675
Isopropylbenzene	ND		0.0394	1.56	08/21/2016 07:20	WG900675
Methyl tert-butyl ether	ND		0.00394	1.56	08/21/2016 07:20	WG900675
Toluene	ND		0.0197	1.56	08/21/2016 07:20	WG900675
1,2,4-Trimethylbenzene	ND		0.00394	1.56	08/21/2016 07:20	WG900675
1,3,5-Trimethylbenzene	ND		0.00394	1.56	08/21/2016 07:20	WG900675
Xylenes, Total	ND		0.00895	1.18	08/22/2016 21:11	WG900675
(S) Toluene-d8	*100*		*88.7-115*		*08/22/2016 21:11*	WG900675
(S) Toluene-d8	*105*		*88.7-115*		*08/21/2016 07:20*	WG900675
(S) Dibromofluoromethane	*110*		*76.3-123*		*08/21/2016 07:20*	WG900675
(S) Dibromofluoromethane	*113*		*76.3-123*		*08/22/2016 21:11*	WG900675
(S) a,a,a-Trifluorotoluene	*90.5*		*87.2-117*		*08/22/2016 21:11*	WG900675
(S) a,a,a-Trifluorotoluene	*98.7*		*87.2-117*		*08/21/2016 07:20*	WG900675
(S) 4-Bromofluorobenzene	*87.9*		*69.7-129*		*08/21/2016 07:20*	WG900675
(S) 4-Bromofluorobenzene	*73.6*		*69.7-129*		*08/22/2016 21:11*	WG900675

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		16.7	200	08/16/2016 17:03	WG898448
Anthracene	19.7		16.7	200	08/16/2016 17:03	WG898448
Benzo(a)anthracene	47.2		16.7	200	08/16/2016 17:03	WG898448
Benzo(b)fluoranthene	56.6		16.7	200	08/16/2016 17:03	WG898448
Benzo(k)fluoranthene	20.0		16.7	200	08/16/2016 17:03	WG898448
Benzo(g,h,i)perylene	ND		16.7	200	08/16/2016 17:03	WG898448
Benzo(a)pyrene	37.9		16.7	200	08/16/2016 17:03	WG898448
Biphenyl	ND		168	200	08/16/2016 17:03	WG898448
Chrysene	50.0		16.7	200	08/16/2016 17:03	WG898448
Dibenz(a,h)anthracene	ND		16.7	200	08/16/2016 17:03	WG898448
Fluoranthene	98.1		16.7	200	08/16/2016 17:03	WG898448
Fluorene	ND		16.7	200	08/16/2016 17:03	WG898448
Indeno(1,2,3-cd)pyrene	ND		16.7	200	08/16/2016 17:03	WG898448
2-Methylnaphthalene	ND		16.7	200	08/16/2016 17:03	WG898448

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Naphthalene	ND		16.7	200	08/16/2016 17:03	WG898448
Phenanthrene	77.5		16.7	200	08/16/2016 17:03	WG898448
Pyridine	ND		168	200	08/16/2016 17:03	WG898448
Bis(2-ethylhexyl)phthalate	ND		168	200	08/16/2016 17:03	WG898448
Di-n-butyl phthalate	ND		168	200	08/16/2016 17:03	WG898448
Diethyl phthalate	ND		168	200	08/16/2016 17:03	WG898448
Pyrene	68.5		16.7	200	08/16/2016 17:03	WG898448
2,4-Dimethylphenol	ND		168	200	08/16/2016 17:03	WG898448
2,4-Dinitrophenol	ND		168	200	08/16/2016 17:03	WG898448
2-Methylphenol	ND		168	200	08/16/2016 17:03	WG898448
3&4-Methyl Phenol	ND		168	200	08/16/2016 17:03	WG898448
4-Nitrophenol	ND		168	200	08/16/2016 17:03	WG898448
Phenol	ND		168	200	08/16/2016 17:03	WG898448
Quinoline	ND		168	200	08/16/2016 17:09	WG898448
(S) 2-Fluorophenol	*53.2*	J7	*21.1-116*		*08/16/2016 17:03*	WG898448
(S) Phenol-d5	*67.2*	J7	*26.3-121*		*08/16/2016 17:03*	WG898448
(S) Nitrobenzene-d5	*59.0*	J7	*21.9-129*		*08/16/2016 17:03*	WG898448
(S) 2-Fluorobiphenyl	*78.6*	J7	*34.9-129*		*08/16/2016 17:03*	WG898448
(S) 2,4,6-Tribromophenol	*29.9*	J7	*21.6-142*		*08/16/2016 17:03*	WG898448
(S) p-Terphenyl-d14	*87.4*	J7	*21.5-128*		*08/16/2016 17:03*	WG898448

Sample Narrative:

8270C L853517-03 WG898448: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	66.4		1	08/16/2016 15:25	WG899372

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzo(a)pyrene	2.54		0.181	20	08/18/2016 09:48	WG899508
(S) p-Terphenyl-d14	*44.5*	J7	*32.2-131*		*08/18/2016 09:48*	WG899508
(S) Nitrobenzene-d5	*30.8*	J7	*22.1-146*		*08/18/2016 09:48*	WG899508
(S) 2-Fluorobiphenyl	*46.9*	J7	*40.6-122*		*08/18/2016 09:48*	WG899508

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	81.0		1	08/16/2016 15:25	WG899372

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzo(a)pyrene	4.14		0.148	20	08/18/2016 09:04	WG899508
(S) p-Terphenyl-d14	*44.3*	J7	*32.2-131*		*08/18/2016 09:04*	WG899508
(S) Nitrobenzene-d5	*30.9*	J7	*22.1-146*		*08/18/2016 09:04*	WG899508
(S) 2-Fluorobiphenyl	*52.6*	J7	*40.6-122*		*08/18/2016 09:04*	WG899508

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	60.2		1	08/16/2016 15:25	WG899372

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzo(a)pyrene	2.77		0.0499	5	08/18/2016 07:15	WG899508
(S) p-Terphenyl-d14	*45.0*		*32.2-131*		*08/18/2016 07:15*	WG899508
(S) Nitrobenzene-d5	*39.8*		*22.1-146*		*08/18/2016 07:15*	WG899508
(S) 2-Fluorobiphenyl	*52.4*		*40.6-122*		*08/18/2016 07:15*	WG899508

Method Blank (MB)

(MB) R3157308-1 08/16/16 15:40

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000700			

L853509-06 Original Sample (OS) • Duplicate (DUP)

(OS) L853509-06 08/16/16 15:40 • (DUP) R3157308-3 08/16/16 15:40

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	81.6	81.8	1	0.187		5

Laboratory Control Sample (LCS)

(LCS) R3157308-2 08/16/16 15:40

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.1	100	85.0-115	

Method Blank (MB)

(MB) R3157304-1 08/16/16 15:25

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000400			

L853519-01 Original Sample (OS) • Duplicate (DUP)

(OS) L853519-01 08/16/16 15:25 • (DUP) R3157304-3 08/16/16 15:25

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	78.6	78.5	1	0.0754		5

Laboratory Control Sample (LCS)

(LCS) R3157304-2 08/16/16 15:25

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3157243-1 08/17/16 00:17

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Cobalt	U		0.23	1.00
Lead	U		0.19	0.500
Nickel	U		0.49	2.00
Vanadium	U		0.24	2.00
Zinc	U		0.59	5.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157243-2 08/17/16 00:20 • (LCSD) R3157243-3 08/17/16 00:22

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Cobalt	100	101	101	101	101	80-120			0	20
Lead	100	101	101	101	101	80-120			0	20
Nickel	100	98.9	98.8	99	99	80-120			0	20
Vanadium	100	100	100	100	100	80-120			0	20
Zinc	100	97.7	97.7	98	98	80-120			0	20

L853694-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L853694-02 08/17/16 00:25 • (MS) R3157243-6 08/17/16 00:33 • (MSD) R3157243-7 08/17/16 00:35

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Cobalt	213	16.8	225	236	98	103	1	75-125			5	20
Lead	213	75.0	279	289	96	100	1	75-125			3	20
Nickel	213	38.7	242	253	95	100	1	75-125			4	20
Vanadium	213	83.7	278	298	91	101	1	75-125			7	20
Zinc	213	771	944	943	82	81	1	75-125			0	20

Method Blank (MB)

(MB) R3158235-3 08/21/16 02:38

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000270	0.00100
sec-Butylbenzene	U		0.000201	0.00100
tert-Butylbenzene	U		0.000206	0.00100
Cyclohexane	U		0.000350	0.00100
1,2-Dibromoethane	U		0.000343	0.00100
1,2-Dichloroethane	U		0.000265	0.00100
Ethylbenzene	U		0.000297	0.00100
n-Hexane	U		0.000290	0.0100
Isopropylbenzene	U		0.000243	0.0100
Methyl tert-butyl ether	U		0.000212	0.00100
Toluene	U		0.000434	0.00500
1,2,4-Trimethylbenzene	U		0.000211	0.00100
1,3,5-Trimethylbenzene	U		0.000266	0.00100
Xylenes, Total	U		0.000698	0.00300
(S) Toluene-d8	*111*			*88.7-115*
(S) Dibromofluoromethane	*107*			*76.3-123*
(S) a,a,a-Trifluorotoluene	*100*			*87.2-117*
(S) 4-Bromofluorobenzene	*97.3*			*69.7-129*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3158235-1 08/21/16 00:25 • (LCSD) R3158235-2 08/21/16 00:45

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0290	0.0273	116	109	72.6-120			5.98	20
sec-Butylbenzene	0.0250	0.0248	0.0237	99.2	94.7	77.8-129			4.61	20
tert-Butylbenzene	0.0250	0.0247	0.0234	98.9	93.8	77.2-129			5.30	20
1,2-Dibromoethane	0.0250	0.0256	0.0241	102	96.6	78.7-123			5.86	20
1,2-Dichloroethane	0.0250	0.0283	0.0266	113	106	67.2-121			6.25	20
Ethylbenzene	0.0250	0.0251	0.0236	100	94.3	78.6-124			6.37	20
n-Hexane	0.0250	0.0300	0.0278	120	111	59.9-125			7.34	20
Isopropylbenzene	0.0250	0.0250	0.0237	100	94.6	79.4-126			5.52	20
Methyl tert-butyl ether	0.0250	0.0285	0.0260	114	104	70.2-122			9.02	20
Toluene	0.0250	0.0256	0.0243	102	97.3	76.7-116			5.09	20
1,2,4-Trimethylbenzene	0.0250	0.0247	0.0237	98.9	94.7	77.1-124			4.35	20
1,3,5-Trimethylbenzene	0.0250	0.0247	0.0237	98.9	94.8	79.0-125			4.22	20
Xylenes, Total	0.0750	0.0750	0.0711	100	94.8	78.1-123			5.41	20
(S) Toluene-d8				*107*	*107*	*88.7-115*				
(S) Dibromofluoromethane				*108*	*108*	*76.3-123*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3158235-1 08/21/16 00:25 • (LCSD) R3158235-2 08/21/16 00:45

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) a,a,a-Trifluorotoluene				*101*	*99.6*	*87.2-117*				
(S) 4-Bromofluorobenzene				*94.0*	*96.1*	*69.7-129*				

L853529-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L853529-01 08/21/16 04:18 • (MS) R3158235-4 08/21/16 03:18 • (MSD) R3158235-5 08/21/16 03:38

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0308	U	0.00132	0.000945	4.28	3.07	1	47.8-131	J6	J3 J6	33.1	22.8
sec-Butylbenzene	0.0308	U	0.000275	0.000483	0.892	1.57	1	31.0-142	J6	J3 J6	55.1	34.7
tert-Butylbenzene	0.0308	U	0.000315	0.000479	1.02	1.55	1	36.9-142	J6	J3 J6	41.2	31.7
1,2-Dibromoethane	0.0308	U	0.00139	0.000806	4.52	2.62	1	50.2-133	J6	J3 J6	53.4	23.6
1,2-Dichloroethane	0.0308	U	0.00209	0.00131	6.78	4.27	1	47.1-129	J6	J3 J6	45.5	22.7
Ethylbenzene	0.0308	U	0.000596	0.000753	1.93	2.45	1	44.8-135	J6	J6	23.3	26.9
n-Hexane	0.0308	U	0.000669	0.000804	2.17	2.61	1	26.0-123	J6	J6	18.3	40
Isopropylbenzene	0.0308	U	0.000337	0.000496	1.09	1.61	1	41.9-139	J6	J3 J6	38.2	29.3
Methyl tert-butyl ether	0.0308	0.000432	0.00215	0.00119	5.57	2.47	1	50.4-131	J6	J3 J6	57.2	24.8
Toluene	0.0308	U	0.000883	0.000820	2.87	2.66	1	47.8-127	J6	J6	7.39	24.3
1,2,4-Trimethylbenzene	0.0308	U	0.000303	0.000478	0.984	1.55	1	32.9-139	J6	J3 J6	44.8	30.6
1,3,5-Trimethylbenzene	0.0308	U	ND	0.000452	0.000	1.47	1	37.1-138	J6	J3 J6	200	30.6
Xylenes, Total	0.0924	U	0.00198	0.00273	2.15	2.95	1	42.7-135	J6	J3 J6	31.6	26.6
(S) Toluene-d8					*110*	*109*		*88.7-115*				
(S) Dibromofluoromethane					*110*	*112*		*76.3-123*				
(S) a,a,a-Trifluorotoluene					*99.0*	*98.6*		*87.2-117*				
(S) 4-Bromofluorobenzene					*93.4*	*94.2*		*69.7-129*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3157036-3 08/15/16 16:54

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00642	0.0330
Anthracene	U		0.00632	0.0330
Benzo(a)anthracene	U		0.00428	0.0330
Benzo(b)fluoranthene	U		0.00695	0.0330
Benzo(k)fluoranthene	U		0.00582	0.0330
Benzo(g,h,i)perylene	U		0.00721	0.0330
Benzo(a)pyrene	U		0.00548	0.0330
Biphenyl	U		0.00588	0.333
Chrysene	U		0.00555	0.0330
Dibenz(a,h)anthracene	U		0.00821	0.0330
Fluoranthene	U		0.00496	0.0330
Fluorene	U		0.00682	0.0330
Indeno(1,2,3-cd)pyrene	U		0.00772	0.0330
2-Methylnaphthalene	U		0.00861	0.0330
Naphthalene	U		0.00889	0.0330
Phenanthrene	U		0.00528	0.0330
Bis(2-ethylhexyl)phthalate	U		0.0120	0.333
Di-n-butyl phthalate	U		0.0109	0.333
Diethyl phthalate	U		0.00691	0.333
Pyrene	U		0.0123	0.0330
Pyridine	U		0.0628	0.333
2-Methylphenol	U		0.00986	0.333
3&4-Methyl Phenol	U		0.00783	0.333
2,4-Dimethylphenol	U		0.0471	0.333
2,4-Dinitrophenol	U		0.0980	0.333
4-Nitrophenol	U		0.0525	0.333
Phenol	U		0.00695	0.333
(S) Nitrobenzene-d5	*74.0*			*21.9-129*
(S) 2-Fluorobiphenyl	*78.4*			*34.9-129*
(S) p-Terphenyl-d14	*89.6*			*21.5-128*
(S) Phenol-d5	*73.1*			*26.3-121*
(S) 2-Fluorophenol	*73.4*			*21.1-116*
(S) 2,4,6-Tribromophenol	*57.9*			*21.6-142*

Method Blank (MB)

(MB) R3157320-2 08/16/16 13:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Quinoline	U		0.0574	0.333

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157036-1 08/15/16 16:05 • (LCSD) R3157036-2 08/15/16 16:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.667	0.530	0.524	79.5	78.6	48.9-107			1.14	20
Anthracene	0.667	0.557	0.542	83.5	81.2	52.0-112			2.75	20
Benzo(a)anthracene	0.667	0.549	0.540	82.3	80.9	52.3-106			1.72	20
Benzo(b)fluoranthene	0.667	0.525	0.518	78.8	77.6	51.3-106			1.50	20
Benzo(k)fluoranthene	0.667	0.565	0.539	84.7	80.8	52.9-107			4.69	20
Benzo(g,h,i)perylene	0.667	0.561	0.551	84.1	82.6	45.8-108			1.77	20
Benzo(a)pyrene	0.667	0.557	0.546	83.5	81.9	51.9-106			1.93	20
Biphenyl	0.667	0.495	0.494	74.3	74.0	45.6-103			0.330	20
Chrysene	0.667	0.552	0.536	82.7	80.4	54.4-110			2.88	20
Dibenz(a,h)anthracene	0.667	0.554	0.551	83.0	82.6	45.7-111			0.420	20
Fluoranthene	0.667	0.555	0.533	83.2	80.0	53.7-110			3.94	20
Fluorene	0.667	0.537	0.523	80.5	78.4	51.1-109			2.75	20
Indeno(1,2,3-cd)pyrene	0.667	0.558	0.556	83.7	83.4	47.5-109			0.310	20
2-Methylnaphthalene	0.667	0.499	0.515	74.8	77.3	48.0-101			3.30	20
Naphthalene	0.667	0.469	0.479	70.4	71.8	43.4-103			2.05	20
Phenanthrene	0.667	0.538	0.523	80.7	78.4	51.6-107			2.92	20
Bis(2-ethylhexyl)phthalate	0.667	0.581	0.566	87.2	84.8	48.1-116			2.76	20.5
Di-n-butyl phthalate	0.667	0.562	0.542	84.2	81.3	49.7-113			3.50	20
Diethyl phthalate	0.667	0.568	0.552	85.2	82.8	52.0-112			2.91	20
Pyrene	0.667	0.553	0.544	82.9	81.5	47.1-108			1.67	20
Pyridine	0.667	0.212	0.161	31.8	24.1	10.0-90.0			27.4	38.3
2-Methylphenol	0.667	0.464	0.456	69.6	68.4	42.4-100			1.73	20
3&4-Methyl Phenol	0.667	0.522	0.515	78.2	77.3	50.5-115			1.21	20
2,4-Dimethylphenol	0.667	0.454	0.445	68.1	66.7	42.2-110			1.97	20
2,4-Dinitrophenol	0.667	0.337	0.318	50.5	47.6	10.0-105			5.82	36.5
4-Nitrophenol	0.667	0.519	0.498	77.7	74.6	34.8-109			4.12	20
Phenol	0.667	0.465	0.465	69.6	69.7	41.5-106			0.0800	20
(S) Nitrobenzene-d5				*69.2*	*71.3*	*21.9-129*				
(S) 2-Fluorobiphenyl				*75.1*	*74.7*	*34.9-129*				
(S) p-Terphenyl-d14				*84.9*	*83.2*	*21.5-128*				
(S) Phenol-d5				*68.8*	*69.8*	*26.3-121*				
(S) 2-Fluorophenol				*71.1*	*70.1*	*21.1-116*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157036-1 08/15/16 16:05 • (LCSD) R3157036-2 08/15/16 16:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) 2,4,6-Tribromophenol				*76.7*	*72.2*	*21.6-142*				

Laboratory Control Sample (LCS)

(LCS) R3157320-1 08/16/16 12:50

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Quinoline	0.667	0.411	61.6	60.0-140	

L852572-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852572-01 08/15/16 18:31 • (MS) R3157036-4 08/15/16 18:55 • (MSD) R3157036-5 08/15/16 19:19

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.753	U	0.554	0.527	73.6	70.1	1	32.2-134			4.99	27.3
Anthracene	0.753	U	0.559	0.518	74.3	68.8	1	32.3-137			7.68	28.4
Benzo(a)anthracene	0.753	U	0.531	0.488	70.5	64.9	1	33.3-124			8.39	29
Benzo(b)fluoranthene	0.753	U	0.591	0.572	78.6	76.0	1	23.3-133			3.34	30.3
Benzo(k)fluoranthene	0.753	U	0.501	0.476	66.5	63.3	1	31.0-129			4.94	26.7
Benzo(g,h,i)perylene	0.753	U	0.333	0.260	44.2	34.6	1	10.0-127			24.4	31.9
Benzo(a)pyrene	0.753	U	0.535	0.492	71.0	65.4	1	28.2-128			8.22	28.4
Biphenyl	0.753	U	0.517	0.489	68.7	64.9	1	38.5-118			5.64	28.9
Chrysene	0.753	U	0.530	0.487	70.4	64.8	1	36.3-129			8.34	28
Dibenz(a,h)anthracene	0.753	U	0.370	0.300	49.1	39.9	1	10.5-128			20.8	29.5
Fluoranthene	0.753	U	0.573	0.560	76.2	74.4	1	27.9-138			2.31	26.9
Fluorene	0.753	U	0.564	0.522	74.9	69.4	1	34.0-133			7.66	27.1
Indeno(1,2,3-cd)pyrene	0.753	U	0.383	0.310	50.8	41.1	1	10.0-128			21.1	31.5
2-Methylnaphthalene	0.753	U	0.551	0.526	73.2	69.8	1	28.7-128			4.66	30.7
Naphthalene	0.753	U	0.501	0.492	66.6	65.4	1	36.4-121			1.80	27.2
Phenanthrene	0.753	U	0.543	0.498	72.2	66.2	1	30.8-137			8.68	26.5
Bis(2-ethylhexyl)phthalate	0.753	0.0614	0.625	0.590	74.9	70.3	1	21.8-141			5.76	35.2
Di-n-butyl phthalate	0.753	U	0.555	0.498	73.7	66.2	1	32.2-133			10.8	25.9
Diethyl phthalate	0.753	U	0.613	0.553	81.5	73.5	1	39.4-136			10.4	25.5
Pyrene	0.753	U	0.559	0.479	74.3	63.7	1	24.1-130			15.4	29.9
Pyridine	0.753	U	0.399	0.371	53.0	49.3	1	10.0-111			7.30	30.5
2-Methylphenol	0.753	U	0.509	0.497	67.7	66.0	1	30.3-118			2.53	25.1
3&4-Methyl Phenol	0.753	U	0.573	0.553	76.1	73.4	1	33.3-141			3.58	25.7
2,4-Dimethylphenol	0.753	U	0.520	0.520	69.1	69.0	1	12.3-149			0.100	32.3

1 Cp 2 Tc 3 Ss 4 Cn 5 Sr 6 Qc 7 Gl 8 Al 9 Sc

L852572-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L852572-01 08/15/16 18:31 • (MS) R3157036-4 08/15/16 18:55 • (MSD) R3157036-5 08/15/16 19:19

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,4-Dinitrophenol	0.753	U	0.271	0.244	36.1	32.5	1	10.0-121			10.5	39.4
4-Nitrophenol	0.753	U	0.553	0.512	73.5	68.0	1	20.0-133			7.78	30.2
Phenol	0.753	U	0.475	0.465	63.1	61.7	1	25.1-130			2.24	29.6
(S) Nitrobenzene-d5					*65.2*	*65.3*		*21.9-129*				
(S) 2-Fluorobiphenyl					*72.9*	*69.5*		*34.9-129*				
(S) p-Terphenyl-d14					*84.3*	*74.7*		*21.5-128*				
(S) Phenol-d5					*64.1*	*62.2*		*26.3-121*				
(S) 2-Fluorophenol					*64.9*	*63.0*		*21.1-116*				
(S) 2,4,6-Tribromophenol					*75.9*	*68.4*		*21.6-142*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3157694-3 08/18/16 03:56

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzo(a)pyrene	U		0.000600	0.00600
(S) p-Terphenyl-d14	*67.7*			*32.2-131*
(S) Nitrobenzene-d5	*38.0*			*22.1-146*
(S) 2-Fluorobiphenyl	*71.0*			*40.6-122*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3157694-1 08/18/16 03:13 • (LCSD) R3157694-2 08/18/16 03:35

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzo(a)pyrene	0.0800	0.0470	0.0529	58.8	66.1	42.3-119			11.8	20
(S) p-Terphenyl-d14				*53.9*	*65.7*	*32.2-131*				
(S) Nitrobenzene-d5				*34.4*	*45.5*	*22.1-146*				
(S) 2-Fluorobiphenyl				*58.5*	*73.6*	*40.6-122*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
J3	The associated batch QC was outside the established quality control range for precision.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
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Florida	E87487
Georgia	NELAP
Georgia [1]	923
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Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1 4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

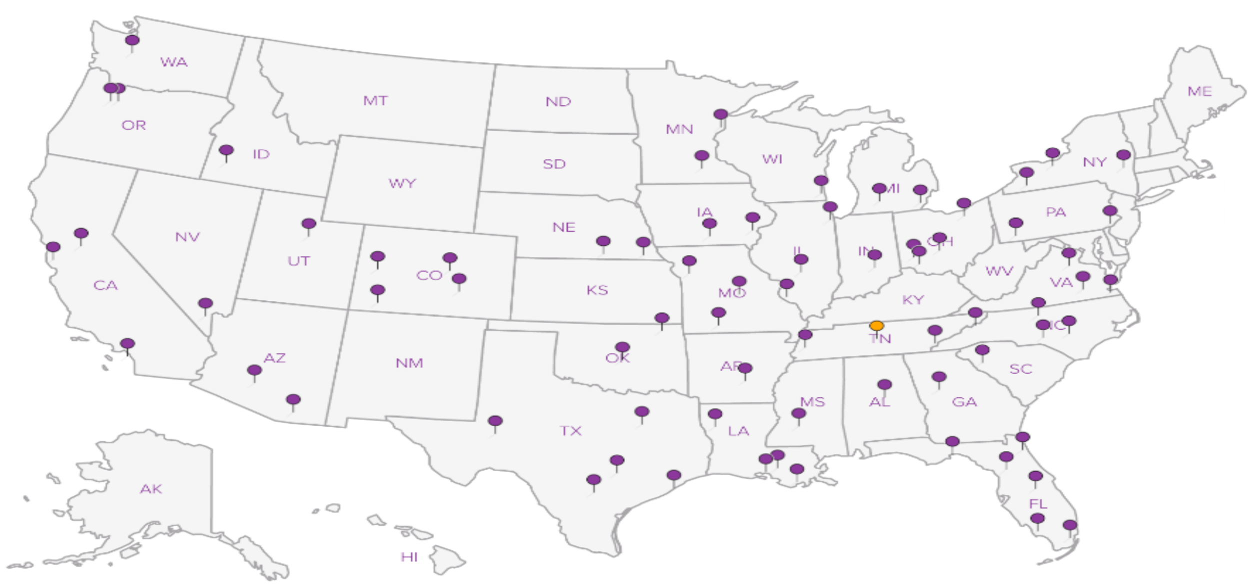
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Company Name/Address:
Aquaterra Technologies - S/E
122 South Church Street
West Chester, PA 19382

Billing Information:
Accounts Payable
122 South Church Street
West Chester, PA 19382

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

ESC LAB SCIENCES
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Mount Juliet, TN 37122
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Phone: 800-767-5859
Fax: 615-758-5859

Report to: Andrew Klingbeil
Michael Sarcinello / ~~Michael Newton~~

Email To: Andrew-Klingbeil@Stantec
ms@aquaterra-tech.com, Michael.N

Project Description: AOI8

City/State Collected: PA

Phone: (610) 431-5733
Fax:

Client Project #

Lab Project # SUNAQUA-AOI8

L# 853517

C243

Acctnum: SUNAQUA
Template: T113711
Prelogin: P560320
TSR: Mark Beasley
Cooler:
Shipped Via:

Collected by (print): Luke Mokrzycki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No ___Yes
FAX? ___No ___Yes

Analyses:
1. EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar
2. EVERGREENCOMP + MEK-3 - 40ml 5035 + 2 - 4oz ja
3. SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK-3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz							Rem./Contaminant	Sample # (lab only)
AOI8-BH-16-059-0-2-20160811		SS	0-2'	8-11	0800	5	X										01
AOI8-BH-16-060-0-2-20160811		SS	0-2'	8-11	1000	5	X										02
AOI8-BH-16-061-0-2-20160811		SS	0-2'	8-11	1200	5	X										03
AOI8-BH-16-064-0-2-20160811		SS	0-2'	8-11	1300	1			X								04
AOI8-BH-16-065-0-2-20160811		SS	0-2'	8-11	1400	1			X								05
AOI8-BH-16-066-0-2-20160811		SS	0-2'	8-11	1500	1			X								06
		SS															
		SS															
		SS															
		SS															

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other________

Remarks:

pH ______ Temp ______
Flow ______ Other ______

Hold #

Relinquished by : (Signature)	Date: 8/12/16	Time: 1310	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ____

Temp: 3.3 °C Bottles Received: 18

Date: 8/13/16 Time: 1300

Condition: (lab use only)
Tubes = E1602392 ✓ G

COC Seal Intact: ✓ Y ___N ___NA

pH Checked: NCF:

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

Cooler Receipt Checklist

Client: SunAqua SDG# 853517

Cooler Received/Opened On: 8/ 13 /16 By: _Alex_Schulert____

Temperature Upon Receipt: 3.3 °c

(Signature)

Cooler Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?	✓		
Were custody papers properly filled out (ink, signed, etc.)?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were correct preservatives used?			✓
Were all applicable sample containers checked for preservation?			✓
(Any samples not in accepted pH range noted on COC .)			
If applicable, was an observable VOA headspace present?			✓
Non Conformance Generated? (If yes see attached NCF)		✓	

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ANALYTICAL REPORT

October 28, 2016

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L860374
Samples Received:	09/17/2016
Project Number:	PH REF AOI8
Description:	AOI-8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

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

TABLE OF CONTENTS

AOI8-BH-16-063-0-2-20160914 L860374-01 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/14/16 08:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 21:53	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	5	09/21/16 19:10	09/23/16 00:14	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	5	09/21/16 19:10	09/23/16 12:00	SNR
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1	09/22/16 21:07	09/23/16 06:46	DAH

AOI8-BH-16-063-12-14-20160914 L860374-02 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/14/16 10:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 21:55	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	50	09/21/16 19:10	09/23/16 01:24	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	50	09/21/16 19:10	09/23/16 12:51	SNR
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1.12	09/22/16 21:07	09/23/16 07:08	DAH

AOI8-BH-16-002-0-2-20160915 L860374-03 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/15/16 09:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 21:58	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	5	09/21/16 19:10	09/22/16 23:51	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	5	09/21/16 19:10	09/23/16 11:42	SNR
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1.09	09/22/16 21:07	09/23/16 07:29	DAH

AOI8-BH-16-002-6-8-20160915 L860374-04 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/15/16 11:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 22:01	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	10	09/21/16 19:10	09/23/16 00:38	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	20	09/21/16 19:10	09/23/16 12:17	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	20	09/21/16 19:10	09/23/16 13:43	JF
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1	09/22/16 21:07	09/23/16 09:49	DAH

AOI8-BH-16-059-6-8-20160915 L860374-05 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/15/16 15:30	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 22:04	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	1	09/21/16 19:10	09/22/16 23:27	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	1	09/21/16 19:10	09/23/16 11:08	SNR
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1	09/22/16 21:07	09/23/16 10:10	DAH

AOI8-BH-16-060-4-6-20160916 L860374-06 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/16/16 10:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	1	09/21/16 17:14	09/21/16 22:07	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	1	09/21/16 19:10	09/22/16 19:10	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	1	09/21/16 19:10	09/23/16 11:25	SNR
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1	09/22/16 21:07	09/23/16 10:32	DAH

AOI8-BH-16-061-6-8-20160916 L860374-07 Solid

Collected by	Collected date/time	Received date/time
Luke M.	09/16/16 12:00	09/17/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG909868	5	09/21/16 17:14	09/21/16 23:01	ST
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	20	09/21/16 19:10	09/23/16 01:01	JF
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	40	09/21/16 19:10	09/23/16 12:34	SNR
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG909541	40	09/21/16 19:10	09/23/16 13:19	JF
Total Solids by Method 2540 G-2011	WG909238	1	09/19/16 16:14	09/19/16 16:22	MEL
Volatile Organic Compounds (GC/MS) by Method 8260B	WG910487	1.03	09/22/16 21:07	09/23/16 10:53	DAH

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	89.7		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	7.39		1.12	1	09/21/2016 21:53	WG909868
Lead	114		0.558	1	09/21/2016 21:53	WG909868
Nickel	12.2		2.23	1	09/21/2016 21:53	WG909868
Vanadium	27.1		2.23	1	09/21/2016 21:53	WG909868
Zinc	103		5.58	1	09/21/2016 21:53	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00112	1	09/23/2016 06:46	WG910487
sec-Butylbenzene	ND		0.00112	1	09/23/2016 06:46	WG910487
tert-Butylbenzene	ND		0.00112	1	09/23/2016 06:46	WG910487
Cyclohexane	ND		0.00112	1	09/23/2016 06:46	WG910487
1,2-Dibromoethane	ND		0.00112	1	09/23/2016 06:46	WG910487
n-Hexane	ND		0.0112	1	09/23/2016 06:46	WG910487
1,2-Dichloroethane	ND		0.00112	1	09/23/2016 06:46	WG910487
Ethylbenzene	ND		0.00112	1	09/23/2016 06:46	WG910487
Isopropylbenzene	ND		0.0112	1	09/23/2016 06:46	WG910487
Methyl tert-butyl ether	ND		0.00112	1	09/23/2016 06:46	WG910487
Toluene	ND		0.00558	1	09/23/2016 06:46	WG910487
1,2,4-Trimethylbenzene	ND		0.00112	1	09/23/2016 06:46	WG910487
1,3,5-Trimethylbenzene	ND		0.00112	1	09/23/2016 06:46	WG910487
Xylenes, Total	ND		0.00335	1	09/23/2016 06:46	WG910487
(S) Toluene-d8	*108*		*88.7-115*		*09/23/2016 06:46*	WG910487
(S) Dibromofluoromethane	*104*		*76.3-123*		*09/23/2016 06:46*	WG910487
(S) a,a,a-Trifluorotoluene	*99.2*		*87.2-117*		*09/23/2016 06:46*	WG910487
(S) 4-Bromofluorobenzene	*91.9*		*69.7-129*		*09/23/2016 06:46*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.184	5	09/23/2016 00:14	WG909541
Anthracene	0.208		0.184	5	09/23/2016 00:14	WG909541
Benzo(a)anthracene	0.759		0.184	5	09/23/2016 00:14	WG909541
Benzo(b)fluoranthene	1.01		0.184	5	09/23/2016 00:14	WG909541
Benzo(k)fluoranthene	0.322		0.184	5	09/23/2016 00:14	WG909541
Benzo(g,h,i)perylene	0.300		0.184	5	09/23/2016 00:14	WG909541
Benzo(a)pyrene	0.734		0.184	5	09/23/2016 00:14	WG909541
Biphenyl	ND		1.86	5	09/23/2016 00:14	WG909541
Chrysene	0.774		0.184	5	09/23/2016 00:14	WG909541
Dibenz(a,h)anthracene	ND		0.184	5	09/23/2016 00:14	WG909541
Fluoranthene	1.44		0.184	5	09/23/2016 00:14	WG909541
Fluorene	ND		0.184	5	09/23/2016 00:14	WG909541
Indeno(1,2,3-cd)pyrene	0.298		0.184	5	09/23/2016 00:14	WG909541
2-Methylnaphthalene	ND		0.184	5	09/23/2016 00:14	WG909541
Naphthalene	ND		0.184	5	09/23/2016 00:14	WG909541
Phenanthrene	0.953		0.184	5	09/23/2016 00:14	WG909541
Pyridine	ND		1.86	5	09/23/2016 00:14	WG909541
Bis(2-ethylhexyl)phthalate	ND		1.86	5	09/23/2016 00:14	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		1.86	5	09/23/2016 00:14	WG909541
Diethyl phthalate	ND		1.86	5	09/23/2016 00:14	WG909541
Pyrene	1.20		0.184	5	09/23/2016 00:14	WG909541
2,4-Dimethylphenol	ND		1.86	5	09/23/2016 00:14	WG909541
2,4-Dinitrophenol	ND		1.86	5	09/23/2016 00:14	WG909541
2-Methylphenol	ND		1.86	5	09/23/2016 00:14	WG909541
3&4-Methyl Phenol	ND		1.86	5	09/23/2016 00:14	WG909541
4-Nitrophenol	ND		1.86	5	09/23/2016 00:14	WG909541
Phenol	ND		1.86	5	09/23/2016 00:14	WG909541
Quinoline	ND	J4	1.86	5	09/23/2016 12:00	WG909541
(S) 2-Fluorophenol	*72.3*		*21.1-116*		*09/23/2016 00:14*	WG909541
(S) Phenol-d5	*76.5*		*26.3-121*		*09/23/2016 00:14*	WG909541
(S) Nitrobenzene-d5	*61.3*		*21.9-129*		*09/23/2016 00:14*	WG909541
(S) 2-Fluorobiphenyl	*69.4*		*34.9-129*		*09/23/2016 00:14*	WG909541
(S) 2,4,6-Tribromophenol	*62.7*		*21.6-142*		*09/23/2016 00:14*	WG909541
(S) p-Terphenyl-d14	*61.5*		*21.5-128*		*09/23/2016 00:14*	WG909541

Sample Narrative:

8270C L860374-01 WG909541: Dilution due to matrix

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	73.7		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	6.80		1.36	1	09/21/2016 21:55	WG909868
Lead	586		0.679	1	09/21/2016 21:55	WG909868
Nickel	60.0		2.71	1	09/21/2016 21:55	WG909868
Vanadium	28.4		2.71	1	09/21/2016 21:55	WG909868
Zinc	604		6.79	1	09/21/2016 21:55	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00177		0.00152	1.12	09/23/2016 07:08	WG910487
sec-Butylbenzene	ND		0.00152	1.12	09/23/2016 07:08	WG910487
tert-Butylbenzene	ND		0.00152	1.12	09/23/2016 07:08	WG910487
Cyclohexane	ND		0.00152	1.12	09/23/2016 07:08	WG910487
1,2-Dibromoethane	ND		0.00152	1.12	09/23/2016 07:08	WG910487
n-Hexane	ND		0.0152	1.12	09/23/2016 07:08	WG910487
1,2-Dichloroethane	ND		0.00152	1.12	09/23/2016 07:08	WG910487
Ethylbenzene	ND		0.00152	1.12	09/23/2016 07:08	WG910487
Isopropylbenzene	ND		0.0152	1.12	09/23/2016 07:08	WG910487
Methyl tert-butyl ether	ND		0.00152	1.12	09/23/2016 07:08	WG910487
Toluene	ND		0.00760	1.12	09/23/2016 07:08	WG910487
1,2,4-Trimethylbenzene	ND		0.00152	1.12	09/23/2016 07:08	WG910487
1,3,5-Trimethylbenzene	ND		0.00152	1.12	09/23/2016 07:08	WG910487
Xylenes, Total	ND		0.00456	1.12	09/23/2016 07:08	WG910487
(S) Toluene-d8	*107*		*88.7-115*		*09/23/2016 07:08*	WG910487
(S) Dibromofluoromethane	*108*		*76.3-123*		*09/23/2016 07:08*	WG910487
(S) a,a,a-Trifluorotoluene	*98.8*		*87.2-117*		*09/23/2016 07:08*	WG910487
(S) 4-Bromofluorobenzene	*107*		*69.7-129*		*09/23/2016 07:08*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		2.24	50	09/23/2016 01:24	WG909541
Anthracene	ND		2.24	50	09/23/2016 01:24	WG909541
Benzo(a)anthracene	ND		2.24	50	09/23/2016 01:24	WG909541
Benzo(b)fluoranthene	ND		2.24	50	09/23/2016 01:24	WG909541
Benzo(k)fluoranthene	ND		2.24	50	09/23/2016 01:24	WG909541
Benzo(g,h,i)perylene	ND		2.24	50	09/23/2016 01:24	WG909541
Benzo(a)pyrene	ND		2.24	50	09/23/2016 01:24	WG909541
Biphenyl	ND		22.6	50	09/23/2016 01:24	WG909541
Chrysene	ND		2.24	50	09/23/2016 01:24	WG909541
Dibenz(a,h)anthracene	ND		2.24	50	09/23/2016 01:24	WG909541
Fluoranthene	ND		2.24	50	09/23/2016 01:24	WG909541
Fluorene	ND		2.24	50	09/23/2016 01:24	WG909541
Indeno(1,2,3-cd)pyrene	ND		2.24	50	09/23/2016 01:24	WG909541
2-Methylnaphthalene	ND		2.24	50	09/23/2016 01:24	WG909541
Naphthalene	ND		2.24	50	09/23/2016 01:24	WG909541
Phenanthrene	ND		2.24	50	09/23/2016 01:24	WG909541
Pyridine	ND		22.6	50	09/23/2016 01:24	WG909541
Bis(2-ethylhexyl)phthalate	ND		22.6	50	09/23/2016 01:24	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		22.6	50	09/23/2016 01:24	WG909541
Diethyl phthalate	ND		22.6	50	09/23/2016 01:24	WG909541
Pyrene	ND		2.24	50	09/23/2016 01:24	WG909541
2,4-Dimethylphenol	ND		22.6	50	09/23/2016 01:24	WG909541
2,4-Dinitrophenol	ND		22.6	50	09/23/2016 01:24	WG909541
2-Methylphenol	ND		22.6	50	09/23/2016 01:24	WG909541
3&4-Methyl Phenol	ND		22.6	50	09/23/2016 01:24	WG909541
4-Nitrophenol	ND		22.6	50	09/23/2016 01:24	WG909541
Phenol	ND		22.6	50	09/23/2016 01:24	WG909541
Quinoline	ND	J4	22.6	50	09/23/2016 12:51	WG909541
(S) 2-Fluorophenol	*71.9*	J7	*21.1-116*		*09/23/2016 01:24*	WG909541
(S) Phenol-d5	*69.7*	J7	*26.3-121*		*09/23/2016 01:24*	WG909541
(S) Nitrobenzene-d5	*81.7*	J7	*21.9-129*		*09/23/2016 01:24*	WG909541
(S) 2-Fluorobiphenyl	*57.0*	J7	*34.9-129*		*09/23/2016 01:24*	WG909541
(S) 2,4,6-Tribromophenol	*33.5*	J7	*21.6-142*		*09/23/2016 01:24*	WG909541
(S) p-Terphenyl-d14	*35.5*	J7	*21.5-128*		*09/23/2016 01:24*	WG909541

Sample Narrative:

8270C L860374-02 WG909541: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	94.6		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	13.2		1.06	1	09/21/2016 21:58	WG909868
Lead	97.9		0.529	1	09/21/2016 21:58	WG909868
Nickel	23.3		2.11	1	09/21/2016 21:58	WG909868
Vanadium	36.2		2.11	1	09/21/2016 21:58	WG909868
Zinc	129		5.29	1	09/21/2016 21:58	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00151		0.00115	1.09	09/23/2016 07:29	WG910487
sec-Butylbenzene	ND		0.00115	1.09	09/23/2016 07:29	WG910487
tert-Butylbenzene	ND		0.00115	1.09	09/23/2016 07:29	WG910487
Cyclohexane	ND		0.00115	1.09	09/23/2016 07:29	WG910487
1,2-Dibromoethane	ND		0.00115	1.09	09/23/2016 07:29	WG910487
n-Hexane	ND		0.0115	1.09	09/23/2016 07:29	WG910487
1,2-Dichloroethane	ND		0.00115	1.09	09/23/2016 07:29	WG910487
Ethylbenzene	ND		0.00115	1.09	09/23/2016 07:29	WG910487
Isopropylbenzene	ND		0.0115	1.09	09/23/2016 07:29	WG910487
Methyl tert-butyl ether	ND		0.00115	1.09	09/23/2016 07:29	WG910487
Toluene	ND		0.00576	1.09	09/23/2016 07:29	WG910487
1,2,4-Trimethylbenzene	0.00178		0.00115	1.09	09/23/2016 07:29	WG910487
1,3,5-Trimethylbenzene	ND		0.00115	1.09	09/23/2016 07:29	WG910487
Xylenes, Total	ND		0.00346	1.09	09/23/2016 07:29	WG910487
(S) Toluene-d8	*108*		*88.7-115*		*09/23/2016 07:29*	WG910487
(S) Dibromofluoromethane	*107*		*76.3-123*		*09/23/2016 07:29*	WG910487
(S) a,a,a-Trifluorotoluene	*98.4*		*87.2-117*		*09/23/2016 07:29*	WG910487
(S) 4-Bromofluorobenzene	*87.7*		*69.7-129*		*09/23/2016 07:29*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.174	5	09/22/2016 23:51	WG909541
Anthracene	0.353		0.174	5	09/22/2016 23:51	WG909541
Benzo(a)anthracene	1.50		0.174	5	09/22/2016 23:51	WG909541
Benzo(b)fluoranthene	1.81		0.174	5	09/22/2016 23:51	WG909541
Benzo(k)fluoranthene	0.471		0.174	5	09/22/2016 23:51	WG909541
Benzo(g,h,i)perylene	0.444		0.174	5	09/22/2016 23:51	WG909541
Benzo(a)pyrene	1.25		0.174	5	09/22/2016 23:51	WG909541
Biphenyl	ND		1.76	5	09/22/2016 23:51	WG909541
Chrysene	1.40		0.174	5	09/22/2016 23:51	WG909541
Dibenz(a,h)anthracene	ND		0.174	5	09/22/2016 23:51	WG909541
Fluoranthene	2.72		0.174	5	09/22/2016 23:51	WG909541
Fluorene	ND		0.174	5	09/22/2016 23:51	WG909541
Indeno(1,2,3-cd)pyrene	0.454		0.174	5	09/22/2016 23:51	WG909541
2-Methylnaphthalene	ND		0.174	5	09/22/2016 23:51	WG909541
Naphthalene	ND		0.174	5	09/22/2016 23:51	WG909541
Phenanthrene	1.58		0.174	5	09/22/2016 23:51	WG909541
Pyridine	ND		1.76	5	09/22/2016 23:51	WG909541
Bis(2-ethylhexyl)phthalate	ND		1.76	5	09/22/2016 23:51	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		1.76	5	09/22/2016 23:51	WG909541
Diethyl phthalate	ND		1.76	5	09/22/2016 23:51	WG909541
Pyrene	2.25		0.174	5	09/22/2016 23:51	WG909541
2,4-Dimethylphenol	ND		1.76	5	09/22/2016 23:51	WG909541
2,4-Dinitrophenol	ND		1.76	5	09/22/2016 23:51	WG909541
2-Methylphenol	ND		1.76	5	09/22/2016 23:51	WG909541
3&4-Methyl Phenol	ND		1.76	5	09/22/2016 23:51	WG909541
4-Nitrophenol	ND		1.76	5	09/22/2016 23:51	WG909541
Phenol	ND		1.76	5	09/22/2016 23:51	WG909541
Quinoline	ND	J4	1.76	5	09/23/2016 11:42	WG909541
(S) 2-Fluorophenol	*70.1*		*21.1-116*		*09/22/2016 23:51*	WG909541
(S) Phenol-d5	*76.4*		*26.3-121*		*09/22/2016 23:51*	WG909541
(S) Nitrobenzene-d5	*64.8*		*21.9-129*		*09/22/2016 23:51*	WG909541
(S) 2-Fluorobiphenyl	*70.3*		*34.9-129*		*09/22/2016 23:51*	WG909541
(S) 2,4,6-Tribromophenol	*65.7*		*21.6-142*		*09/22/2016 23:51*	WG909541
(S) p-Terphenyl-d14	*71.2*		*21.5-128*		*09/22/2016 23:51*	WG909541

Sample Narrative:

8270C L860374-03 WG909541: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	85.9		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	3.13		1.16	1	09/21/2016 22:01	WG909868
Lead	5.58		0.582	1	09/21/2016 22:01	WG909868
Nickel	3.69		2.33	1	09/21/2016 22:01	WG909868
Vanadium	5.38		2.33	1	09/21/2016 22:01	WG909868
Zinc	12.5		5.82	1	09/21/2016 22:01	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00333		0.00116	1	09/23/2016 09:49	WG910487
sec-Butylbenzene	0.00405		0.00116	1	09/23/2016 09:49	WG910487
tert-Butylbenzene	ND		0.00116	1	09/23/2016 09:49	WG910487
Cyclohexane	0.0216		0.00116	1	09/23/2016 09:49	WG910487
1,2-Dibromoethane	ND		0.00116	1	09/23/2016 09:49	WG910487
n-Hexane	ND		0.0116	1	09/23/2016 09:49	WG910487
1,2-Dichloroethane	ND		0.00116	1	09/23/2016 09:49	WG910487
Ethylbenzene	ND		0.00116	1	09/23/2016 09:49	WG910487
Isopropylbenzene	0.0792		0.0116	1	09/23/2016 09:49	WG910487
Methyl tert-butyl ether	ND		0.00116	1	09/23/2016 09:49	WG910487
Toluene	ND		0.00582	1	09/23/2016 09:49	WG910487
1,2,4-Trimethylbenzene	0.00337		0.00116	1	09/23/2016 09:49	WG910487
1,3,5-Trimethylbenzene	0.00392		0.00116	1	09/23/2016 09:49	WG910487
Xylenes, Total	ND		0.00349	1	09/23/2016 09:49	WG910487
(S) Toluene-d8	*112*		*88.7-115*		*09/23/2016 09:49*	WG910487
(S) Dibromofluoromethane	*112*		*76.3-123*		*09/23/2016 09:49*	WG910487
(S) a,a,a-Trifluorotoluene	*92.9*		*87.2-117*		*09/23/2016 09:49*	WG910487
(S) 4-Bromofluorobenzene	*105*		*69.7-129*		*09/23/2016 09:49*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	7.50		0.384	10	09/23/2016 00:38	WG909541
Anthracene	5.96		0.384	10	09/23/2016 00:38	WG909541
Benzo(a)anthracene	5.59		0.384	10	09/23/2016 00:38	WG909541
Benzo(b)fluoranthene	4.48		0.384	10	09/23/2016 00:38	WG909541
Benzo(k)fluoranthene	1.47		0.384	10	09/23/2016 00:38	WG909541
Benzo(g,h,i)perylene	0.709		0.384	10	09/23/2016 00:38	WG909541
Benzo(a)pyrene	4.02		0.384	10	09/23/2016 00:38	WG909541
Biphenyl	ND		3.88	10	09/23/2016 00:38	WG909541
Chrysene	5.66		0.384	10	09/23/2016 00:38	WG909541
Dibenz(a,h)anthracene	ND		0.384	10	09/23/2016 00:38	WG909541
Fluoranthene	10.2		0.384	10	09/23/2016 00:38	WG909541
Fluorene	5.76		0.384	10	09/23/2016 00:38	WG909541
Indeno(1,2,3-cd)pyrene	0.752		0.384	10	09/23/2016 00:38	WG909541
2-Methylnaphthalene	ND		0.384	10	09/23/2016 00:38	WG909541
Naphthalene	ND		0.384	10	09/23/2016 00:38	WG909541
Phenanthrene	20.0		0.768	20	09/23/2016 13:43	WG909541
Pyridine	ND		3.88	10	09/23/2016 00:38	WG909541
Bis(2-ethylhexyl)phthalate	ND		3.88	10	09/23/2016 00:38	WG909541

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		3.88	10	09/23/2016 00:38	WG909541
Diethyl phthalate	ND		3.88	10	09/23/2016 00:38	WG909541
Pyrene	11.5		0.384	10	09/23/2016 00:38	WG909541
2,4-Dimethylphenol	ND		3.88	10	09/23/2016 00:38	WG909541
2,4-Dinitrophenol	ND		3.88	10	09/23/2016 00:38	WG909541
2-Methylphenol	ND		3.88	10	09/23/2016 00:38	WG909541
3&4-Methyl Phenol	ND		3.88	10	09/23/2016 00:38	WG909541
4-Nitrophenol	ND		3.88	10	09/23/2016 00:38	WG909541
Phenol	ND		3.88	10	09/23/2016 00:38	WG909541
Quinoline	ND	J4	7.75	20	09/23/2016 12:17	WG909541
(S) 2-Fluorophenol	*67.0*		*21.1-116*		*09/23/2016 00:38*	WG909541
(S) 2-Fluorophenol	*64.7*	J7	*21.1-116*		*09/23/2016 13:43*	WG909541
(S) Phenol-d5	*74.2*	J7	*26.3-121*		*09/23/2016 13:43*	WG909541
(S) Phenol-d5	*70.0*		*26.3-121*		*09/23/2016 00:38*	WG909541
(S) Nitrobenzene-d5	*69.0*		*21.9-129*		*09/23/2016 00:38*	WG909541
(S) Nitrobenzene-d5	*59.2*	J7	*21.9-129*		*09/23/2016 13:43*	WG909541
(S) 2-Fluorobiphenyl	*52.5*	J7	*34.9-129*		*09/23/2016 13:43*	WG909541
(S) 2-Fluorobiphenyl	*48.8*		*34.9-129*		*09/23/2016 00:38*	WG909541
(S) 2,4,6-Tribromophenol	*54.7*		*21.6-142*		*09/23/2016 00:38*	WG909541
(S) 2,4,6-Tribromophenol	*45.4*	J7	*21.6-142*		*09/23/2016 13:43*	WG909541
(S) p-Terphenyl-d14	*44.1*	J7	*21.5-128*		*09/23/2016 13:43*	WG909541
(S) p-Terphenyl-d14	*39.7*		*21.5-128*		*09/23/2016 00:38*	WG909541

Sample Narrative:

8270C L860374-04 WG909541: Dilution due to matrix

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	74.5		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	2.05		1.34	1	09/21/2016 22:04	WG909868
Lead	152		0.671	1	09/21/2016 22:04	WG909868
Nickel	12.0		2.69	1	09/21/2016 22:04	WG909868
Vanadium	6.45		2.69	1	09/21/2016 22:04	WG909868
Zinc	288		6.71	1	09/21/2016 22:04	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00134	1	09/23/2016 10:10	WG910487
sec-Butylbenzene	ND		0.00134	1	09/23/2016 10:10	WG910487
tert-Butylbenzene	ND		0.00134	1	09/23/2016 10:10	WG910487
Cyclohexane	ND		0.00134	1	09/23/2016 10:10	WG910487
1,2-Dibromoethane	ND		0.00134	1	09/23/2016 10:10	WG910487
n-Hexane	ND		0.0134	1	09/23/2016 10:10	WG910487
1,2-Dichloroethane	ND		0.00134	1	09/23/2016 10:10	WG910487
Ethylbenzene	ND		0.00134	1	09/23/2016 10:10	WG910487
Isopropylbenzene	ND		0.0134	1	09/23/2016 10:10	WG910487
Methyl tert-butyl ether	ND		0.00134	1	09/23/2016 10:10	WG910487
Toluene	ND		0.00671	1	09/23/2016 10:10	WG910487
1,2,4-Trimethylbenzene	0.00152		0.00134	1	09/23/2016 10:10	WG910487
1,3,5-Trimethylbenzene	ND		0.00134	1	09/23/2016 10:10	WG910487
Xylenes, Total	ND		0.00403	1	09/23/2016 10:10	WG910487
(S) Toluene-d8	*106*		*88.7-115*		*09/23/2016 10:10*	WG910487
(S) Dibromofluoromethane	*105*		*76.3-123*		*09/23/2016 10:10*	WG910487
(S) a,a,a-Trifluorotoluene	*97.4*		*87.2-117*		*09/23/2016 10:10*	WG910487
(S) 4-Bromofluorobenzene	*84.2*		*69.7-129*		*09/23/2016 10:10*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0443	1	09/22/2016 23:27	WG909541
Anthracene	0.0551		0.0443	1	09/22/2016 23:27	WG909541
Benzo(a)anthracene	0.279		0.0443	1	09/22/2016 23:27	WG909541
Benzo(b)fluoranthene	0.366		0.0443	1	09/22/2016 23:27	WG909541
Benzo(k)fluoranthene	0.145		0.0443	1	09/22/2016 23:27	WG909541
Benzo(g,h,i)perylene	0.0995		0.0443	1	09/22/2016 23:27	WG909541
Benzo(a)pyrene	0.257		0.0443	1	09/22/2016 23:27	WG909541
Biphenyl	ND		0.447	1	09/22/2016 23:27	WG909541
Chrysene	0.233		0.0443	1	09/22/2016 23:27	WG909541
Dibenz(a,h)anthracene	ND		0.0443	1	09/22/2016 23:27	WG909541
Fluoranthene	0.456		0.0443	1	09/22/2016 23:27	WG909541
Fluorene	ND		0.0443	1	09/22/2016 23:27	WG909541
Indeno(1,2,3-cd)pyrene	0.103		0.0443	1	09/22/2016 23:27	WG909541
2-Methylnaphthalene	ND		0.0443	1	09/22/2016 23:27	WG909541
Naphthalene	ND		0.0443	1	09/22/2016 23:27	WG909541
Phenanthrene	0.237		0.0443	1	09/22/2016 23:27	WG909541
Pyridine	ND		0.447	1	09/22/2016 23:27	WG909541
Bis(2-ethylhexyl)phthalate	ND		0.447	1	09/22/2016 23:27	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		0.447	1	09/22/2016 23:27	WG909541
Diethyl phthalate	ND		0.447	1	09/22/2016 23:27	WG909541
Pyrene	0.379		0.0443	1	09/22/2016 23:27	WG909541
2,4-Dimethylphenol	ND		0.447	1	09/22/2016 23:27	WG909541
2,4-Dinitrophenol	ND		0.447	1	09/22/2016 23:27	WG909541
2-Methylphenol	ND		0.447	1	09/22/2016 23:27	WG909541
3&4-Methyl Phenol	ND		0.447	1	09/22/2016 23:27	WG909541
4-Nitrophenol	ND		0.447	1	09/22/2016 23:27	WG909541
Phenol	ND		0.447	1	09/22/2016 23:27	WG909541
Quinoline	ND	J4	0.447	1	09/23/2016 11:08	WG909541
(S) 2-Fluorophenol	*79.8*		*21.1-116*		*09/22/2016 23:27*	WG909541
(S) Phenol-d5	*82.0*		*26.3-121*		*09/22/2016 23:27*	WG909541
(S) Nitrobenzene-d5	*67.8*		*21.9-129*		*09/22/2016 23:27*	WG909541
(S) 2-Fluorobiphenyl	*64.6*		*34.9-129*		*09/22/2016 23:27*	WG909541
(S) 2,4,6-Tribromophenol	*74.4*		*21.6-142*		*09/22/2016 23:27*	WG909541
(S) p-Terphenyl-d14	*36.9*		*21.5-128*		*09/22/2016 23:27*	WG909541

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	64.0		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	7.84		1.56	1	09/21/2016 22:07	WG909868
Lead	245		0.781	1	09/21/2016 22:07	WG909868
Nickel	7.92		3.12	1	09/21/2016 22:07	WG909868
Vanadium	15.6		3.12	1	09/21/2016 22:07	WG909868
Zinc	117		7.81	1	09/21/2016 22:07	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00156	1	09/23/2016 10:32	WG910487
sec-Butylbenzene	ND		0.00156	1	09/23/2016 10:32	WG910487
tert-Butylbenzene	ND		0.00156	1	09/23/2016 10:32	WG910487
Cyclohexane	ND		0.00156	1	09/23/2016 10:32	WG910487
1,2-Dibromoethane	ND		0.00156	1	09/23/2016 10:32	WG910487
n-Hexane	ND		0.0156	1	09/23/2016 10:32	WG910487
1,2-Dichloroethane	ND		0.00156	1	09/23/2016 10:32	WG910487
Ethylbenzene	ND		0.00156	1	09/23/2016 10:32	WG910487
Isopropylbenzene	ND		0.0156	1	09/23/2016 10:32	WG910487
Methyl tert-butyl ether	ND		0.00156	1	09/23/2016 10:32	WG910487
Toluene	ND		0.00781	1	09/23/2016 10:32	WG910487
1,2,4-Trimethylbenzene	ND		0.00156	1	09/23/2016 10:32	WG910487
1,3,5-Trimethylbenzene	ND		0.00156	1	09/23/2016 10:32	WG910487
Xylenes, Total	ND		0.00469	1	09/23/2016 10:32	WG910487
(S) Toluene-d8	*109*		*88.7-115*		*09/23/2016 10:32*	WG910487
(S) Dibromofluoromethane	*110*		*76.3-123*		*09/23/2016 10:32*	WG910487
(S) a,a,a-Trifluorotoluene	*99.0*		*87.2-117*		*09/23/2016 10:32*	WG910487
(S) 4-Bromofluorobenzene	*89.8*		*69.7-129*		*09/23/2016 10:32*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.0515	1	09/22/2016 19:10	WG909541
Anthracene	ND		0.0515	1	09/22/2016 19:10	WG909541
Benzo(a)anthracene	ND		0.0515	1	09/22/2016 19:10	WG909541
Benzo(b)fluoranthene	ND		0.0515	1	09/22/2016 19:10	WG909541
Benzo(k)fluoranthene	ND		0.0515	1	09/22/2016 19:10	WG909541
Benzo(g,h,i)perylene	ND		0.0515	1	09/22/2016 19:10	WG909541
Benzo(a)pyrene	ND		0.0515	1	09/22/2016 19:10	WG909541
Biphenyl	ND		0.520	1	09/22/2016 19:10	WG909541
Chrysene	ND		0.0515	1	09/22/2016 19:10	WG909541
Dibenz(a,h)anthracene	ND		0.0515	1	09/22/2016 19:10	WG909541
Fluoranthene	ND		0.0515	1	09/22/2016 19:10	WG909541
Fluorene	ND		0.0515	1	09/22/2016 19:10	WG909541
Indeno(1,2,3-cd)pyrene	ND		0.0515	1	09/22/2016 19:10	WG909541
2-Methylnaphthalene	ND		0.0515	1	09/22/2016 19:10	WG909541
Naphthalene	ND		0.0515	1	09/22/2016 19:10	WG909541
Phenanthrene	ND		0.0515	1	09/22/2016 19:10	WG909541
Pyridine	ND		0.520	1	09/22/2016 19:10	WG909541
Bis(2-ethylhexyl)phthalate	ND		0.520	1	09/22/2016 19:10	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		0.520	1	09/22/2016 19:10	WG909541
Diethyl phthalate	ND		0.520	1	09/22/2016 19:10	WG909541
Pyrene	ND		0.0515	1	09/22/2016 19:10	WG909541
2,4-Dimethylphenol	ND		0.520	1	09/22/2016 19:10	WG909541
2,4-Dinitrophenol	ND		0.520	1	09/22/2016 19:10	WG909541
2-Methylphenol	ND		0.520	1	09/22/2016 19:10	WG909541
3&4-Methyl Phenol	ND		0.520	1	09/22/2016 19:10	WG909541
4-Nitrophenol	ND		0.520	1	09/22/2016 19:10	WG909541
Phenol	ND		0.520	1	09/22/2016 19:10	WG909541
Quinoline	ND	J4	0.520	1	09/23/2016 11:25	WG909541
(S) 2-Fluorophenol	*57.1*		*21.1-116*		*09/22/2016 19:10*	WG909541
(S) Phenol-d5	*56.4*		*26.3-121*		*09/22/2016 19:10*	WG909541
(S) Nitrobenzene-d5	*49.0*		*21.9-129*		*09/22/2016 19:10*	WG909541
(S) 2-Fluorobiphenyl	*49.5*		*34.9-129*		*09/22/2016 19:10*	WG909541
(S) 2,4,6-Tribromophenol	*46.3*		*21.6-142*		*09/22/2016 19:10*	WG909541
(S) p-Terphenyl-d14	*38.5*		*21.5-128*		*09/22/2016 19:10*	WG909541

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	78.9		1	09/19/2016 16:22	WG909238

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Cobalt	8.23		6.34	5	09/21/2016 23:01	WG909868
Lead	149		3.17	5	09/21/2016 23:01	WG909868
Nickel	14.4		12.7	5	09/21/2016 23:01	WG909868
Vanadium	44.8		12.7	5	09/21/2016 23:01	WG909868
Zinc	423		31.7	5	09/21/2016 23:01	WG909868

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
sec-Butylbenzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
tert-Butylbenzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
Cyclohexane	ND		0.00131	1.03	09/23/2016 10:53	WG910487
1,2-Dibromoethane	ND		0.00131	1.03	09/23/2016 10:53	WG910487
n-Hexane	ND		0.0131	1.03	09/23/2016 10:53	WG910487
1,2-Dichloroethane	ND		0.00131	1.03	09/23/2016 10:53	WG910487
Ethylbenzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
Isopropylbenzene	ND		0.0131	1.03	09/23/2016 10:53	WG910487
Methyl tert-butyl ether	ND		0.00131	1.03	09/23/2016 10:53	WG910487
Toluene	ND		0.00653	1.03	09/23/2016 10:53	WG910487
1,2,4-Trimethylbenzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
1,3,5-Trimethylbenzene	ND		0.00131	1.03	09/23/2016 10:53	WG910487
Xylenes, Total	ND		0.00392	1.03	09/23/2016 10:53	WG910487
(S) Toluene-d8	*108*		*88.7-115*		*09/23/2016 10:53*	WG910487
(S) Dibromofluoromethane	*108*		*76.3-123*		*09/23/2016 10:53*	WG910487
(S) a,a,a-Trifluorotoluene	*100*		*87.2-117*		*09/23/2016 10:53*	WG910487
(S) 4-Bromofluorobenzene	*87.1*		*69.7-129*		*09/23/2016 10:53*	WG910487

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	0.954		0.837	20	09/23/2016 01:01	WG909541
Anthracene	15.5		0.837	20	09/23/2016 01:01	WG909541
Benzo(a)anthracene	31.5		0.837	20	09/23/2016 01:01	WG909541
Benzo(b)fluoranthene	31.5		0.837	20	09/23/2016 01:01	WG909541
Benzo(k)fluoranthene	11.6		0.837	20	09/23/2016 01:01	WG909541
Benzo(g,h,i)perylene	4.93		0.837	20	09/23/2016 01:01	WG909541
Benzo(a)pyrene	23.8		0.837	20	09/23/2016 01:01	WG909541
Biphenyl	ND		8.44	20	09/23/2016 01:01	WG909541
Chrysene	27.5		0.837	20	09/23/2016 01:01	WG909541
Dibenz(a,h)anthracene	2.01		0.837	20	09/23/2016 01:01	WG909541
Fluoranthene	70.3		1.67	40	09/23/2016 13:19	WG909541
Fluorene	3.03		0.837	20	09/23/2016 01:01	WG909541
Indeno(1,2,3-cd)pyrene	5.95		0.837	20	09/23/2016 01:01	WG909541
2-Methylnaphthalene	ND		0.837	20	09/23/2016 01:01	WG909541
Naphthalene	ND		0.837	20	09/23/2016 01:01	WG909541
Phenanthrene	51.3		1.67	40	09/23/2016 13:19	WG909541
Pyridine	ND		8.44	20	09/23/2016 01:01	WG909541
Bis(2-ethylhexyl)phthalate	ND		8.44	20	09/23/2016 01:01	WG909541

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Di-n-butyl phthalate	ND		8.44	20	09/23/2016 01:01	WG909541
Diethyl phthalate	ND		8.44	20	09/23/2016 01:01	WG909541
Pyrene	55.5		1.67	40	09/23/2016 13:19	WG909541
2,4-Dimethylphenol	ND		8.44	20	09/23/2016 01:01	WG909541
2,4-Dinitrophenol	ND		8.44	20	09/23/2016 01:01	WG909541
2-Methylphenol	ND		8.44	20	09/23/2016 01:01	WG909541
3&4-Methyl Phenol	ND		8.44	20	09/23/2016 01:01	WG909541
4-Nitrophenol	ND		8.44	20	09/23/2016 01:01	WG909541
Phenol	ND		8.44	20	09/23/2016 01:01	WG909541
Quinoline	ND	J4	16.9	40	09/23/2016 12:34	WG909541
(S) 2-Fluorophenol	*58.7*	J7	*21.1-116*		*09/23/2016 01:01*	WG909541
(S) 2-Fluorophenol	*61.9*	J7	*21.1-116*		*09/23/2016 13:19*	WG909541
(S) Phenol-d5	*63.3*	J7	*26.3-121*		*09/23/2016 13:19*	WG909541
(S) Phenol-d5	*59.2*	J7	*26.3-121*		*09/23/2016 01:01*	WG909541
(S) Nitrobenzene-d5	*56.4*	J7	*21.9-129*		*09/23/2016 01:01*	WG909541
(S) Nitrobenzene-d5	*57.1*	J7	*21.9-129*		*09/23/2016 13:19*	WG909541
(S) 2-Fluorobiphenyl	*59.9*	J7	*34.9-129*		*09/23/2016 13:19*	WG909541
(S) 2-Fluorobiphenyl	*63.3*	J7	*34.9-129*		*09/23/2016 01:01*	WG909541
(S) 2,4,6-Tribromophenol	*51.2*	J7	*21.6-142*		*09/23/2016 01:01*	WG909541
(S) 2,4,6-Tribromophenol	*54.0*	J7	*21.6-142*		*09/23/2016 13:19*	WG909541
(S) p-Terphenyl-d14	*68.1*	J7	*21.5-128*		*09/23/2016 13:19*	WG909541
(S) p-Terphenyl-d14	*60.0*	J7	*21.5-128*		*09/23/2016 01:01*	WG909541

Method Blank (MB)

(MB) R3164649-1 09/19/16 16:22

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000700			

L860374-01 Original Sample (OS) • Duplicate (DUP)

(OS) L860374-01 09/19/16 16:22 • (DUP) R3164649-3 09/19/16 16:22

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	89.7	91.5	1	2.00		5

Laboratory Control Sample (LCS)

(LCS) R3164649-2 09/19/16 16:22

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3165200-1 09/21/16 21:11

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Cobalt	U		0.23	1.00
Lead	U		0.19	0.500
Nickel	U		0.49	2.00
Vanadium	U		0.24	2.00
Zinc	U		0.59	5.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165200-2 09/21/16 21:13 • (LCSD) R3165200-3 09/21/16 21:16

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Cobalt	100	101	104	101	104	80-120			4	20
Lead	100	98.9	103	99	103	80-120			4	20
Nickel	100	99.6	104	100	104	80-120			4	20
Vanadium	100	99.6	103	100	103	80-120			3	20
Zinc	100	99.6	103	100	103	80-120			4	20

L860336-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L860336-02 09/21/16 21:18 • (MS) R3165200-6 09/21/16 21:26 • (MSD) R3165200-7 09/21/16 21:28

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Cobalt	100	2.78	107	107	105	104	1	75-125			0	20
Lead	100	3.16	106	105	103	102	1	75-125			1	20
Nickel	100	4.41	108	107	103	103	1	75-125			0	20
Vanadium	100	16.5	114	114	97	98	1	75-125			1	20
Zinc	100	16.7	115	114	98	98	1	75-125			1	20

Method Blank (MB)

(MB) R3165726-4 09/23/16 00:08

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000270	0.00100
sec-Butylbenzene	U		0.000201	0.00100
tert-Butylbenzene	U		0.000206	0.00100
Cyclohexane	U		0.000350	0.00100
1,2-Dibromoethane	U		0.000343	0.00100
1,2-Dichloroethane	U		0.000265	0.00100
Ethylbenzene	U		0.000297	0.00100
n-Hexane	U		0.000290	0.0100
Isopropylbenzene	U		0.000243	0.0100
Methyl tert-butyl ether	U		0.000212	0.00100
Toluene	U		0.000434	0.00500
1,2,4-Trimethylbenzene	U		0.000211	0.00100
1,3,5-Trimethylbenzene	U		0.000266	0.00100
Xylenes, Total	U		0.000698	0.00300
(S) Toluene-d8	*107*			*88.7-115*
(S) Dibromofluoromethane	*108*			*76.3-123*
(S) a,a,a-Trifluorotoluene	*99.2*			*87.2-117*
(S) 4-Bromofluorobenzene	*87.5*			*69.7-129*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165726-1 09/22/16 22:22 • (LCSD) R3165726-2 09/22/16 22:43

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0294	0.0289	118	116	72.6-120			1.74	20
sec-Butylbenzene	0.0250	0.0248	0.0240	99.0	95.9	77.8-129			3.23	20
tert-Butylbenzene	0.0250	0.0240	0.0233	95.8	93.3	77.2-129			2.65	20
1,2-Dibromoethane	0.0250	0.0243	0.0246	97.3	98.4	78.7-123			1.05	20
1,2-Dichloroethane	0.0250	0.0292	0.0290	117	116	67.2-121			0.640	20
Ethylbenzene	0.0250	0.0251	0.0240	100	96.1	78.6-124			4.40	20
n-Hexane	0.0250	0.0275	0.0274	110	110	59.9-125			0.150	20
Isopropylbenzene	0.0250	0.0242	0.0233	96.6	93.1	79.4-126			3.66	20
Methyl tert-butyl ether	0.0250	0.0245	0.0250	98.1	99.9	70.2-122			1.86	20
Toluene	0.0250	0.0266	0.0269	107	108	76.7-116			1.02	20
1,2,4-Trimethylbenzene	0.0250	0.0244	0.0237	97.5	94.7	77.1-124			2.90	20
1,3,5-Trimethylbenzene	0.0250	0.0247	0.0238	98.9	95.2	79.0-125			3.74	20
Xylenes, Total	0.0750	0.0734	0.0719	97.8	95.9	78.1-123			1.96	20
(S) Toluene-d8				*107*	*109*	*88.7-115*				
(S) Dibromofluoromethane				*109*	*106*	*76.3-123*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165726-1 09/22/16 22:22 • (LCSD) R3165726-2 09/22/16 22:43

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) a,a,a-Trifluorotoluene				*97.3*	*103*	*87.2-117*				
(S) 4-Bromofluorobenzene				*92.0*	*93.8*	*69.7-129*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165791-1 09/23/16 08:18 • (LCSD) R3165791-2 09/23/16 10:16

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0248	0.0248	99.2	99.2	72.6-120			0.0200	20
sec-Butylbenzene	0.0250	0.0277	0.0267	111	107	77.8-129			3.32	20
tert-Butylbenzene	0.0250	0.0283	0.0274	113	110	77.2-129			3.17	20
1,2-Dibromoethane	0.0250	0.0306	0.0295	122	118	78.7-123			3.63	20
1,2-Dichloroethane	0.0250	0.0238	0.0231	95.2	92.4	67.2-121			2.90	20
Ethylbenzene	0.0250	0.0283	0.0279	113	112	78.6-124			1.34	20
n-Hexane	0.0250	0.0216	0.0204	86.5	81.6	59.9-125			5.87	20
Isopropylbenzene	0.0250	0.0279	0.0270	111	108	79.4-126			3.18	20
Methyl tert-butyl ether	0.0250	0.0222	0.0208	88.7	83.2	70.2-122			6.44	20
Toluene	0.0250	0.0278	0.0274	111	109	76.7-116			1.46	20
1,2,4-Trimethylbenzene	0.0250	0.0282	0.0272	113	109	77.1-124			3.40	20
1,3,5-Trimethylbenzene	0.0250	0.0281	0.0273	112	109	79.0-125			2.77	20
Xylenes, Total	0.0750	0.0851	0.0835	114	111	78.1-123			1.97	20
(S) Toluene-d8				*106*	*108*	*88.7-115*				
(S) Dibromofluoromethane				*91.7*	*95.0*	*76.3-123*				
(S) a,a,a-Trifluorotoluene				*105*	*106*	*87.2-117*				
(S) 4-Bromofluorobenzene				*100*	*100*	*69.7-129*				

L860524-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L860524-01 09/23/16 04:17 • (MS) R3165726-5 09/23/16 01:04 • (MSD) R3165726-6 09/23/16 01:25

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.0250	0.0245	0.567	0.563	110	109	19.75	47.8-131			0.680	22.8
sec-Butylbenzene	0.0250	0.445	0.907	0.899	93.5	91.9	19.75	31.0-142			0.890	34.7
tert-Butylbenzene	0.0250	ND	0.469	0.477	94.9	96.5	19.75	36.9-142			1.70	31.7
1,2-Dibromoethane	0.0250	ND	0.435	0.453	88.1	91.7	19.75	50.2-133			3.94	23.6
1,2-Dichloroethane	0.0250	ND	0.533	0.545	108	110	19.75	47.1-129			2.19	22.7
Ethylbenzene	0.0250	2.45	2.90	2.92	91.4	95.3	19.75	44.8-135			0.650	26.9
Isopropylbenzene	0.0250	0.439	0.903	0.909	93.9	95.2	19.75	41.9-139			0.670	29.3
n-Hexane	0.0250	ND	0.442	0.440	85.3	85.0	19.75	26.0-123			0.380	40

L860524-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L860524-01 09/23/16 04:17 • (MS) R3165726-5 09/23/16 01:04 • (MSD) R3165726-6 09/23/16 01:25

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Methyl tert-butyl ether	0.0250	ND	0.483	0.495	97.9	100	19.75	50.4-131			2.43	24.8
Toluene	0.0250	2.47	2.94	2.87	94.7	82.0	19.75	47.8-127			2.16	24.3
1,2,4-Trimethylbenzene	0.0250	ND	ND	ND	0.000	0.000	19.75	32.9-139	V	V	0.000	30.6
1,3,5-Trimethylbenzene	0.0250	5.32	5.77	5.74	92.4	85.6	19.75	37.1-138	E	E	0.580	30.6
Xylenes, Total	0.0750	15.2	16.5	16.6	87.0	96.3	19.75	42.7-135	E	E	0.840	26.6
(S) Toluene-d8					*109*	*108*		*88.7-115*				
(S) Dibromofluoromethane					*108*	*109*		*76.3-123*				
(S) a,a,a-Trifluorotoluene					*98.9*	*97.8*		*87.2-117*				
(S) 4-Bromofluorobenzene					*100*	*95.7*		*69.7-129*				

Method Blank (MB)

(MB) R3165417-3 09/22/16 12:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00642	0.0330
Anthracene	U		0.00632	0.0330
Benzo(a)anthracene	U		0.00428	0.0330
Benzo(b)fluoranthene	U		0.00695	0.0330
Benzo(k)fluoranthene	U		0.00582	0.0330
Benzo(g,h,i)perylene	U		0.00721	0.0330
Benzo(a)pyrene	U		0.00548	0.0330
Biphenyl	U		0.00588	0.333
Chrysene	U		0.00555	0.0330
Dibenz(a,h)anthracene	U		0.00821	0.0330
Fluoranthene	U		0.00496	0.0330
Fluorene	U		0.00682	0.0330
Indeno(1,2,3-cd)pyrene	U		0.00772	0.0330
2-Methylnaphthalene	U		0.00861	0.0330
Naphthalene	U		0.00889	0.0330
Phenanthrene	U		0.00528	0.0330
Bis(2-ethylhexyl)phthalate	U		0.0120	0.333
Di-n-butyl phthalate	U		0.0109	0.333
Diethyl phthalate	U		0.00691	0.333
Pyrene	U		0.0123	0.0330
Pyridine	U		0.0628	0.333
2-Methylphenol	U		0.00986	0.333
3&4-Methyl Phenol	U		0.00783	0.333
2,4-Dimethylphenol	U		0.0471	0.333
2,4-Dinitrophenol	U		0.0980	0.333
4-Nitrophenol	U		0.0525	0.333
Phenol	U		0.00695	0.333
(S) Nitrobenzene-d5	*66.9*			*21.9-129*
(S) 2-Fluorobiphenyl	*78.5*			*34.9-129*
(S) p-Terphenyl-d14	*85.3*			*21.5-128*
(S) Phenol-d5	*76.1*			*26.3-121*
(S) 2-Fluorophenol	*77.8*			*21.1-116*
(S) 2,4,6-Tribromophenol	*91.6*			*21.6-142*

Cp Tc Ss Cn Sr Qc Gl Al Sc

Method Blank (MB)

(MB) R3165916-1 09/23/16 10:34

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Quinoline	U		0.0574	0.333

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165417-1 09/22/16 12:10 • (LCSD) R3165417-2 09/22/16 12:33

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.667	0.567	0.541	85.1	81.2	48.9-107			4.69	20
Anthracene	0.667	0.560	0.539	83.9	80.8	52.0-112			3.83	20
Benzo(a)anthracene	0.667	0.544	0.525	81.5	78.8	52.3-106			3.41	20
Benzo(b)fluoranthene	0.667	0.548	0.551	82.2	82.6	51.3-106			0.490	20
Benzo(k)fluoranthene	0.667	0.572	0.502	85.8	75.3	52.9-107			13.0	20
Benzo(g,h,i)perylene	0.667	0.573	0.540	85.9	80.9	45.8-108			6.06	20
Benzo(a)pyrene	0.667	0.560	0.537	83.9	80.5	51.9-106			4.12	20
Biphenyl	0.667	0.539	0.509	80.8	76.3	45.6-103			5.78	20
Chrysene	0.667	0.564	0.553	84.6	82.9	54.4-110			2.10	20
Dibenz(a,h)anthracene	0.667	0.558	0.534	83.6	80.0	45.7-111			4.37	20
Fluoranthene	0.667	0.573	0.563	85.9	84.4	53.7-110			1.80	20
Fluorene	0.667	0.574	0.548	86.1	82.1	51.1-109			4.67	20
Indeno(1,2,3-cd)pyrene	0.667	0.568	0.543	85.1	81.4	47.5-109			4.51	20
2-Methylnaphthalene	0.667	0.574	0.549	86.1	82.2	48.0-101			4.61	20
Naphthalene	0.667	0.533	0.508	79.9	76.1	43.4-103			4.81	20
Phenanthrene	0.667	0.554	0.524	83.1	78.6	51.6-107			5.56	20
Bis(2-ethylhexyl)phthalate	0.667	0.534	0.525	80.1	78.7	48.1-116			1.84	20.5
Di-n-butyl phthalate	0.667	0.549	0.531	82.4	79.6	49.7-113			3.34	20
Diethyl phthalate	0.667	0.576	0.556	86.4	83.3	52.0-112			3.65	20
Pyrene	0.667	0.536	0.531	80.4	79.6	47.1-108			0.990	20
Pyridine	0.667	0.226	0.160	33.8	24.0	10.0-90.0			33.9	38.3
2-Methylphenol	0.667	0.511	0.477	76.6	71.6	42.4-100			6.83	20
3&4-Methyl Phenol	0.667	0.568	0.553	85.1	82.9	50.5-115			2.65	20
2,4-Dimethylphenol	0.667	0.499	0.494	74.9	74.1	42.2-110			1.06	20
2,4-Dinitrophenol	0.667	0.516	0.480	77.3	72.0	10.0-105			7.19	36.5
4-Nitrophenol	0.667	0.550	0.539	82.5	80.8	34.8-109			2.03	20
Phenol	0.667	0.491	0.471	73.6	70.5	41.5-106			4.18	20
(S) Nitrobenzene-d5				*68.9*	*69.2*	*21.9-129*				
(S) 2-Fluorobiphenyl				*82.5*	*76.7*	*34.9-129*				
(S) p-Terphenyl-d14				*86.7*	*85.9*	*21.5-128*				
(S) Phenol-d5				*76.6*	*73.4*	*26.3-121*				
(S) 2-Fluorophenol				*79.6*	*74.4*	*21.1-116*				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3165417-1 09/22/16 12:10 • (LCSD) R3165417-2 09/22/16 12:33

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
(S) 2,4,6-Tribromophenol				*111*	*109*	*21.6-142*				

Laboratory Control Sample (LCS)

(LCS) R3165916-2 09/23/16 10:51

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Quinoline	0.667	0.335	50.2	60.0-140	J4

L860389-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L860389-01 09/22/16 19:33 • (MS) R3165417-4 09/22/16 19:57 • (MSD) R3165417-5 09/22/16 20:20

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	0.788	U	0.575	0.594	73.0	75.4	1	32.2-134			3.21	27.3
Anthracene	0.788	U	0.570	0.602	72.4	76.4	1	32.3-137			5.39	28.4
Benzo(a)anthracene	0.788	U	0.544	0.567	69.0	72.0	1	33.3-124			4.15	29
Benzo(b)fluoranthene	0.788	U	0.558	0.573	70.9	72.7	1	23.3-133			2.60	30.3
Benzo(k)fluoranthene	0.788	U	0.512	0.543	65.0	68.9	1	31.0-129			5.79	26.7
Benzo(g,h,i)perylene	0.788	U	0.468	0.434	59.4	55.0	1	10.0-127			7.61	31.9
Benzo(a)pyrene	0.788	U	0.553	0.569	70.2	72.3	1	28.2-128			2.86	28.4
Biphenyl	0.788	U	0.547	0.556	69.5	70.6	1	38.5-118			1.57	28.9
Chrysene	0.788	U	0.558	0.587	70.9	74.4	1	36.3-129			4.94	28
Dibenz(a,h)anthracene	0.788	U	0.495	0.472	62.9	59.9	1	10.5-128			4.78	29.5
Fluoranthene	0.788	U	0.545	0.582	69.1	73.9	1	27.9-138			6.69	26.9
Fluorene	0.788	U	0.577	0.591	73.2	75.0	1	34.0-133			2.43	27.1
Indeno(1,2,3-cd)pyrene	0.788	U	0.492	0.467	62.4	59.3	1	10.0-128			5.16	31.5
2-Methylnaphthalene	0.788	U	0.548	0.560	69.5	71.0	1	28.7-128			2.12	30.7
Naphthalene	0.788	U	0.529	0.522	67.1	66.3	1	36.4-121			1.32	27.2
Phenanthrene	0.788	U	0.559	0.592	71.0	75.1	1	30.8-137			5.68	26.5
Bis(2-ethylhexyl)phthalate	0.788	U	0.650	0.676	82.5	85.8	1	21.8-141			3.91	35.2
Di-n-butyl phthalate	0.788	U	0.593	0.636	75.2	80.7	1	32.2-133			6.96	25.9
Diethyl phthalate	0.788	U	0.577	0.589	73.2	74.7	1	39.4-136			2.05	25.5
Pyrene	0.788	U	0.553	0.591	70.2	75.0	1	24.1-130			6.61	29.9
Pyridine	0.788	U	0.0858	ND	10.9	0.000	1	10.0-111		J3 J6	200	30.5
2-Methylphenol	0.788	U	0.525	0.491	66.6	62.3	1	30.3-118			6.75	25.1
3&4-Methyl Phenol	0.788	U	0.585	0.518	74.3	65.7	1	33.3-141			12.2	25.7
2,4-Dimethylphenol	0.788	U	0.441	0.345	56.0	43.8	1	12.3-149			24.5	32.3

L860389-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L860389-01 09/22/16 19:33 • (MS) R3165417-4 09/22/16 19:57 • (MSD) R3165417-5 09/22/16 20:20

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,4-Dinitrophenol	0.788	U	0.418	0.425	53.1	53.9	1	10.0-121			1.49	39.4
4-Nitrophenol	0.788	U	0.570	0.591	72.4	75.1	1	20.0-133			3.61	30.2
Phenol	0.788	U	0.513	0.518	65.1	65.7	1	25.1-130			0.970	29.6
(S) Nitrobenzene-d5					*62.4*	*61.8*		*21.9-129*				
(S) 2-Fluorobiphenyl					*67.1*	*68.6*		*34.9-129*				
(S) p-Terphenyl-d14					*70.6*	*70.7*		*21.5-128*				
(S) Phenol-d5					*69.5*	*69.2*		*26.3-121*				
(S) 2-Fluorophenol					*69.5*	*65.6*		*21.1-116*				
(S) 2,4,6-Tribromophenol					*65.6*	*68.4*		*21.6-142*				

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
V	The sample concentration is too high to evaluate accurate spike recoveries.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1,4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

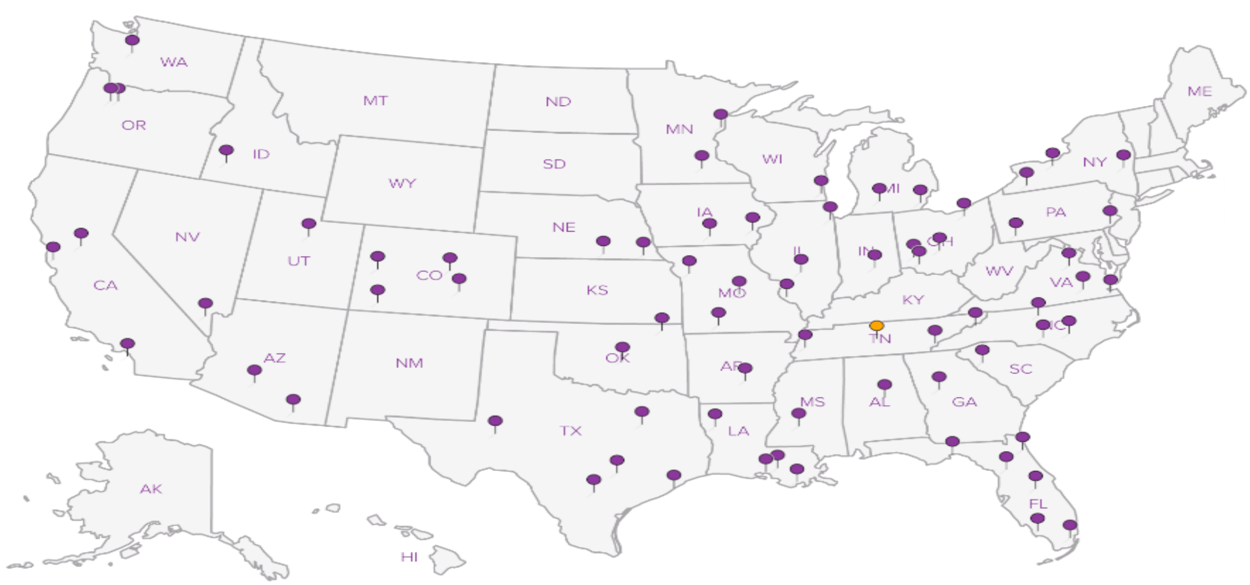
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Company Name/Address:
Aquaterra Technologies - S/E
122 South Church Street
West Chester, PA 19382

Billing Information:
Accounts Payable
122 South Church Street
West Chester, PA 19382

Chain of Custody Page 1 of 1

ESC LAB SCIENCES
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

Report to: Andrew Klingbeil
~~Michael Sarcinello / Michael Newton~~

Email To: Andrew.Klingbeil@stantec.com
ms@aquaterra-tech.com, Michael.N

Project Description: AOI8

City/State Collected: Philadelphia, PA

Phone: (610) 431-5733
Fax:

Client Project # PhRef AOI-8

Lab Project # SUNAQUA-AOI8

Collected by (print): Luke Mokrycki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ____ Y ____

Rush? (Lab MUST Be Notified)
____ Same Day 200%
____ Next Day 100%
____ Two Day 50%
____ Three Day 25%

Date Results Needed
Email? ___No ___Yes
FAX? ___No ___Yes

L# 880374
J191

Acctnum: SUNAQUA
Template: T113711
Prelogin: P560321
TSR: Mark Beasley
Cooler:
Shipped Via: 7-6-16

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK- 3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz								Rem./Contaminant	Sample # (lab only)
AOI8-BH-16-073-0-2-20160914		SS	0-2'	9-14	0800	5	X											01
AOI8-BH-16-073-12-14-20160914		SS	12-14'	9-14	1000	5	X											02
AOI8-BH-16-002-0-2-20160915		SS	0-2'	9-15	0900	5	X											03
AOI8-BH-16-002-6-8-20160915		SS	6-8'	9-15	1100	5	X											04
AOI8-BH-16-059-6-8-20160915		SS	6-8'	9-15	1530	5	X											05
AOI8-BH-16-060-4-6-20160916		SS	4-6'	9-16	1000	5	X											06
AOI8-BH-16-061-6-8-20160916		SS	6-8'	9-16	1200	5	X											07
		SS																
		SS																
		SS																

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other________

Remarks:

pH ________ Temp ________
Flow ________ Other ________

Relinquished by : (Signature)	Date: 9-16-16	Time: 1315	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ______

Temp: 2.9 °C Bottles Received: 35+1TB

Date: 9/17/16 Time: 0900

Hold #

Condition: (lab use only) JW7

COC Seal Intact: ✓ Y ___N ✓ NA

pH Checked:

NCF:

ESC

L·A·B S·C·I·E·N·C·E·S

YOUR LAB OF CHOICE

Cooler Receipt Form

Client: SUNAQUA	SDG# 860374
Cooler Received/Opened On: 9/17/16	Temperature Upon Receipt: 2.9 °c
Received By: Jeremy Watkins	
Signature:	

Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?			✓
Were custody papers properly filled out?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)			✓
If applicable, was an observable VOA headspace present?			✓
Non Conformance Generated. (If yes see attached NCF)			

Company Name/Address:
Aquaterra Technologies - S/E
122 South Church Street
West Chester, PA 19382

Billing Information:
Accounts Payable
122 South Church Street
West Chester, PA 19382

Report to: Andrew Klingbeil
Michael Sarcinello / Michael Newton

Email To: andrew.klingbeil@...
ms@aquaterra-tech.com, Michael.N

Project Description: AOI8

City/State Collected: Philadelphia, PA

Phone: (610) 431-5733
Fax:

Client Project # PhRef AOI-8

Lab Project # SUNAQUA-AOI8

Collected by (print): Luke Mokrycki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y ___

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No ___Yes
FAX? ___No ___Yes

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

ESC L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L # 860374
Table #
Acctnum: SUNAQUA
Template: T113711
Prelogin: P560321
TSR: Mark Beasley
Cooler:
Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK- 3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz								Rem./Contaminant	Sample # (lab only)
~~AOI8-BH-16-073-0-2-20160914~~	"063"	SS	0-2'	9-14	0800	5	X		AOI8-BH-16-063-0-2-20160914									
~~AOI8-BH-16-073-12-14-20160914~~	"063"	SS	12-14'	9-14	1000	5	X		AOI8-BH-16-063-12-14-20160914									
AOI8-BH-16-002-0-2-20160915		SS	0-2'	9-15	0900	5	X											
AOI8-BH-16-002-6-8-20160915		SS	6-8'	9-15	1100	5	X											
AOI8-BH-16-059-6-8-20160915		SS	6-8'	9-15	1530	5	X											
AOI8-BH-16-060-4-6-20160916		SS	4-6'	9-16	1000	5	X											
AOI8-BH-16-061-6-8-20160916		SS	6-8'	9-16	1200	5	X											
		SS																
		SS																
		SS																

Already Corrected

Correction Sent to lab 10/28/16 NS

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other ___

Remarks:

pH ___ Temp ___
Flow ___ Other ___

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ___	Condition: (lab use only)
[signature]	9-16-16	1315	[signature]		
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: °C Bottles Received:	COC Seal Intact: ___Y ___N ___NA
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: Time:	pH Checked: NCF:

ANALYTICAL REPORT

October 23, 2016

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L866853
Samples Received:	10/19/2016
Project Number:	
Description:	AOI8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

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

TABLE OF CONTENTS

Collected by	Collected date/time	Received date/time
Luke M.	10/18/16 13:30	10/19/16 09:00

AOI8-BH-16-078-0-2-20161018 L866853-01 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG919089	5	10/20/16 12:22	10/20/16 20:27	ST
Total Solids by Method 2540 G-2011	WG918821	1	10/20/16 10:07	10/20/16 10:18	KDW

Collected by	Collected date/time	Received date/time
Luke M.	10/18/16 14:00	10/19/16 09:00

AOI8-BH-16-079-0-2-20161018 L866853-02 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG919089	1	10/20/16 12:22	10/20/16 19:22	ST
Total Solids by Method 2540 G-2011	WG918821	1	10/20/16 10:07	10/20/16 10:18	KDW

Collected by	Collected date/time	Received date/time
Luke M.	10/18/16 14:30	10/19/16 09:00

AOI8-BH-16-080-0-2-20161018 L866853-03 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG919089	1	10/20/16 12:22	10/20/16 19:25	ST
Total Solids by Method 2540 G-2011	WG918821	1	10/20/16 10:07	10/20/16 10:18	KDW

Collected by	Collected date/time	Received date/time
Luke M.	10/18/16 15:00	10/19/16 09:00

AOI8-BH-16-081-0-2-20161018 L866853-04 Solid

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG918774	10	10/19/16 22:27	10/21/16 00:04	ADF
Total Solids by Method 2540 G-2011	WG918821	1	10/20/16 10:07	10/20/16 10:18	KDW

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	74.2		1	10/20/2016 10:18	WG918821

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Lead	3450		3.37	5	10/20/2016 20:27	WG919089

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	74.0		1	10/20/2016 10:18	WG918821

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Lead	1030		0.675	1	10/20/2016 19:22	WG919089

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	80.2		1	10/20/2016 10:18	WG918821

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Lead	36.8		0.623	1	10/20/2016 19:25	WG919089

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	82.6		1	10/20/2016 10:18	WG918821

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzo(a)pyrene	2.81		0.0727	10	10/21/2016 00:04	WG918774
(S) p-Terphenyl-d14	*58.4*		*32.2-131*		*10/21/2016 00:04*	WG918774
(S) Nitrobenzene-d5	*76.7*		*22.1-146*		*10/21/2016 00:04*	WG918774
(S) 2-Fluorobiphenyl	*68.6*		*40.6-122*		*10/21/2016 00:04*	WG918774

Method Blank (MB)

(MB) R3172272-1 10/20/16 10:18

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000800			

L866910-01 Original Sample (OS) • Duplicate (DUP)

(OS) L866910-01 10/20/16 10:18 • (DUP) R3172272-3 10/20/16 10:18

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	83.7	82.1	1	1.86		5

Laboratory Control Sample (LCS)

(LCS) R3172272-2 10/20/16 10:18

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3172229-1 10/20/16 18:33

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Lead	0.264	J	0.19	0.500

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3172229-2 10/20/16 18:35 • (LCSD) R3172229-3 10/20/16 18:38

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead	100	106	103	106	103	80-120			2	20

L866584-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L866584-01 10/20/16 18:41 • (MS) R3172229-6 10/20/16 18:49 • (MSD) R3172229-7 10/20/16 18:52

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Lead	100	60.7	170	167	109	106	1	75-125			2	20

Method Blank (MB)

(MB) R3172412-1 10/21/16 11:42

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzo(a)pyrene	U		0.000600	0.00600
(S) p-Terphenyl-d14	*90.7*			*32.2-131*
(S) Nitrobenzene-d5	*104*			*22.1-146*
(S) 2-Fluorobiphenyl	*90.2*			*40.6-122*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3172412-2 10/21/16 12:03 • (LCSD) R3172412-3 10/21/16 12:23

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzo(a)pyrene	0.0800	0.0698	0.0638	87.2	79.7	42.3-119			9.01	20
(S) p-Terphenyl-d14				*83.0*	*76.0*	*32.2-131*				
(S) Nitrobenzene-d5				*90.8*	*85.8*	*22.1-146*				
(S) 2-Fluorobiphenyl				*87.3*	*83.4*	*40.6-122*				

L866797-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L866797-04 10/21/16 15:36 • (MS) R3172433-1 10/21/16 15:58 • (MSD) R3172433-2 10/21/16 16:20

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzo(a)pyrene	0.0857	U	0.0847	0.0873	98.9	102	1	16.9-135			3.03	25.2
(S) p-Terphenyl-d14					*82.4*	*84.1*		*32.2-131*				
(S) Nitrobenzene-d5					*124*	*128*		*22.1-146*				
(S) 2-Fluorobiphenyl					*83.7*	*86.2*		*40.6-122*				

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
***** Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1,4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

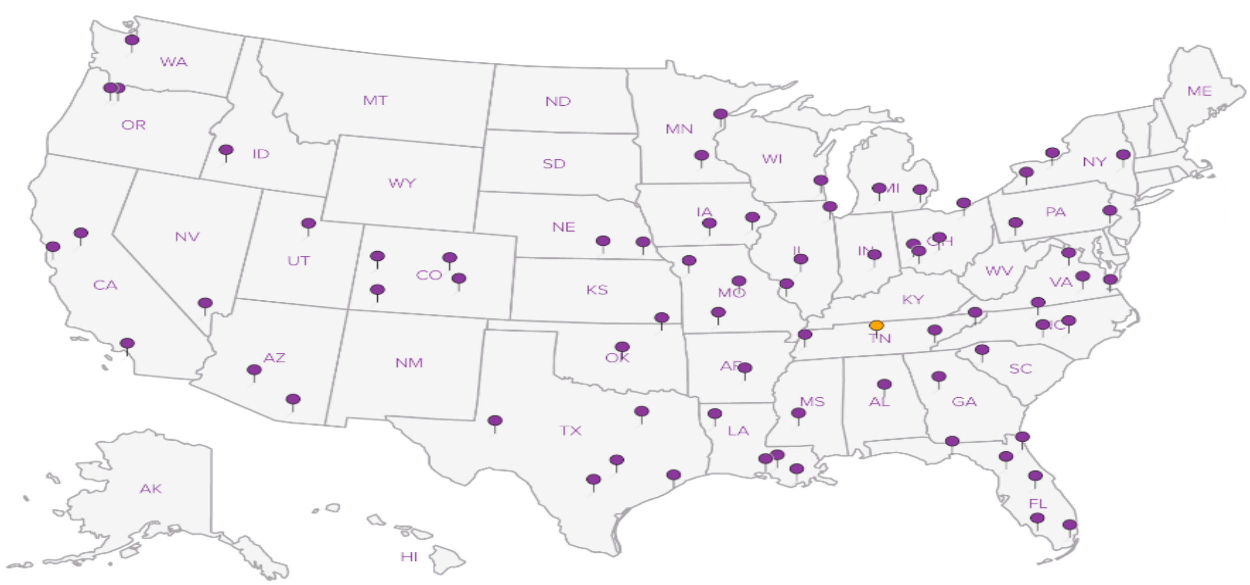
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Chain of Custody Page 1 of 1

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L # L866853

E220

Acctnum: SUNAQUA
Template: T113711
Prelogin: P560321
TSR: Mark Beasley
Cooler:
Shipped Via: 7-6-166

Company Name/Address:
Aquaterra Technologies - S/E
122 South Church Street
West Chester, PA 19382

Billing Information:
Accounts Payable
122 South Church Street
West Chester, PA 19382

Report to: Michael Sarcinello / Michael Newton

Email To: ms@aquaterra-tech.com, Michael.N

Project Description: AOI8

City/State Collected: Philadelphia, PA

Phone: (610) 431-5733
Fax:

Client Project #

Lab Project # SUNAQUA-AOI8

Collected by (print): Luke Malyda

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N____ Y____

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
X Three Day 25%

Date Results Needed
Email? __No __Yes
FAX? __No __Yes

Analysis / Container / Preservative:
1. EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar
2. EVERGREENCOMP + MEK- 3 - 40ml 5035 + 2 - 4oz ja
3. SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz
4. PB METHOD 6010
5. BENZO'A'PYRENE METHOD 8270

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP	EVERGREENCOMP + MEK	SV8270PAHSIM	PB METHOD 6010	BENZO'A'PYRENE METHOD 8270	Rem./Contaminant	Sample # (lab only)
AOI8-BH-16-078-0-2-20161018		SS	0-2'	10-18	1330	1				X			-01
AOI8-BH-16-079-0-2-20161018		SS	0-2'	10-18	1400	1				X			-02
AOI8-BH-16-080-0-2-20161018		SS	0-2'	10-18	1430	1				X			-03
AOI8-BH-16-081-0-2-20161018		SS	0-2'	10-18	1500	1					X		-04
		SS											
		SS											
		SS											
		SS											
		SS											
		SS											

* Matrix: **SS** - Soil **GW** - Groundwater **WW** - WasteWater **DW** - Drinking Water **OT** - Other____

Remarks: 6905 4750 3639

E16023PE = TS tube

pH ____ Temp ____
Flow ____ Other ____

Hold #

Condition: (lab use only) OK

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ____

Relinquished by : (Signature)	Date: 10/18/16	Time: 1536	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)

Temp: 3.1 °C Bottles Received: 4 9r

Date: 10-19-16 Time: 900

COC Seal Intact: ✓ Y ___N ___NA

pH Checked:

NCF:

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

Cooler Receipt Form

Client: SUN AQUA	SDG# L866853
Cooler Received/Opened On: 10-19-16	Temperature Upon Receipt: 3.1 °C
Received By: mesha Freeman	
Signature:	

Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?	✓		
Were custody papers properly filled out?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)			✓
If applicable, was an observable VOA headspace present?			✓
Non Conformance Generated. (If yes see attached NCF)			

ANALYTICAL REPORT

November 01, 2016

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L869424
Samples Received:	10/29/2016
Project Number:	PH REF AOI8
Description:	AOI-8
Report To:	Michael Sarcinello 122 South Church Street West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

TABLE OF CONTENTS

AOI8-BH-16-082-0-2-20161028 L869424-01 Solid

Collected by	Collected date/time	Received date/time
Luke M.	10/28/16 08:00	10/29/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010B	WG922491	1	10/31/16 15:20	10/31/16 20:08	ST
Total Solids by Method 2540 G-2011	WG922395	1	10/31/16 15:41	10/31/16 15:50	MEL

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	91.4		1	10/31/2016 15:50	WG922395

Metals (ICP) by Method 6010B

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Lead	38.8		0.547	1	10/31/2016 20:08	WG922491

Method Blank (MB)

(MB) R3174852-1 10/31/16 15:50

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000700			

L869339-01 Original Sample (OS) • Duplicate (DUP)

(OS) L869339-01 10/31/16 15:50 • (DUP) R3174852-3 10/31/16 15:50

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	82.7	81.5	1	1.43		5

Laboratory Control Sample (LCS)

(LCS) R3174852-2 10/31/16 15:50

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	99.9	85.0-115	

Method Blank (MB)

(MB) R3174817-1 10/31/16 18:44

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Lead	U		0.19	0.500

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3174817-2 10/31/16 18:47 • (LCSD) R3174817-3 10/31/16 18:50

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead	100	102	91.5	102	92	80-120			11	20

L869132-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L869132-01 10/31/16 18:52 • (MS) R3174817-6 10/31/16 19:00 • (MSD) R3174817-7 10/31/16 19:03

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Lead	100	6.70	108	110	101	104	1	75-125			2	20

Cp Tc Ss Cn Sr Qc Gl Al Sc

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Rec.	Recovery.

Qualifier	Description
	The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

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* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1 4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA	100789
DOD	1461.01
USDA	S-67674

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

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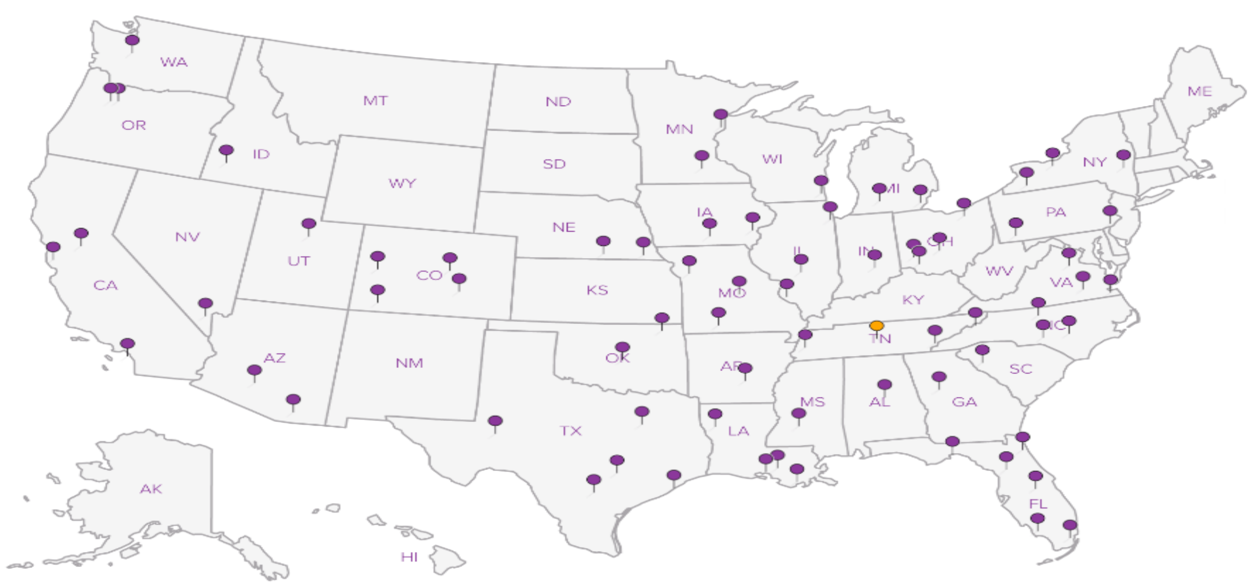


Company Name/Address:	Billing Information:	Analysis / Container / Preservative	Chain of Custody Page 1 of 2
Aquaterra Technologies - S/E South Church Street West Chester, PA 19382	Accounts Payable 122 South Church Street West Chester, PA 19382		ESC L·A·B S·C·I·E·N·C·E·S YOUR LAB OF CHOICE 12065 Lebanon Rd Mount Juliet, TN 37122 Phone: 615-758-5858 Phone: 800-767-5859 Fax: 615-758-5859
Report to: ...ael Sarcinello / Andrew Klingbeil	Email To: ...ms@aquaterra-tech.com, andrew.kl...		L# L869424
Project Description: AOI8	City/State Collected: Philadelphia PA		Table #
Phone: (610) 431-5733	Client Project #: PH REF AOI - 8	Lab Project #: SUNAQUA-AOI8	Acctnum: SUNAQUA
Collected by (print): ...e Mokrycki	Site/Facility ID #:	P.O. #:	Template: T114547
Collected by (signature):	Rush? (Lab MUST Be Notified) ___ Same Day ......200% ___ Next Day ......100% ___ Two Day ......50% X Three Day 25%	Date Results Needed Email? __No __Yes FAX? __No __Yes	Prelogin: P563710 TSR: Mark Beasley Cooler: Shipped Via:
Immediately Packed on Ice N ___ Y ___			

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP	PB							Rem./Contaminant	Sample # (lab only)
...H-16-082-0-2-20161028	G	~~GW~~ SS	0-2	10-28	0800	1		X							-01	
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														
		GW														

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other______

EVERGREENCOMP = 2-40ml HCL, 3-40ml NaThi, 2-40ml NP, 2-100ml NP, 1-250ml HDPE NP

pH ______ Temp ______

Flow ______ Other ______

Hold #

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ____	Condition: (lab use only)
[signature]	10-28-16	1015			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.4 °C Bottles Received: 1	COC Seal Intact: ✓ Y __ N __ NA
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) [signature] For Ricky Mosley	Date: 10/29/16 Time: 0900	pH Checked: NCF:

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

Cooler Receipt Form

Client:	SUNAQUA	SDG#	~~L869262~~
Cooler Received/Opened On: 10/ 29 /16		Temperature Upon Receipt:	2.4 °c
Received By: Rickey Mosley			
Signature: Rickey Mosley			

AN 10/31/16 L869424

Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?	✓		
Were custody papers properly filled out?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)			✓
If applicable, was an observable VOA headspace present?			✓
Non Conformance Generated. (If yes see attached NCF)			

Andy Vann

From:	Mark Beasley
Sent:	Saturday, October 29, 2016 6:53 PM
To:	Login
Subject:	L869292 *SUNAQUA*
Attachments:	KIMG0016.jpg; KIMG0015.jpg

Use the attached COC instead of the original COC. Log as two separate L#'s. Log the soil sample as R2 due 11/1.

Thanks
Mark

From: Luke Mokrycki [mailto:lm.aquaterra@gmail.com]
Sent: Friday, October 28, 2016 10:23 AM
To: Mark Beasley
Subject: COC's 10/28

Hello Mark,
Just handed off two samples to your courier, Ed. I mistakenly put then on the same chain. Also we need a rush tat on the soil sample. I have attached the original chain and two corrected ones. Sorry for the confusion.
Thanks,
Luke

Luke Mokrycki
Aquaterra Technologies, Inc.
Office: 610.431.5733
Cell: 484.832.7476

ESC LAB SCIENCES
YOUR LAB OF CHOICE

ANALYTICAL REPORT

April 06, 2017

myESC
REAL TIME DATA ACCESS

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group:	L898996
Samples Received:	03/29/2017
Project Number:	
Description:	AOI-8
Report To:	Michael Sarcinello
	122 South Church Street
	West Chester, PA 19382

Entire Report Reviewed By:

Mark W. Beasley
Technical Service Representative

TABLE OF CONTENTS

	Collected by	Collected date/time	Received date/time
AOI8-BH-16-083-0-2-20170328 L898996-01 Solid	Luke M.	03/28/17 13:45	03/29/17 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG966940	1	04/04/17 09:19	04/04/17 09:30	KDW
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG965810	1	03/31/17 15:07	04/01/17 08:28	CLG

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	80.7		1	04/04/2017 09:30	WG966940

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Benzo(a)pyrene	0.123		0.00743	1	04/01/2017 08:28	WG965810
(S) p-Terphenyl-d14	*29.4*		*23.0-120*		*04/01/2017 08:28*	WG965810
(S) Nitrobenzene-d5	*24.5*		*14.0-149*		*04/01/2017 08:28*	WG965810
(S) 2-Fluorobiphenyl	*21.9*	J2	*34.0-125*		*04/01/2017 08:28*	WG965810

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Method Blank (MB)

(MB) R3208247-1 04/04/17 09:30

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.000500			

L899039-02 Original Sample (OS) • Duplicate (DUP)

(OS) L899039-02 04/04/17 09:30 • (DUP) R3208247-3 04/04/17 09:30

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	85.2	81.4	1	4.53		5

Laboratory Control Sample (LCS)

(LCS) R3208247-2 04/04/17 09:30

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3207900-3 04/01/17 04:40

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzo(a)pyrene	U		0.000600	0.00600
(S) p-Terphenyl-d14	*93.4*			*23.0-120*
(S) Nitrobenzene-d5	*101*			*14.0-149*
(S) 2-Fluorobiphenyl	*88.0*			*34.0-125*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3207900-1 04/01/17 03:57 • (LCSD) R3207900-2 04/01/17 04:19

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzo(a)pyrene	0.0800	0.0572	0.0578	71.5	72.2	42.0-121			0.990	20
(S) p-Terphenyl-d14				*102*	*82.6*	*23.0-120*				
(S) Nitrobenzene-d5				*109*	*95.5*	*14.0-149*				
(S) 2-Fluorobiphenyl				*94.5*	*84.3*	*34.0-125*				

L898624-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L898624-03 04/01/17 09:51 • (MS) R3207900-4 04/01/17 10:12 • (MSD) R3207900-5 04/01/17 10:33

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzo(a)pyrene	0.0800	0.0197	0.0857	0.0807	82.6	76.4	1	14.0-138			5.99	27
(S) p-Terphenyl-d14					*77.1*	*76.0*		*23.0-120*				
(S) Nitrobenzene-d5					*101*	*97.6*		*14.0-149*				
(S) 2-Fluorobiphenyl					*81.7*	*81.1*		*34.0-125*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
J2	Surrogate recovery limits have been exceeded; values are outside lower control limits.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Conneticut	PH-0197	North Carolina [1]	DW21704
Florida	E87487	North Carolina [2]	41
Georgia	NELAP	North Dakota	R-140
Georgia [1]	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky [1]	90010	South Dakota	n/a
Kentucky [2]	16	Tennessee [1 4]	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

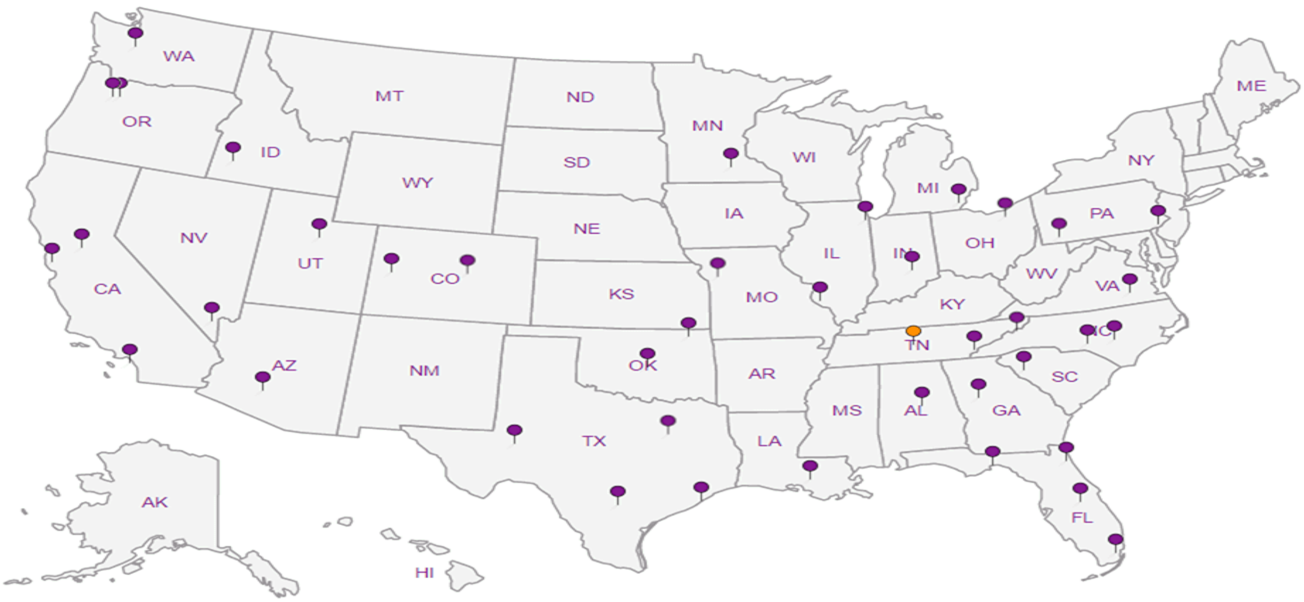
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Company Name/Address:	Billing Information:
Aquaterra Technologies - S/E 122 South Church Street West Chester, PA 19382	Accounts Payable 122 South Church Street West Chester, PA 19382
Report to: Michael Sarcinello / Michael Newton	Email To: ms@aquaterra-tech.com, Michael N

Project Description: AOI8

City/State Collected: Philadelphia, PA

Phone: (610) 431-5733

Fax:

Client Project #

Lab Project # SUNAQUA-AOI8

Collected by (print): Luke Mokonecki

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N___ Y___

Rush? (Lab MUST Be Notified)

- ___ Same Day 200%
- ___ Next Day 100%
- ___ Two Day 50%
- ___ Three Day 25%

Date Results Needed

Email? ___No ___Yes

FAX? ___No ___Yes

Chain of Custody Page 1 of 1

ESC L·A·B S·C·I·E·N·C·E·S

YOUR LAB OF CHOICE

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# 793596

G196

Acctnum: SUNAQUA

Template: T113711

Prelogin: P560320

TSR: Mark Beasley

Cooler:

Shipped Via:

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	EVERGREENCOMP - 3 - 40ml 5035 vials + 2 - 4oz jar	EVERGREENCOMP + MEK - 3 - 40ml 5035 + 2 - 4oz ja	SV8270PAHSIM, TS (Benzo(a)pyrene only) 1 - 4oz	Rem./Contaminant	Sample # (lab only)
AOI8-BH-16-083-0-2-20170328	G	SS	0-2'	03-28-17	1345	1			X		01
AOI8-BH-16-084-0-2-20170328	G	SS	0-2'	03-28-17	1430	1			X		
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									
		SS									

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other________

Remarks: Please Run AOI8-BH-16-083-0-2-20170328 5 Day Rush TAT. Please HOLD SAMPLE #2 AOI8-BH-16-084-20170328

pH ______ Temp ______

Flow ______ Other ______

03-139

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ ____	Condition: (lab use only)
	03/28/17	1500			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature) 7860 5932 9850	Temp: °C 1.3 / Bottles Received: 2	COC Seal Intact: ✓ Y ___ N ___ NA
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 3-29-17 Time: 0900	pH Checked: / NCF:

ESC LAB SCIENCES

Cooler Receipt Form

Client: SUNAQUA	SDG#	888896	
Cooler Received/Opened On: 3/ 29 /17	Temperature: 1.3		
Received By: Jon Deboard			
Signature: Jon Deboard			

Receipt Check List	**NP**	**Yes**	**No**
COC Seal Present / Intact?			
COC Signed / Accurate?		✓	
Bottles arrive intact?		✓	
Correct bottles used?		✓	
Sufficient volume sent?		✓	
If Applicable		✓	
VOA Zero headspace?			
Preservation Correct / Checked?			