
SITE CHARACTERIZATION/REMEDIAL INVESTIGATION REPORT AREA OF INTEREST 7

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1.0 INTRODUCTION

Sunoco Inc. (R&M) (Sunoco) and the Pennsylvania Department of Environmental Protection (PADEP) entered into a Consent Order & Agreement (CO&A) in December 2003 with respect to Sunoco's Philadelphia Refinery (Refinery). Sunoco's Phase I Remedial Plan (Phase I Plan), dated November 2003, was included as an attachment to the CO&A. In accordance with the CO&A and Phase I Plan, a Current Conditions Report and Comprehensive Remedial Plan (CCR) was prepared by Sunoco in June 2004. The Phase I Plan and the CCR divided the facility into 11 Areas of Interest (AOIs), and presented a prioritization of the AOIs based on specific risk factors. The AOIs are shown in Figure 1 and 2 of this report. The CCR also presented the Phase II remedial approach and schedule to characterize each of the 11 AOIs, and to conduct Phase I and II corrective action activities in accordance with the 2003 CO&A and the Phase I Plan. Since 2003, Sunoco has completed site characterization activities at six AOIs (AOIs 1, 4, 5, 6, 8 and 9). For each AOI that has been characterized, Sunoco has prepared and submitted a corresponding Site Characterization Report in accordance with the Revised Phase II Corrective Action Activities schedule that was included in the CCR. Based on the Phase II Corrective Action Activities Schedule, AOI 7 along with AOI 2 and AOI 3, were identified by Sunoco to be investigated and characterized in 2010.

In April 2004, the PADEP and the United States Environmental Protection Agency (EPA) signed an agreement entitled "One Cleanup Program Memorandum of Agreement (PA One Cleanup Program)," which clarifies how sites remediated under Pennsylvania's Land Recycling and Environmental Remediation Standards Act (Act 2) program may satisfy EPA's Resource, Conservation and Recovery Act (RCRA) corrective action requirements through characterization and attainment of Act 2 remediation standards. Since November 2005, Sunoco and its representatives have met with officials of the PADEP and EPA on several occasions to discuss the applicability of PA One Cleanup Program to the ongoing remedial program for the facility. Sunoco, PADEP and EPA agreed that the ongoing remedial program can be addressed under the PA One Cleanup Program. Sunoco submitted a Notice of Intent to Remediate (NIR) on October 12, 2006 to formally enter the facility into the PA Act 2 Program. The portion of the Refinery known as the Belmont Terminal was not included in the NIR. A NIR may be submitted in the future for the Belmont Terminal. The cover letter included with the NIR expressed Sunoco's intent to enter the facility into the PA One Cleanup Program. To date, acknowledgement of formal acceptance into the PA One Cleanup Program has not been

received by EPA; however, the facility is listed on EPA's online PA One Cleanup Program list and is therefore considered to be in the PA One Cleanup Program.

Sunoco prepared a Site Characterization Work Plan (Work Plan) for AOI 7 and submitted the work plan to the PADEP and EPA on May 26, 2010. This work plan summarized proposed activities to be completed to characterize AOI 7 in accordance with the objectives of the CCR. The Work Plan also included proposed activities to characterize the five leaded tank bottom RCRA Solid Waste Management Units (SWMUs) in AOI 7.

This Site Characterization/Remedial Investigation Report (SCR/RIR) has been prepared exclusively for AOI 7 and documents the results of the characterization activities completed in accordance with the Work Plan. The objective of this SCR/RIR is to document current environmental conditions at AOI 7 in accordance with the 2003 CO&A, the 2004 CCR and to evaluate whether the remedial objectives of the CO&A are being met based on the current conditions.

1.1 Site History and Background

The Sunoco Philadelphia Refinery is located in southwest Philadelphia. The facility has a long history of petroleum transportation, storage, and processing. The oldest portion of the facility started petroleum related activities in the 1860's, when the Atlantic Refining Company established 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 time. Current operations at the Refinery are limited to the production of fuels and basic petrochemicals for the chemical industry. The current, historic uses/investigations, and approximate limits of impervious surfaces of AOI 7 are described on Figure A-1 in Appendix A.

AOI 7, also known as the Girard Point Fuels Processing Area, is located on the east side of the Schuylkill River. AOI 7 is bordered by Lanier Avenue to the east, Pennypacker Avenue to the south and Schuylkill River to the west and north (Figures 1 and 2). AOI 7 encompasses approximately 130 acres, and is covered by approximately 40% of impervious surfaces. The entire western and northern boundary of AOI 7 along the Schuylkill River is bound by a sheet pile wall which is keyed into the Middle Clay Unit. The extent of the sheet pile wall is shown in Figure 3.

There are a total of five SWMUs (SWMU Nos. 87, 88, 89, 90, and 91) located in AOI 7 that were addressed in several previous RCRA investigations as part of the EPA Corrective Action Process. The history and locations of the five SWMUs are discussed in detail in section 2.1 below.

AOI 7 formerly contained a fluid catalytic cracker (FCC) unit, CO boiler, sulfur plant, East and West Sludge Basin - RCRA Tank, Hazardous Waste Incinerator, and crude units. Based on review of historical reports and aerial photographs, early refining units in AOI 7 were built in the 1940s. AOI 7 currently consists of crude units, FCC and alkylation units, flares, and above ground storage tanks (ASTs). The ASTs contain primarily naphtha crude, waste oil, and cat charge stocks. Eight liquefied petroleum gases (LPG) tanks are located in the south-central portion of this area. A wastewater treatment plant (WWTP) is located along the southwestern portion of AOI 7. Four RCRA hazardous waste ASTs are also located in the western portion of AOI 7 approximately 150 feet north of the WWTP.

Institutional controls (i.e. permits governing excavation, Occupation Safety and Health Administration (OSHA) restrictions, etc.) apply to AOI 7. These institutional controls limit exposure to hazardous site COCs as listed in Table 1. Prior to any work being completed within AOI 7, appropriate work permits, safety and security measures, etc must be approved by Refinery personnel. Operating areas of AOI 7 are located within a secured area to prevent unauthorized access. Direct contact to site soils (soils greater than two feet beneath the ground surface) is governed by Sunoco's on-site procedures and personal protective equipment (PPE).

The existing monitoring well network in AOI 7 includes a total of 51 accessible existing monitoring points: 35 existing monitoring wells, and one river gauge location. Fifteen new monitoring wells were installed as part of the site characterization effort in accordance with the Work Plan. A well construction summary of AOI 7 monitoring points is included in Table 2. There are no active remediation systems in AOI 7. Groundwater gauging of select monitoring wells in AOI 7 occurs on an annual basis during the second quarter of each year. Annual gauging activities and results are reported to the PADEP and EPA in Quarterly Reports prepared by Sunoco.

1.2 Selection of Compounds of Concern and Applicable Standards

The compounds of concern (COCs) for soil and groundwater are listed in Table 1 of this report. The COCs include all current constituents from the PA Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E of the PADEP's Closure Requirements for Underground Storage Tank Systems, with the exception of select waste oil constituents. These COCs are the same as those listed in the Work Plan and only differ from those listed in the CCR based on the addition of two compounds: 1,2,4-trimethylbenzene (TMB) and 1,3,5-trimethylbenzene (TMB). These two compounds were added to the list of COCs based on PADEP's recent revisions to the Petroleum Short List of Compounds. The following sections describe the applicable standards that were used in evaluating the site characterization data.

Soil

Surface (0-2 feet) soil samples were collected at each soil boring/well location that represents a potential complete direct contact exposure pathway to site workers (e.g., unpaved areas). These surface soil results were screened against the PADEP non-residential statewide health soil medium-specific concentrations (MSCs). As summarized in the CCR, where these MSCs are exceeded, Sunoco evaluated application of the site-specific remediation standard using either the pathway elimination or calculated risk-based standard options.

Groundwater

Groundwater sample results were screened against the PADEP non-residential, used-aquifer (TDS<2,500) statewide health groundwater MSCs. As summarized in the CCR, where these statewide health MSCs are exceeded, Sunoco evaluated application of the site-specific remediation standard using either the pathway elimination or calculated risk-based standard options.

1.3 Overview of Investigative Framework and Remedial Approach for AOI 7

The current remediation program for the Refinery is performed under the 2003 CO&A between PADEP and Sunoco. In April 2004, the PADEP and EPA signed an agreement entitled "One Cleanup Program Memorandum of Agreement (MOA or One-Cleanup

Program),” which clarifies how sites remediated under Pennsylvania’s Act 2 program may satisfy RCRA corrective action requirements through characterization and attainment of Act 2 remediation standards pursuant to Pennsylvania’s Act 2. On November 22, 2005, Sunoco and its representatives met with officials of the PADEP and EPA to discuss the applicability of the Sunoco Philadelphia Refinery to the One Cleanup Program. During the November 22, 2005 meeting, all parties agreed that the One Cleanup Program would benefit the project by merging the remediation obligations under the various programs into one streamlined approach which would be conducted under the existing 2003 CO&A.

As a follow up to the November 22, 2005 meeting, Sunoco submitted a letter dated December 2, 2005 to EPA and PADEP documenting the discussions at the meeting. Sunoco submitted a Notice of Intent to Remediate (NIR) for the Refinery, excluding the Belmont Terminal, to the PADEP on October 12, 2006 and held a public involvement meeting in South Philadelphia on September 19, 2007. On March 5, 2009, Sunoco and its representatives met again with EPA to discuss Sunoco Philadelphia Refinery’s remediation progress and path forward under the One Clean-Up Program. As a follow up to the meeting, Sunoco submitted a letter dated March 11, 2009 to EPA and PADEP documenting the discussions at the meeting. The major points of this letter are below:

- US EPA will provide a formal letter that acknowledges that there is a One Clean Up Program Agreement with Sunoco and it’s currently operating under one US EPA ID Number (PAD049791098) for Point Breeze, Girard Point and Schuylkill River Tank Farm;
- US EPA will add in a Corrective Action Module to the Sunoco-submitted Draft Part B RCRA Permit. The module will reference the One Clean-Up Program agreement and the current remediation work being completed under the existing Consent Order and Agreement between PADEP and Sunoco, Inc.; and
- US EPA will issue a letter to Sunoco for each characterized SWMU that lists a non-leaded tank bottom designation for which no further action is required.

In development of the Work Plan, Sunoco and Langan reviewed relevant RCRA reports previously prepared for the Girard Point portion of the refinery. A list of the reports reviewed is provided in the Work Plan. Based on this review, five SWMUs (87, 88, 89,

90, and 91) were identified in AOI 7 that required further characterization. The locations of the SWMUs are shown on Figure A-1 in Appendix A. These areas were characterized following the investigative approach outlined in Section 1.2 of the Work Plan. Characterization activities completed at each SWMU area is presented in this report.

2.0 ENVIRONMENTAL SETTING

AOI 7 is located north of Pennypacker Avenue, east of Lanier Avenue, and south and east of the Schuylkill River (Figures 1 and 2). AOI 7 encompasses approximately 130 acres.

2.1 Historic and Current Use

Historic Use

Sunoco obtained available historical aerial photographs with coverage of AOI 7 from the City of Philadelphia Library and reviewed them to identify specific areas for characterization and to assist in determining previous uses of AOI 7. Aerial photos were reviewed for the following years: 1930, 1945, 1959, 1965, 1970, 1975, 1980, 1985, 1990, 1995 and 2005. A brief summary of each photograph was provided in the AOI 7 Work Plan, which was submitted to PADEP and EPA on May 26, 2010.

AOI 7 formerly contained a FCC unit, CO boiler, sulfur plant, East and West Sludge Basin - RCRA Tank, Hazardous Waste Incinerator, and crude units. These features are shown on the Figure A-1 in Appendix A. Based on the review of historical reports and aerial photographs, early refining units in AOI 7 were built in the 1940s.

Based on a review of historic RCRA reports, five SWMUs were identified in AOI 7 that required further characterization in accordance with the current remedial program. The RCRA reports identify these areas as the northwestern fill area (SWMUs 87, 88, and 89) and storage tank area (SWMUs 90 and 91). These SWMUs are shown on Figure A1 in Appendix A.

The northwestern fill area consists of SWMU 87 (Buried Lead Sludge Area No. 1), SWMU 88 (Buried Lead Sludge Area No. 2), and SWMU 89 (Buried Lead Sludge Area No. 3). All three SWMUs are located adjacent to each other in the northwestern portion

of AOI 7. A sheet pile wall keyed into the Middle Clay and the Schuylkill River borders these SWMUs to the north and west. The 1990 *RCRA Facility Investigation Work Plan* (RFIWP) reported that these three SWMUs received cooling tower sludge, leaded tank bottom sludge, and oily tank bottom sludge.

Two hazardous waste sludge basins (388 Tank Basins - East and West) were formerly located in the southwest corner of SWMU 87. The 388 Tank Basins – East and West were properly closed under the PA storage tank program in November 1999. One Hazardous Waste Incinerator was formerly located in the in the southwest corner of AOI 7. This incinerator was properly closed in March 1999.

The storage tank area is located in the southeastern portion of AOI 7 and contains SWMU 90 (Buried Lead Sludge Area No. 4) and SWMU 91 (Buried Lead Sludge Area No. 5). SWMU 90 is located immediately north of SWMU 91 as shown in Figure A-1 in Appendix A. AOI 3 borders SWMUs 90 and 91 to the east and AOI 6 borders the SWMUs to the south. The 1990 RFIWP reported that leaded sludge from tank bottoms was periodically removed from tanks in this area and disposed on the ground or in shallow excavations. These SWMUs reportedly received leaded sludge from the tank bottoms beginning in the 1960s and up until November 1980.

Historic reports have indicated that SWMUs 87, 88, 89, 90, and 91 have the potential to contain leaded tank bottom materials. Leaded tank bottom materials are distinguished by distinctive rusty-red to black, metallic mostly oxidized scale materials. Leaded tank bottoms also can be found in a matrix of petroleum wax sludge. Sunoco's general procedure to characterize the SWMUs in AOI 7 for the presence of leaded tank bottom materials is presented in Section 3.1 of this report and was described in the Work Plan.

Current Use

AOI 7 currently consists of crude units, FCC and alkylation units, flares, and ASTs. The ASTs contain primarily naphtha crude, waste oil, and cat charge stocks. Eight LPG tanks are located in the south-central portion of this area. A WWTP is located along the western portion of AOI 7 adjacent to the Schuylkill River. Four RCRA hazardous waste ASTs are located in the western portion of AOI 7 approximately 150 feet north of the WWTP.

A sheet pile wall, which is keyed into the Middle Clay, extends along the entire western boundary of the AOI 7 between the Schuylkill River and AOI 7. The extent of the wall is shown in Figure 3.

2.2 Geology

To further characterize geology beneath AOI 7, Sunoco advanced twelve new shallow/intermediate (fill/alluvium, and Trenton Gravel) monitoring wells ranging in depths between 12 to 15 feet below ground surface (ft bgs). In addition, three deep (Lower Sand) monitoring wells were installed to depths ranging between 66 and 78 ft bgs. Soils were continually logged at each well location and copies of the boring/well construction logs are included as Appendix B.

To illustrate the geology at AOI 7, three geologic cross sections (Figures 5a, 5b, and 5c) trending north-south, east-west, and northwest to southeast were prepared using historic and recently completed soil boring/well logs. The cross section locations are shown in plan view in Figure 4.

The following paragraphs describe the primary geologic units beneath AOI 7 beginning with the deepest units to the shallowest units:

Wissahickon Formation – Bedrock beneath the refinery and AOI 7 is identified as the Wissahickon Schist. This formation is a metamorphosed greenish-gray micaceous schist and quartzite. The competent bedrock of the Wissahickon Formation is overlain by weathered bedrock consisting of micaceous clay, which becomes increasingly sandy as the degree of weathering lessens and competent bedrock is encountered. Based on historic and recent deep monitoring well and soil borings completed in AOI 7, the Wissahickon Schist is located at depths ranging between 66 and 78 ft bgs. The bedrock depth is illustrated in Figures 5a, 5b and 5c.

Lower Sand Unit of the PRM – Throughout the majority of the Refinery, the Wissahickon Formation is overlain by the Lower Sand, which is the lowest member of the Potomac-Raritan Magothy (PRM) Aquifer System. As shown in Figures 5a, 5b and 5c, the Lower Sand overlies bedrock throughout AOI 7.

Two deep (Lower Sand) groundwater monitoring wells (C-50D and C-65D) existed in AOI 7 prior to the recent characterization work. A total of three new deep groundwater monitoring wells (C-129D, C-134D and C-144D) were installed in AOI 7 as part of the recent site characterization activities. C-144D was installed to replace C-65D, as this well was damaged. The purpose of the additional deep (Lower Sand) monitoring wells was to obtain geologic information to refine the site conceptual model and obtain groundwater quality data for the Lower Sand. Based on interpretation of the geology as shown in Figures 5a, 5b, and 5c, all deep wells in AOI 7 (with the exception of C-50D) are screened in the Lower Sand where the Lower/Middle Clay is present. Based on interpretation of geology as shown in Figures 5a, 5b and 5c, deep well (C-50D) in the western portion of AOI 7, near AOI 3 eastern boundary is screened into the upper portion of the Lower Sand where the Lower/Middle Clay is interfingering with the Lower Sand.

The Lower Sand beneath AOI 7 is a reddish-brown, orange and/or yellowish-brown, fine to coarse gravel and fine to coarse sand that grades upward into medium-to-fine sands and contains layers of silts and clay. The Lower Sand is located approximately 20 ft bgs along the eastern boundary of AOI 7, and at 50-60 ft bgs along the eastern portion of AOI 7 and ranges in thickness between 20 and 70 feet. The extent of the Lower Sand beneath AOI 7 is generally consistent with the extent illustrated by USGS (USGS, 1961).

Middle/Lower Clay – The Middle/Lower Clay located beneath AOI 7 is characterized by a low permeability reddish-brown, brown or gray clays, sandy clays, with trace amounts of organic matter. The Lower/Middle Clay overlies the Lower Sand throughout most of AOI 7, with the exception being along the eastern portion of AOI 7, as shown in Figures 5A, 5b, and 5c. In the eastern portion of AOI 7, the Lower/Middle Clay appears to be interfingering with the Lower Sand. The USGS (USGS, 1961) interpreted that a depositional trough (shown in Figure 3 of the USGS publication) is located near AOI 7 and notes that, near the heads of these troughs of deposition, the clay members have been removed.

The extent of the clay beneath AOI 7 as shown in Figures 5a, 5b and 5c is generally consistent with the extent illustrated by USGS (USGS, 1961), as interfingering of the clay is present. Plate 20 of the USGS publication includes a geologic cross section of the coastal plain deposits near AOI 7. This plate is provided in Appendix B of this report.

As shown in Figures 5a, 5b and 5c, the clay ranges in thickness between approximately 55 feet along the most western extent to approximately 0 feet in the eastern portion of AOI 7. The western boundary of AOI 7 is bound by a sheet pile wall which is keyed into the Middle/Lower Clay.

Trenton Gravel – Throughout most of the Refinery, the Trenton Gravel typically overlies the Middle/Lower Clay and Lower Sand with thicknesses up to 80 feet and a typical thickness of 40 feet. The Trenton Gravel is of Pleistocene Age (Ice Age; less than 2 million years) and is a very heterogeneous unit comprised of a predominant brown to gray sand, gravel and minor amounts of clay (Owens and Minard, 1979). As shown in Figures 5a, 5b and 5c, the Trenton Gravel is undifferentiated from the fill/alluvium in AOI 7, and is present in the northwestern and northeastern area of AOI 7, near the Schuylkill River.

Recent Fill/Alluvium - Fill material generally consisted of sands and gravels, silts, silty clays, cinder ash, brick, wood, and glass. The alluvium deposits in AOI 7 generally consist of dark brown silts and sands, with trace amounts of clay undifferentiated with fill material. Lesser amounts of fill are observed towards the western portion of the AOI. A total of 12 monitoring wells were advanced into the fill/alluvium as part of the site characterization activities. As shown in Figures 5a, 5b and 5c, fill/alluvium deposits exist throughout AOI 7 and range in thickness between 10 and 20 feet.

In addition to the above descriptions, the following general observations can be made concerning the geology in AOI 7:

- The depth to bedrock beneath AOI 7 is at approximately 66 to 78 ft bgs. The depth to bedrock is generally consistent with previous geologic cross sections prepared by Dames & Moore and with the USGS's interpretation (USGS, 1961);
- The Lower Sand overlies bedrock throughout AOI 7 and is generally shallower in the eastern and northern portions of AOI 7;
- In the eastern portion of AOI 7, the Middle/Lower Clay appears to be interfingering with the Lower Sand;

- Trenton Gravel is undifferentiated from the fill/alluvium throughout AOI 7 and is only present in the northwestern and northeastern portions of AOI 7; and
- The fill/alluvium materials are present throughout AOI 7, and range in thickness between 10 to 20 feet.

2.3 Hydrogeology

2.3.1 Groundwater Occurrence and Flow

Groundwater gauging data collected by Stantec, Inc. (Stantec) in July 2010 was used to generate groundwater contour maps for AOI 7. The groundwater elevation data from this gauging event is provided in Table 3. Well construction details for these monitoring wells are provided in Table 2 and boring/well construction logs for the newly installed wells are provided in Appendix B of this report. Historic boring/well logs for wells installed prior to the site characterization activities were provided in Appendix D of the CCR.

Groundwater flow within AOI 7 is described below:

- Two sets of groundwater contours were created using groundwater elevations from both the shallow/intermediate and deep (Lower Sand) wells (Figures 6 and 7).
- Groundwater elevations in the shallow/intermediate wells occur at depths ranging between approximately -1 and 7 ft above mean seal level (amsl);
- Based on the July 2010 groundwater gauging event, the average value of the hydraulic gradient in the shallow/intermediate wells ranged from 0.0043 to 0.0081 with an average of 0.0061. The highest hydraulic gradients are in the southern area near C-56;
- The groundwater gradient in the central portion of AOI 7 is relatively flat;
- Along the western boundary of AOI 7, flow in the shallow/intermediate zone is towards the east-southeast, away from the sheet pile wall;
- In areas where the Lower/Middle clay is either deeper or shallower in elevation, groundwater depressions and/or mounds are observed;

- In areas where the clay is present, it appears to act as a semi-confining layer;
- Groundwater flow in the shallow/intermediate zone in the northern and eastern portions of AOI 7 are generally towards the west-northwest;
- Groundwater flow in shallow/intermediate zone in the southern portion of AOI 7 is towards the east-southeast;
- Groundwater flow in the deep (Lower Sand) aquifer is towards the west-southwest, generally in the direction of Schuylkill River;
- Water levels in the deep (Lower Sand) aquifer occur at depths between approximately -2.5 (in northwestern portion of AOI 7) and 4 ft amsl (in the northeaster portion of AOI 7); and
- The deep (Lower Sand) groundwater gradient in the central portion of AOI 7 is relatively flat, with the highest gradients observed in the C-129D monitoring well area; and
- Groundwater elevations in the Lower Sand are lower than the shallow/intermediate zone, exhibiting a downward gradient.

2.4 Surface Water

No surface water features are located in AOI 7. The nearest surface water body to AOI 7 is the Schuylkill River which borders the western and northern boundary. A sheet pile wall keyed into the Middle Clay exists between AOI 7 and the Schuylkill River as shown in plan view on Figure 3 and in cross-sectional view in Figures 5a, 5b and 5c. Shallow/intermediate groundwater interaction with surface water is limited by the sheet pile wall.

3.0 SITE CHARACTERIZATION ACTIVITIES

The following sections summarize the site characterization activities that were completed in AOI 7 in support of this SCR/RIR. Site characterization activities were performed between April and July 2010 by Aquaterra and Langan in coordination with Sunoco. These activities were executed in accordance with the AOI 7 Work Plan.

3.1 Shallow Soil Borings and Sampling in SWUM Areas

A detailed description of SWMUs 87, 88, 89, 90, and 91 and a summary of previous investigation work completed at these SWMUs were provided in Section 1.2 of the AOI 7 Work Plan. To supplement data previously collected as part of the historical RCRA investigations, a total of 31 shallow soil borings were completed to a depth of two feet via a stainless steel hand auger in accordance with the Work Plan. Two additional shallow soil borings were advanced via split spoon samples for monitoring wells C-142 and C-143. Soil samples were collected at each soil boring location utilizing a TerraCore samplers. Soil boring activities were performed in June 2010 by Total Quality Drilling, LLC of Mullica Hills, New Jersey under the direct supervision of Aquaterra and Langan. The soils were evaluated to determine if leaded tank bottom materials were present and to characterize historic soil exceedances of site COCs in the areas of the SWMUs. Soil boring logs from each location are presented in Appendix B. Below is a summary of the number of soil borings completed in each SWMU area:

- SWMU 87 – Eight shallow soil borings;
- SWMU 88 – Six shallow soil borings;
- SWMU 89 – Six shallow soil borings;
- SWMU 90 – Eight shallow soil borings; and
- SWMU 91 – Five shallow soil borings.

The locations of the SWMUs and the soil borings advanced within the SWMUs are shown on Figure 3.

If materials were encountered matching the physical description of leaded tank bottoms within the SWMU areas, then the following procedures would have been performed:

- Collect soil samples for total lead;
- If total lead results exceeded the PADEP's non-residential soil MSC for lead (450 parts per million), then the samples would have been analyzed for lead via a Toxicity Characteristic Leaching Procedure (TCLP), EPA Test Method 1311; and
- Delineated areas that have soils that physically resemble leaded tank bottoms, have concentrations of total lead exceeding 450 parts per million

(ppm), and were hazardous for lead based on TCLP analysis, would retain the leaded tank bottom designation.

If no soils were encountered that meet all three of the criteria, then the area was no longer classified as a leaded tank bottom area.

Following the completion of all 33 soil borings, there was no evidence of soil matching the physical description of leaded tank bottoms in the five SWMU areas. A total of 33 soil samples were collected from the 33 soil boring locations. The locations of all soil and monitoring well borings are shown on Figure 3 and 8.

Soil samples were submitted to Lancaster Laboratories, Inc. (LLI) of Lancaster, Pennsylvania for analysis of site COCs. A summary of the soil analytical results screened against the PADEP non-residential soil MSCs is provided as Table 4 and the results are further discussed in Section 4.1 below. A summary of samples above the non-residential soil MSCs are illustrated in Figure 8. The laboratory analytical reports are provided as Appendix D.

3.2 Shallow Soil Borings and Sampling in Non-SWMU Areas

A total of nine soil borings were advanced outside of the SWMU areas at unpaved monitoring well locations. The locations of all soil and monitoring well borings are shown on Figures 3 and 8. All soil borings were advanced utilizing split-spoon sampling techniques. Soil borings were advanced to a maximum depth of two feet below grade at each unpaved location in accordance with the AOI 7 Work Plan. Soil samples were collected at each soil boring location with a TerraCore sampler.

Soil samples were submitted to LLI for analysis of site COCs. A summary of the soil analytical results screened against the PADEP non-residential soil MSCs is provided as Table 4 and the results are further discussed in Section 4.1 below. The laboratory analytical reports are provided as Appendix C.

3.3 Installation of Groundwater Monitoring Wells

Well installation activities were performed between May and July 2010 by Parrat Wolff, Inc. (PWI) of East Syracuse, New York and East Coast Drilling (ECDI) of Moorestown,

NJ under the direct supervision of Aquaterra and Langan, and in coordination with Sunoco. The locations of all monitoring wells installed are shown on Figure 3. Monitoring wells were installed to monitor the water table aquifers above the clay and the deep (Lower Sand) beneath the clay. The well installation activities are discussed in the following sections.

3.3.1 Fill/Alluvium and Trenton Gravel Groundwater Monitoring Wells

Aquaterra and Langan provided direction and oversight to PWI to install 12 shallow/intermediate (fill/alluvium, and Trenton Gravel) groundwater monitoring wells in AOI 7.

Monitoring wells were installed and constructed in accordance with the Work Plan. Prior to the installation of monitoring wells, each well location was cleared for subsurface utilities between 8 to 10 ft bgs with a hydrovac excavator. Shallow/intermediate (fill/alluvium, and Trenton Gravel) wells were advanced by PWI utilizing hollow stem augers and split spoon samplers to record lithology. Split spoon samples were collected at various intervals throughout the borings typically starting at 8 to 10 ft bgs. Where shallow soil samples were collected, split spoon samples (from zero to two ft bgs) were advanced alongside the cleared drill hole location. Shallow/intermediate monitoring wells were constructed to a maximum depth of 15 ft bgs with screen intervals of 10 feet. Monitoring wells were constructed with either a flush mount manhole cover or with a stickup protective steel casing. Well construction details are provided in Table 2. Boring logs depicting monitoring well construction details and lithology are provided as Appendix B.

Following well construction, the monitoring wells were developed in accordance with the Work Plan.

3.3.2 Lower Sand Groundwater Monitoring Wells

Two Lower Sand groundwater monitoring wells (C-50D and C-65D) had existed in AOI 7. C-50D was installed to a depth of approximately 30 ft bgs and the screen was set in the upper portion of the Lower Sand. C-65D is reported to

have been drilled to a depth of 75 ft bgs; however the well is damaged and inaccessible.

Prior to installation of the deep monitoring wells (C-129D, C-134D and C-144D), each well location was cleared for subsurface utilities to a depth of 8 to 10 ft bgs with a hydro-excavator. Deep wells were advanced by ECDI utilizing hollow stem augers, mud rotary, and split spoon samplers to record lithology. Aquaterra and Langan provided direction and oversight to ECDI to install the three deep (Lower Sand) monitoring wells. Monitoring well C-134D was installed along the southern boundary of AOI 7 in AOI 6, due to access issues associated with the original proposed well location. The wells were installed with screened intervals set below the clay and into the Lower Sand. The purpose of the additional deep wells is to obtain lithologic information beneath AOI 7, and to characterize groundwater quality of the Lower Sand. The three deep wells were installed to depths ranging between 66 to 78 ft bgs, with well screened intervals of 15 feet. Well construction details are provided in Table 2 and deep soil boring/well construction logs are provided in Appendix B. Geologic information obtained from the deep soil borings completed in AOI 7 was used to prepare geologic cross sections provided as Figures 5a, 5b, and 5b.

3.4 Groundwater Monitoring

On July 8, 2010, Stantec performed monitoring well gauging activities to collect liquid levels from all accessible monitoring wells in AOI 7. A total of 50 accessible monitoring wells were gauged for depth-to-water, and if applicable, depth-to-product in accordance with the Work Plan. All well gauging readings are summarized in Table 3.

The groundwater monitoring data from Table 3 was used to generate the groundwater contours provided as Figures 6 and 7.

3.5 Groundwater Sampling

In July 2010, Aquaterra performed a complete round of groundwater sampling from 41 accessible monitoring wells in AOI 7. Five wells had measureable (>0.01 ft.) product and three wells were inaccessible. All groundwater sampling activities were completed

in accordance with the AOI 7 Work Plan. The monitoring well sampling summary data sheets are provided as Appendix E.

Following well purging activities, groundwater samples were collected by lowering a disposable bailer slowly into the monitoring well to minimize excess agitation. The bailer was filled with water from the top of the water table and retrieved. Samples were then collected in laboratory-prepared bottleware and immediately placed on ice. Samples were submitted to LLI for analysis of site COCs. Once the sample was collected, the bailer, bailer cord, and nitrile gloves used to obtain the sample were discarded. Sample date, time, number, and site name were recorded on the chain-of-custody and in field books. For groundwater samples analyzed for lead, LLI filtered the samples to analyze for dissolved metals.

The groundwater analytical results for shallow/intermediate wells are presented in Table 5. The groundwater analytical results for the deep wells are presented in Table 6. The laboratory analytical reports are included as Appendix D.

3.6 LNAPL Sampling

During the AOI 7 July 2010 groundwater gauging event, five monitoring wells (C-65, C-97, C-106, C-107 and C-143) in AOI 7 had measurable light non-aqueous phase liquid (LNAPL). LNAPL samples from monitoring wells C-65, C-106, and C-107 were previously collected and characterized as part of the CCR. One new monitoring well (C-143), which was installed as part of the recent site characterization activities contained measurable LNAPL. Stantec collected a LNAPL sample from C-143 using a direct sampling method in accordance with the Work Plan. LNAPL samples were packaged in certified hazardous material shipping boxes and shipped to Torkelson Laboratories (Torkelson) of Tulsa, Oklahoma for LNAPL characterization. LNAPL characterization data included product types, density, proportions of product, degree of weathering, and similarities to other LNAPL samples collected at the Refinery.

Based on the LNAPL characterization performed by Torkelson, LNAPL samples collected in the above mentioned monitoring wells were characterized as follows: C-65: 60% lube oil and 40% residual oil; C-106 is 60% lube oil, 35% middle distillate and 5% gasoline, C-107 is 100% residual oil, and C-143 is 50% middle distillate, 30% naphtha and 20% heavier materials. Appendix H summarizes the LNAPL characterization results

from the CCR and the recent site characterization activities and also includes laboratory data packages.

3.7 Surveying Activities

Following completion of well installation and soil boring activities, the newly installed monitoring wells and soil boring locations were surveyed by Langan to establish the location and elevation of the inner and outer casing and ground surface at each point. All well elevations were determined to the nearest 0.01 foot relative to mean sea level. All survey activities were performed by a Pennsylvania-licensed surveyor and tied to the NAVD 88 datum. The new survey data for the monitoring wells is presented in Table 3. This new survey data was used to update the Geographic Information System (GIS) and site wide database for the Refinery.

4.0 SITE CHARACTERIZATION ANALYTICAL RESULTS

The following sections discuss the analytical results of the site characterization activities performed in AOI 7. .

4.1 Soil Analytical Results at SWMU Areas

As mentioned in Section 3.1 above, there was no evidence of leaded tank bottoms in any of the five SWMU areas. A total of 33 shallow soil samples were collected within the five SWMU areas and analyzed for site COCs to further characterize the SWMUs. The analytical results of the soil samples collected in SWMU areas of AOI 7 are provided in Table 4. All of the soil samples were collected between the ground surface and two ft bgs and no saturated soils were observed at these depths. The soil sample results were screened against the PADEP non-residential soil MSCs. Soil sample locations with results above their respective soil MSCs are shown in Figure 8.

Below is a general summary of the screening results:

SWMU 87 – Buried Lead Sludge Area No. 1

A total of eight shallow soil samples (BH-10-05 through BH-10-12) were collected in SWMU 87. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in BH-10-05, BH-10-06, BH-10-07, BH-10-08, BH-10-11, and BH-10-12; and
- Lead was the only site COC detected in soil above its respective non-residential soil MSC in BH-10-09 (1,230 mg/kg) and BH-10-10 (725 mg/kg).

SWMU 88 – Buried Lead Sludge Area No. 2

A total of six shallow soil samples (BH-10-13 through BH-10-18) were collected in SWMU 88. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in soil samples BH-10-13, BH-10-15, and BH-10-17;
- Lead was detected in soil above its respective non-residential soil MSC in BH-10-14 (531 mg/kg), BH-10-16 (616 mg/kg), and in BH-10-18 (478 mg/kg); and
- Benzene was detected in soil above its respective non-residential soil MSC in BH-10-16 (850 ug/kg).

SWMU 89 – Buried Lead Sludge Area No. 3

A total of six shallow soil samples (BH-10-19 through BH-10-22) were collected in SWMU 89. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in soil samples BH-10-19, BH-10-20, and BH-10-22;
- Lead was detected in soil above its respective non-residential soil MSC in C-142 (1,370 mg/kg) and BH-10-21 (869 mg/kg); and
- Benzene was detected in soil above its respective non-residential soil MSC in C-143 (2,000 ug/kg).

SWMU 90 – Buried Lead Sludge Area No. 4

A total of eight shallow soil samples (BH-10-23, BH-10-24, BH-10-25, BH-10-26, BH-10-27, BH-10-28, BH-10-29 and BH-10-30) were collected in SWMU 90. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in soil samples BH-10-24, BH-10-29, and BH-10-30;
- Lead was detected in soil above its respective non-residential soil MSC in BH-10-23 (623 mg/kg) and BH-10-26 (2,040 mg/kg);
- Benzene was detected in soil above its respective non-residential soil MSC in BH-10-25 (31,000ug/kg) and BH-10-28 (1,600 ug/kg);
- 1,2,4-TMB was detected in soil above its respective non-residential soil MSC in BH-10-27 (8,000 ug/kg) and BH-10-28 (280,000ug/kg);
- 1,3,5-TMB was detected in soil above its respective non-residential soil MSC in BH-10-28 (130,000ug/kg); and
- Naphthalene was detected in soil above its respective non-residential soil MSC in BH-10-28 (30,000 ug/kg).

SWMU 91 – Buried Lead Sludge Area No. 5

A total of five shallow soil samples (BH-10-31, BH-10-32, BH-10-33, BH-10-34, and BH-10-35) were collected in SWMU 91. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in soil samples BH-10-32, BH-10-33, BH-10-34, and BH-10-35; and
- Lead was detected in soil above its respective non-residential soil MSC in BH-10-31 (610 mg/kg).

4.2 Soil Analytical Results at Non-SWMU Areas

A total of seven shallow soil samples (C-129, C-130, C-131, C-136, C-137, C-138, C-139, C-140, and BH-C-135) were collected in non-paved areas outside of the SWMU areas in AOI 7. A summary of the screening results is as follows:

- There were no soil samples with concentrations above the PADEP non-residential soil MSCs for site COCs in soil samples C-129, C-131, C-136, C-137, C-138, C-139, C-140, and BH-C-135; and
- Lead was detected in soil above its respective non-residential soil MSC in C-130 (814 mg/kg).

4.3 Groundwater Results

The results of the groundwater samples collected from monitoring wells in AOI 7 are provided in Tables 5 and 6. The results were screened against the PADEP non-residential used aquifer (TDS<2,500) groundwater MSCs. Locations with concentrations above the groundwater MSCs are illustrated in Figure 9. A summary of the COC concentrations that exceeded the PADEP non-residential groundwater MSCs are presented below:

Shallow/Intermediate Wells

COCs detected in shallow/intermediate wells at concentrations above their respective non-residential groundwater MSCs included the following:

- C-56 – lead (0.016 ug/L);
- C-111 – benzene (89 ug/L);
- C-133 – chrysene (8 ug/L); and
- C-143 – chrysene (64 ug/L).

Deep (Lower Sand) Wells

There were no COCs detected in deep wells at concentrations above their respective non-residential groundwater MSCs.

4.4 LNAPL Characterization Results

During the AOI 7 July 2010 gauging event, five monitoring wells (C-65, C-97, C-106, C-107 and C-143) in AOI 7 had measurable LNAPL ranging in thickness between 0.25 to 2.19 ft.

The previous LNAPL characterization data for wells C-65, C-106 and C-107 was obtained from the CCR and well C-143 was obtained as part of the SCR/RIR activities. Appendix H summarizes the LNAPL characterization results from the CCR and the recent site characterization activities and also includes laboratory data packages. Based on the LNAPL characterization performed by Torkelson, three specific LNAPL types are present in AOI 7 including the following: lube oil in C-97, C-65, and C-106; residual oil in C-107; and middle distillate in C-143.

LNAPL modeling, using the API model was completed as part of the 2004 CCR to evaluate specific volume and LNAPL mobility for product in some of these wells. Based on the LNAPL type, absence of LNAPL in the surrounding monitoring wells, groundwater flow direction, location of the sheet pile wall, and the LNAPL modeling performed as part of the CCR, indicates that LNAPL in these wells is stable and immobile. Therefore, no additional LNAPL modeling was completed as part of this SCR/RIR.

5.0 REMEDIAL SYSTEM UPDATE

There are no active remediation systems currently operating in AOI 7.

6.0 FATE AND TRANSPORT ANALYSIS

The following sections describe fate and transport modeling activities performed as part of AOI 7 site characterization.

6.1 Soil

No fate and transport modeling was completed for the soil analytical results since the only potential exposure pathway to shallow soil is by direct contact. The soil-to-groundwater pathway is evaluated through evaluation of groundwater data. Potential exposure pathways for AOI 3 are discussed in detail in Section 8.0.

6.2 Groundwater

Fate and transport modeling was completed for all wells that exhibited concentrations of COCs above their respective PADEP non-residential groundwater MSCs in AOI 7. This modeling approach is considered a worst case scenario. Results of the July 2010 groundwater sampling indicated that one metal (lead) in monitoring well C-56 and two organic compounds including benzene (C-111) and chrysene in monitoring wells C-133 and C-142 were detected above their respective groundwater MSCs.

Due to the proximity of the AOI 7 site boundary to many of these sampled locations, the potential for off-site migration from AOI 7 was evaluated by fate and transport modeling using the Quick Domenico (QD) model. The fate and transport modeling was completed to evaluate whether the groundwater conditions above MSCs would reach either the boundary of the Refinery or the Schuylkill River. The QD Version 2 spreadsheet model and either PADEP default or site-specific data were used to perform the fate and transport calculations.

A more detailed description of QD model input parameters and results are also presented in Appendix F. Input and result summary spreadsheets for each monitoring well modeled are included in Appendix F (Tables F.1 through F.4). The results of the QD screening are located in Table F.5. A comparison between the model-predicted downgradient transport distance and the distance to the nearest property boundary and/or surface water receptor is also included in these tables.

The modeling results indicate that concentrations above the groundwater MSCs in shallow/intermediate wells C-133 and C-142 are not predicted to migrate beyond the AOI 7 boundary. The modeling results indicated the following:

- One monitoring well (C-111) contains a concentration of benzene that has the potential to reach the AOI-7 eastern boundary, and migrate into AOI 3, but

concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary.

- One monitoring well (C-56) contains a concentration of lead that has the potential to reach AOI-7 southern boundary, and migrate into AOI 6. Based on QD simulations, lead concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary.

6.3 Surface Water

Given the QD simulations, groundwater flow direction in AOI 7 and the presence of the sheet pile wall located along the northern and western boundaries of AOI 7, groundwater concentrations above the MSC are not expected to reach the Schuylkill River.

6.4 LNAPL

C-65, C-97, C-106, C-107 and C-143 were the only wells in AOI 7 that contained measurable LNAPL. Based on the LNAPL type and mobility, degree of severe LNAPL weathering, absence of LNAPL in the surrounding monitoring wells, groundwater flow/gradients, sheet pile wall restricting shallow/intermediate groundwater flow to Schuylkill River, and the LNAPL modeling performed as part of the CCR, LNAPL in these wells is considered to be stable and immobile. Therefore, no additional LNAPL modeling was completed as part of this SCR/RIR.

6.5 Vapor Intrusion to Indoor Air

There are approximately 15 occupied buildings (potential indoor air receptors) located in AOI 7. These buildings are shown on Figure A-1 in Appendix A. All of the buildings are operated by Sunoco and regulated by OSHA.

To evaluate the vapor intrusion into indoor air pathway for all 15 occupied buildings, soil and groundwater data collected during the site characterization activities were screened against the non-residential EPA/PADEP default OSHA residential permissible exposure limits (PELs) volatilization into indoor air screening values, published in the PADEP's final guidance on vapor intrusion into buildings from groundwater and soil under the Act 2 Statewide Health Standard (July 2003). The OSHA PEL soil screening values were

selected as appropriate because the site and its industrial operations are regulated by OSHA, and the site performs routine air quality monitoring.

With the exception three soil samples (BH-10-16, BH-10-25, and BH-10-28), results of the screening evaluation indicated that no soil or groundwater analytical results in AOI 7 exceeded the non-residential EPA/PADEP default screening values or the OSHA PEL screening values. The nearest occupied building to the soil sample locations with exceedances is over a 100 feet away. In addition, there are no known preferential pathways connecting these locations to the occupied building.

LNAPL is present in five monitoring wells C-65, C-97, C-106, C-107 and C-143 in AOI 7. However, the nearest occupied building (Crude Unit #137) to the nearest LNAPL occurrence location (C-106) is over 210 feet away, and there are no known preferential pathways connecting this location to the occupied building. Furthermore, this building is covered under the Refinery's OSHA monitoring plan.

7.0 SITE CONCEPTUAL MODEL

A preliminary site conceptual model (SCM) for the Refinery, including AOI 7, was presented in the CCR. Data collected from the recent site characterization activities performed in AOI 7 were used to refine the SCM for this area. The revised SCM for AOI 7 is described below:

7.1 Description and Site Use

AOI 7 is located on the east side of the Schuylkill River within the main portion of the Refinery. AOI 7 is commonly known as the Girard Point Fuels Processing Area, and is located north of Pennypacker Avenue, east of Lanier Avenue, and south and west of the Schuylkill River. AOI 7 encompasses approximately 130 acres, and approximately 40 percent of AOI 7 is covered by impervious surfaces. The entire western boundary of AOI 7 is bound by a sheet pile wall. There are five RCRA SWMUs located in AOI 7 that were addressed in various stages of previous RCRA investigations as part of the EPA Corrective Action Process. The current, historic uses/investigations and approximate limits of impervious surfaces are depicted on Figure A-1 provided in Appendix A.

AOI 7 formerly contained a FCC unit, CO boiler, sulfur plant, East and West Sludge Basin - RCRA Tank, Hazardous Waste Incinerator, and crude units. Early refining units in AOI 7 were built in the 1940s. AOI 7 currently consists of crude units, cracking and alkylation units, flares, and ASTs. The ASTs contain primarily naphtha crude, waste oil, and cat charge stocks. Eight LPG tanks are located in the south-central portion of this area. The WWTP is located along the western portion of AOI 7 adjacent to the Schuylkill River. Four RCRA hazardous waste ASTs are located in the western portion of AOI 7 approximately 150 feet north of the WWTP.

Controls (i.e. permits for excavation, Occupation Safety and Health Administration (OSHA) restrictions, etc.) apply to AOI 7. AOI 7 is restricted by fencing and by security measures. Prior to any work being completed within AOI 7, appropriate work permits, safety and security measures, etc must be approved by Refinery personnel. These institutional controls limit exposure to site COCs as listed in Table 1.

7.2 Geology and Hydrogeology

The following summarizes relevant information concerning geology and hydrogeology in AOI 7:

- The depth to bedrock beneath AOI 7 is at approximately 66 to 78 ft bgs;
- The Lower Sand overlies bedrock throughout AOI 7 and is generally shallower in the eastern and northern portions of AOI 7;
- The Middle/Lower Clay appears to be interfingered with the Lower Sand in the eastern portion of AOI 7;
- Where the Middle/Lower Clay is present, it appears to act as semi-confining layer;
- Trenton Gravel is undifferentiated from the fill/alluvium throughout AOI 7, with the exception of areas in the northwestern and northeastern portions of AOI 7;
- The fill/alluvium materials are present throughout AOI 7, and range in thickness between 10 to 20 feet;

- Shallow/intermediate groundwater elevations in the shallow/intermediate wells occur at depths ranging between approximately -1 and 7 ft above mean seal level (amsl);
- Along the western boundary of AOI 7, shallow/intermediate groundwater flow is towards the east-southeast, away from the sheet pile wall;
- In areas where the Lower/Middle clay is either deeper or shallower in elevation, groundwater depressions and/or mounds are observed;
- The shallow/intermediate groundwater flow in the northern and eastern portions of AOI 7 are generally towards the west-northwest;
- The shallow/intermediate groundwater flow in the southern portion of AOI 7 is towards the east-southeast; and
- Groundwater elevations in the Lower Sand are lower than the shallow/intermediate zone, exhibiting a downward gradient.

7.3 Compounds of Concern

The following summarizes relevant information concerning COCs in AOI 3:

- COCs which were detected in shallow soil at concentrations above their respective non-residential soil MSCs, included: benzene (four locations), lead (11 locations), 1,2,4-TMB (one location), 1,3,5-TMB (two locations); and naphthalene (one location);
- The benzene exceedance in groundwater at C-111 is in close (+/- 200 feet) proximity of the benzene exceedances in surface soil in SWMU 90;
- 1,2-dichloroethane, cumene, ethylbenzene, ethylene dibromide, MTBE, toluene, xylenes, anthracene, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, fluorene, phenanthrene and pyrene were not detected in AOI 7 shallow soil samples at concentrations above their respective non-residential soil MSCs;
- COCs detected in groundwater in the fill/alluvium/Trenton Gravel aquifer at concentrations above their respective non-residential groundwater MSCs included: benzene, chrysene, and lead; and

- No deep wells (Lower Sand) had detected concentrations above their respective non-residential PADEP groundwater MSCs.

The exposure assessment completed for AOI 7 COCs is discussed in Section 8.0.

7.4 LNAPL Distribution and LNAPL Mobility

The following summarizes relevant information concerning LNAPL distribution in AOI 7:

- C-65, C-97, C-106, C-107 and C-143 contained measurable LNAPL and the product type is identified as extremely weathered lube oil, residual oil, and/or middle distillate.
- The occurrence of LNAPL does not correlate with the COC concentrations which exceeded MSCs in shallow groundwater in this area.
- Based on LNAPL modeling performed for the CCR, the LNAPL type, degree of weathering, groundwater flow/gradients, presence of a sheet pile wall, the absence of LNAPL in the surrounding monitoring wells, and the occurrence of LNAPL in these wells over time, LNAPL in these wells is considered to be stable and immobile.

7.5 Fate and Transport of COCs

Fate and transport modeling was completed for shallow/intermediate wells that exhibited concentrations of dissolved phase COCs above the groundwater MSCs. Results of the July 2010 groundwater sampling indicated that two organic compounds benzene and chrysene, and one metal (lead) were detected above their respective groundwater MSCs.

Input and result summary spreadsheets for each monitoring well modeled are included in Appendix F (Tables F.1 through F.5). A comparison between the model-predicted downgradient transport distance and the distance to the nearest property boundary is also included in these tables.

The QD modeling results indicated the following:

- Concentrations above the groundwater MSCs in monitoring wells C-133 and C-142 are not predicted to migrate beyond the AOI 7 boundary;

- One monitoring well (C-111) contains a concentration of benzene that has the potential to reach the AOI-7 eastern boundary, and migrate into AOI 3. Based on the QD simulations, benzene concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary; and
- One monitoring well (C-56) contains a concentration of lead that has the potential to reach AOI-7 southern boundary, and migrate into AOI 6. Based on QD simulations, lead concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary.

7.6 Potential Migration Pathways and Site Receptors

The following summarizes the relevant information concerning the potential pathways and site receptors for AOI 7.

- Operating areas of AOI 3 are located within a secured area to prevent unauthorized access. Direct contact to site soils (soils greater than two feet beneath the ground surface) is governed by Sunoco's on-site procedures and personal protective equipment (PPE).
- No human health receptors to groundwater exist for the Refinery based on on-site safety procedures and PPE requirements.
- Based on the vapor intrusion evaluation completed (Section 6.5 of this report), there are no complete exposure pathways from groundwater and soil into indoor air at the onsite receptors. Based on the occurrence of LNAPL in select wells in AOI 7, their distance from occupied buildings being more than a 100 feet away, and the absence of preferential pathways between the LNAPL areas and receptors, further evaluation of the potential vapor intrusion into indoor air pathway for these buildings is not required.
- Based on fate and transport modeling, COCs in groundwater do not have the potential to migrate beyond the Refinery boundaries.

8.0 HUMAN HEALTH EXPOSURE ASSESSMENT/RISK ASSESSMENT

Based on the current and future intended non-residential site use, an exposure assessment was conducted for all compounds which exceeded the non-residential statewide health standards in AOI 7. Potential human health exposures for the Refinery are for an industrial worker scenario. The media evaluated included groundwater, surface soil (less than two feet below grade), and subsurface soil (greater than two feet below grade). As described in Section 6.5, further evaluation of the vapor intrusion pathway is not required based on the lack of complete exposure pathways.

The potential direct contact pathway for soil (greater than two feet), groundwater and LNAPL under the industrial scenario is eliminated through Sunoco's established excavation procedures, PPE requirements and soil handling procedures described in Appendix K of the CCR. However, because direct contact to surface soils could occur outside of excavation activities, shallow soil samples were collected in non-paved areas of AOI 7 to assess this potential exposure pathway.

The following table serves as a summary of potential exposure pathways that can be reasonably expected under the current and intended future non-residential use for AOI 7. The table lists potentially contaminated media, potential receptors for these media, and a summary of whether any potentially complete exposure pathways exist at AOI 7 from the media to these receptors.

Exposure Pathway Evaluation Summary

Contaminated Media	Residents	Workers	Day Care	Construction	Trespassers	Recreation	Food
Groundwater	NA	No ⁽¹⁾	NA	No ⁽²⁾	No	NA	NA
Air (indoor)	NA	No ⁽³⁾	NA	No ⁽³⁾	No	NA	NA
Soil <2 feet bgs.	NA	Yes	NA	Yes	No	NA	NA
Soil >2 feet bgs.	NA	No ⁽⁴⁾	NA	No ⁽⁴⁾	No	NA	NA
Surface Water	NA	No ⁽⁵⁾	NA	No ⁽⁵⁾	Na	NA	NA
Sediment	NA	NA	NA	NA	Na	NA	NA
LNAPL	NA	No ⁽¹⁾	NA	No ⁽²⁾	Na	NA	NA

Notes:

- (1) No complete groundwater or LNAPL pathways exist for workers that are not addressed through on-site procedures and PPE.
- (2) No complete groundwater or LNAPL pathway exists for construction workers due to PPE requirements and Standard Operating Procedures.
- (3) No complete pathway to indoor air exists based on the evaluation described in Section 6.5.
- (4) No complete pathway exists for site soil > 2 feet deep due to PPE requirements and Standard Operating Procedures.
- (5) No complete pathway exists for surface due to PPE requirements and Standard Operating Procedures.

Na - Not applicable

No - No potential complete exposure pathway

Yes - Potential complete exposure pathway

A more detailed evaluation of each of these potential exposure pathways is presented in the following sections by media.

A more detailed evaluation of each of these potential exposure pathways is presented in the following sections by media.

8.1 Surface Water

The nearest surface water body to AOI 7 is the Schuylkill River which borders the western and northern site boundary. A sheet pile wall which is keyed into the Middle Clay exists between AOI 7 and the Schuylkill River as shown in Figure 3. Shallow/intermediate groundwater interaction with surface water is limited by the above referenced sheet pile wall.

Based on the location of the sheet pile wall, groundwater flow, and the results of the fate and transport modeling for wells where groundwater samples were above the groundwater MSCs, none of the constituents detected in groundwater will cause unacceptable level in the Schuylkill River.

8.2 Surface Soils (0-2 Feet Below Grade)

8.2.1 Soil-to-Groundwater

The soil-to-groundwater pathway is being addressed through the groundwater pathway discussed in Section 8.3.

8.2.2 Direct Contact Exposure

Shallow soil samples collected and analyzed as part of the AOI 7 site characterization activities exhibited concentrations of benzene, 1,2,4-TMB, 1,3,5-TMB, naphthalene, and lead above their respective non-residential direct contact soil MSCs. In accordance with Section IV of the PADEP's Technical Guidance Manual, site-specific standards for lead and benzene were calculated using PADEP default intake parameters for an onsite worker and a risk level of 10^{-4} . For calculating a site-specific standard for on-site workers exposed to lead,

Sunoco used the Society of Environmental Geochemistry and Health (SEGH) model used by PADEP to develop the non-residential soil MSCs.

The calculated risk-based site-specific standards presented in Appendix G are as follows:

Compound	Calculated Site-Specific Standard (mg/kg)
Benzene	2,160
Naphthalene	56,780
1,2,4-TMB	320
1,3,5-TMB	320
Lead	3,140

Concentrations of naphthalene, benzene, 1,2,4-TMB, 1,3,5-TMB, and lead detected in the surface soil samples collected in AOI 7 were below the calculated site specific standards and, therefore, risk to an on-site worker due to direct contact exposure is considered to be within the acceptable Act 2 range.

The site-specific standard for lead based on the SEGH model presented in Appendix G was calculated to be 3,140 mg/kg for a worker. To develop site specific criteria for lead, some of the parameters used by the PADEP were updated in consideration of site-specific conditions and updated lead data collected from recent studies. These parameters are discussed in detail in Appendix G. Concentrations of lead detected in the surface soil samples collected in AOI 7 are below the site-specific standard, and, therefore, risk to an on-site worker due to exposure is considered minimal.

In addition to calculating the site-specific standards for benzene, naphthalene, 1,2,4-TMB, 1,3,5-TMB and lead, the cumulative risk of exposure was also calculated. Lead exposure is dependent on the blood/lead concentration and not risk based; therefore, lead could not be incorporated into the cumulative risk calculation. The total cumulative risk is the combined risk of exposure to the concentrations of carcinogenic compounds (benzene) and the cumulative hazard

index is the combined index for exposure to naphthalene, 1,2,4-TMB and 1,3,5-TMB. In accordance with the TGM, the total cumulative risk can not exceed 10^{-4} and the total cumulative hazard index can not exceed 1.

As presented in Table G-6 of Appendix G, the cumulative hazard index for exposure to the non-carcinogenic compounds is larger than the PADEP's requirement of 1.0. Potential exposure within the area of BH-10-28, which has the highest elevated concentrations of naphthalene, 1,2,4-TMB and 1,3,5-TMB, will be addressed by Sunoco through implementation of a remedy which will either remediate or eliminate the potential pathway to onsite workers. Implementing a remedy in this area will reduce the cumulative hazard index for non-carcinogenic compounds below than the PADEP's requirement of 1.0.

The total cumulative risk is the combined risk of exposure to the concentrations of carcinogenic compounds, which for AOI 7 is benzene. In accordance with the TGM, the total cumulative risk cannot exceed 10^{-4} . As presented in Table G-6, the total cumulative risk of exposure to the carcinogenic compounds in AOI 7 is $1.76\text{E-}06$, and therefore, no remedies are required for AOI 7 to address direct benzene exposure.

8.3 Groundwater

Results of the July 2010 groundwater sampling indicates that one metal (lead) and two organic compounds (benzene and chrysene) were detected above their respective groundwater MSCs. Previous investigations (URS, 2002) verified that no monitoring wells located within 1.5 miles of the Refinery are used for drinking water or agricultural use. Also, there are no complete direct contact exposure pathways for groundwater within AOI 7 because of on-site Refinery safety procedures and required PPE.

Based on the completed fate and transport modeling, there are no dissolved phase COCs in groundwater that appear to have the potential to extend off the Refinery boundary. Based on the groundwater evaluation, there appears to be no unacceptable risk to ecological receptors in the Schuylkill River.

8.4 LNAPL

There are no complete direct contact exposure pathways for LNAPL within AOI 7 because of on-site procedures and required PPE.

8.5 Vapor

The results of the screening evaluation using the PADEP's guidance indicated that no soil or groundwater analytical results in AOI 7 exceeded the non-residential EPA/PADEP OSHA PEL screening values, with the exception of three soil sample locations (BH-10-6, BH-10-25 and BH-10-28). However, the nearest occupied building to these sample locations is over 100 feet away. In addition, there are no known preferential migration pathways connecting these locations to the occupied building in AOI 7.

There is no LNAPL within 100 feet of any occupied building or any preferential migration pathway that is within 100 feet of an occupied building, therefore does not pose a significant risk.

9.0 ECOLOGICAL ASSESSMENT

The majority of AOI 7 is covered with soil and gravel. Some areas are covered by impervious surfaces as shown in Appendix A. The soil and gravel-covered portions of AOI 3 are not likely to serve as a breeding area, migratory stopover, or primary habitat for wildlife. In 2002, a survey of endangered, threatened and special concern wildlife was conducted by reviewing maps provided at the Pennsylvania Department of Conservation and Natural Resources. No endangered, threatened or special concern wildlife were identified using these maps or during historical investigations. Based on this information, there are no terrestrial ecological receptors of concern for AOI 7 and no related assessment was necessary.

No surface water features are located in AOI 7. The nearest surface water body to AOI 7 is the Schuylkill River which comprises the western and northern boundaries of AOI 7. A sheet pile wall which is keyed into the Middle Clay exists between AOI 7 and the Schuylkill River. Groundwater interaction with surface water is limited by the above referenced sheet pile wall. Based on QD simulations, the concentrations in groundwater which exceeded their respective MSC will not reach the Refinery boundaries.

10.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the completed activities, the following conclusions and recommendations have been developed for AOI 7:

SOIL

- Concentrations of benzene, naphthalene, 1,2,4-TMB, 1,3,5-TMB and lead detected in surface soil samples collected in AOI 7 were above their respective non-residential soil MSCs; however they were below the calculated site-specific standards. Therefore, risk to on-site workers due to exposure through direct contact to soil is within the acceptable tolerance range of Act 2. Sunoco will delineate the soil concentrations above their MSCs in these areas to ensure that soil is below the calculated site-specific standard.
- Potential exposure within the area of BH-10-28, which has the highest concentrations of naphthalene, 1,2,4-TMB and 1,3,5-TMB, will be addressed by Sunoco through implementation of a remedy which will either remediate or eliminate the potential pathway to onsite workers. Sunoco will present the remedial activities for this area in a Cleanup Plan.

With regard to the potential direct-contact pathway to deeper soil (i.e., greater than 2 ft deep) and the soil-to-groundwater pathway:

- The direct contact pathway to soil greater than 2 feet beneath the ground surface at the refinery is incomplete because of on-site procedures and PPE requirements that protect onsite workers from exposure. The soil-to-groundwater pathway was evaluated using shallow groundwater data as is discussed below.

GROUNDWATER

- Results of the July 2010 groundwater sampling indicates that one metal (lead) and two organic compounds including benzene and chrysene were detected above their respective groundwater MSCs. QD simulation results indicate that concentrations above the groundwater MSCs are not predicted to migrate beyond the AOI 7 boundary.

SOIL VAPOR

The results of the vapor intrusion screening evaluation using the PADEP guidance indicated:

- Three soil samples (BH-10-16, BH-10-25, and BH-10-28) exceeded the EPA/PADEP default vapor screening values. However, the occupied buildings are located over 100 feet away from these soil sample locations. In addition, there are no known preferential pathways connecting these locations to the occupied buildings.

Based on the results of this evaluation, no further evaluation of the potential vapor intrusion into indoor air pathway for the AOI 7 is necessary.

LNAPL

- The horizontal extent of the LNAPL plume, relative to the site boundaries, is delineated and the potential for migrating LNAPL to reach a site boundary is minimal.

RCRA SWMUs

- No leaded tank bottom materials were observed in SWMUs 87, 88, 89, 90, and 91. Therefore Sunoco is requesting a comfort letter for these SWMUs in AOI 7 from EPA.

11.0 REFERENCES

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TABLES

Table 1
Constituents of Concern for Groundwater
AOI 7 Site Characterization/Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

METALS	CAS No.
Lead (dissolved)	7439-92-1

VOLATILE ORGANIC COMPOUNDS	CAS No.
1,2-Dichloroethane	107-06-2
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Ethylene dibromide	106-93-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

SEMI-VOLATILE ORGANIC COMPOUNDS	CAS No.
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

Notes:

1. Constituents are from Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E (pgs. 29-30) of PADEP Document, *Closure Requirements for Underground Storage Tank Systems*, effective April 1, 1998 and the March 18, 2008 revised PADEP Petroleum Short List.

Table 1 (continued)
Constituents of Concern for Soil
AOI 7 Site Characterization/Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

METALS	CAS No.
Lead (total)	7439-92-1

VOLATILE ORGANIC COMPOUNDS	CAS No.
1,2-Dichloroethane	107-06-2
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Ethylene dibromide	106-93-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

SEMI-VOLATILE ORGANIC COMPOUNDS	CAS No.
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo (g,h,i) perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

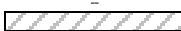
Notes:

1. Constituents are from Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E (pgs. 29-30) of PADEP Document, *Closure Requirements for Underground Storage Tank Systems*, effective April 1, 1998 and the March 18, 2008 revised PADEP Petroleum Short List.

Table 2
AOI 7 Existing Well Summary
As of July 2010
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Well ID	Northing	Easting	Well Type	Well Classification ²	Soil Boring Log Available (Y/N)	Construction Detail Available (Y/N)	Date of Well Completion	Well Construction Details ³							
								Well Completion Depth (ft. bgs)	Well Diameter (in)	Top of Inner Casing Elevation ⁴ (ft. msl) (NAVD88)	Ground Surface Elevation (ft.) (NAVD88)	Top of Screen Elevation (ft) (NAVD88)	Bottom of Screen Elevation (ft) (NAVD88)	Depth to Screen (ft. bgs)	Screen Length (ft.)
C-49	218494.960	2683022.450	Monitoring Well	Shallow	Y	Y	2/22/86	18	4	9.58	8.34	0.34	-9.66	8	10
C-50	219618.590	2682341.310	Monitoring Well	Shallow	Y	Y	2/22/86	15.5	4	12.77	9.33	3.83	-6.17	5.5	10
C-50D	219609.420	2682342.490	Monitoring Well	Deep	Y	Y	11/4/86	26	4	11.49	9.11	-6.89	-16.89	16	10
C-51	220073.270	2681621.380	Monitoring Well	Shallow	Y	Y	2/25/86	13	4	9.26	--	--	--	3	10
C-52	220206.460	2681216.480	Monitoring Well	Shallow	Y	Y	2/25/86	13	4	7.63	6.68	3.68	-6.32	3	10
C-53A	219939.830	2681030.760	Monitoring Well	Shallow	Y	Y	12/19/91	14	4	9.47	7.12	--	--	2	12
C-54	219458.970	2680975.300	Monitoring Well	Shallow	Y	Y	12/19/91	15	4	6.61	5.99	3.49	-8.51	2.5	12
C-55	218851.050	2680863.560	Monitoring Well	Shallow	Y	Y	2/24/86	15	4	9.41	6.49	1.49	-8.51	5	10
C-56	218775.795	2681367.141	Monitoring Well	Shallow	Y	Y	2/24/86	13	4	10.72	--	--	--	3	10
C-57	219572.120	2681650.570	Monitoring Well	Shallow	Y	Y	2/24/86	14.5	4	8.50	8.45	3.95	-6.05	4.5	10
C-58	219017.200	2681692.060	Monitoring Well	Shallow	Y	Y	2/29/86	13	4	7.42	7.39	4.39	-5.61	3	10
C-59 ⁵	218657.752	2681702.651	Monitoring Well	Shallow	Y	Y	2/29/86	14	4	--	--	--	--	4	10
C-60	218657.010	2680150.700	Monitoring Well	Shallow	Y	Y	2/24/86	13	4	7.44	6.02	3.02	-6.98	3	10
C-61	219306.240	2679819.480	Monitoring Well	Shallow	Y	Y	2/25/86	13	4	7.93	7.88	4.88	-5.12	3	10
C-62	219889.700	2679892.080	Monitoring Well	Shallow	Y	Y	2/25/86	13	4	11.40	8.35	5.35	-4.65	3	10
C-63	219610.620	2680379.050	Monitoring Well	Shallow	Y	Y	2/24/86	13	4	7.41	4.17	1.17	-8.83	3	10
C-64	220166.660	2680430.900	Monitoring Well	Shallow	Y	Y	2/24/86	13	4	8.14	6.17	3.17	-6.83	3	10
C-65	220116.400	2680266.000	Monitoring Well	Shallow	Y	Y	2/25/86	13	4	10.84	7.47	4.47	-5.53	3	10
C-65D ⁶	220116.050	2680259.790	Monitoring Well	Deep	Y	Y	11/11/86	75	4	9.62	7.60	-57.40	-67.40	65	10
C-95	219112.670	2682673.580	Monitoring Well	Shallow	Y	Y	10/22/96	20	4	12.25	9.93	-10.07	-20.07	20	10
C-96	219529.380	2681979.800	Monitoring Well	Shallow	Y	Y	10/23/86	17	4	12.88	9.82	2.82	-7.18	7	10
C-97	220229.810	2680615.970	Monitoring Well	Shallow	Y	Y	10/23/86	15	4	10.52	7.55	2.55	-7.45	5	10
C-98	219208.250	2680220.180	Monitoring Well	Shallow	Y	Y	10/23/86	16.5	4	10.55	10.84	4.34	-5.66	6.5	10
C-104	219187.870	2679742.000	Monitoring Well	Shallow	--	--	--	--	--	9.53	6.84	--	--	--	--
C-105	219497.380	2679690.470	Monitoring Well	Shallow	--	--	--	--	--	9.17	6.60	--	--	--	--
C-106	219755.710	2679710.260	Monitoring Well	Shallow	--	--	--	--	--	11.54	7.90	--	--	--	--
C-107	220183.980	2680066.560	Monitoring Well	Shallow	--	--	--	--	--	10.43	7.78	--	--	--	--
C-108	219818.810	2680855.790	Monitoring Well	Shallow	--	--	--	--	--	8.27	5.37	--	--	--	--
C-109	219230.740	2682312.460	Monitoring Well	Shallow	--	--	--	--	--	10.00	7.79	--	--	--	--
C-110	219405.770	2682469.050	Monitoring Well	Shallow	--	--	--	--	--	12.58	9.20	--	--	--	--
C-111	219231.590	2682560.890	Monitoring Well	Shallow	--	--	--	--	--	12.17	9.35	--	--	--	--
C-112	218696.610	2682431.450	Monitoring Well	Shallow	--	--	--	--	--	10.96	8.38	--	--	--	--
C-113	218797.690	2682817.060	Monitoring Well	Shallow	--	--	--	--	--	11.65	9.16	--	--	--	--
C-114	218347.540	2683001.160	Monitoring Well	Shallow	--	--	--	--	--	10.96	8.59	--	--	--	--
C-127	220182.150	2680897.060	Monitoring Well	Shallow	Y	Y	8/20/92	16	4	9.80	6.70	1.70	-8.30	5	10
C-128 ⁶	219916.236	2681231.109	Monitoring Well	Shallow	Y	Y	8/12/92	16	4	13.57	--	--	--	5	10
PH-40	219766.990	2681683.323	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--
PH-41	219112.637	2681758.395	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--
WP13-1	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP13-2	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP13-3	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP14-1	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP14-2	220196.340	2680218.310	Temporary Well Point Location	Shallow	Y	Y	5/27/93	10.5	--	8.01	8.13	7.63	-2.37	0.5	10
WP14-3	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP14-4	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP14-5	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP15-1	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP15-2	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
WP15-3	--	--	Temporary Well Point Location	--	Y	Y	5/27/93	10.5	--	--	--	--	--	0.5	10
C-63	--	--	Abandoned (12/20/1991)	Shallow	Y	Y	2/24/86	15	4	--	--	--	--	5	10
PH-35	--	--	Abandoned	--	--	--	--	--	--	--	--	--	--	--	--
PH-38	--	--	Abandoned	--	--	--	--	--	--	--	--	--	--	--	--
River Gauge GP-2	220256.090	2680273.350	Staff Gauge	--	--	--	--	--	--	--	8.27	--	--	--	--
C-129	220497.185	2681937.365	Monitoring Well	Shallow/Intermediate	Y	Y	6/2/10	12	4	8.94	7.20	5.20	-4.80	2	10
C-129D	220492.006	2681929.233	Monitoring Well	Deep	Y	Y	6/25/10	66	4	9.19	6.85	-44.15	-59.15	51	15
C-130	219981.051	2682139.561	Monitoring Well	Shallow	Y	Y	6/2/10	15	4	11.98	10.29	5.29	-4.71	5	10
C-131	218971.277	2682328.675	Monitoring Well	Shallow	Y	Y	6/3/10	14	4	10.14	8.28	4.28	-5.72	4	10
C-132	218271.326	2682247.680	Monitoring Well	Shallow	Y	Y	6/21/10	14	4	9.97	8.09	4.09	-5.91	4	10
C-133	218336.074	2681693.849	Monitoring Well	Shallow	Y	Y	6/21/10	14	4	7.73	8.18	4.18	-5.82	4	10
C-134D	218306.504	2681164.764	Monitoring Well	Deep	Y	Y	6/18/10	70	4	9.40	6.86	-48.15	-63.15	55	15
C-136	219217.045	2680990.761	Monitoring Well	Shallow	Y	Y	5/28/10	14	4	8.85	6.79	2.79	-7.22	4	10
C-137	219098.264	2680719.078	Monitoring Well	Shallow	Y	Y	5/27/10	14	4	6.51	4.72	0.72	-9.29	4	10
C-138	218658.109	2680452.799	Monitoring Well	Shallow	Y	Y	5/27/10	12	4	7.06	4.40	2.40	-7.60	2	10
C-139	219443.936	2680633.143	Monitoring Well	Shallow	Y	Y	6/2/10	12	4	7.32	5.47	3.47	-6.53	2	10
C-140	218857.817	2679799.125	Monitoring Well	Shallow	Y	Y	5/26/10	12	4	7.55	7.99	5.99	-4.01	2	10
C-142	220134.108	2680659.962	Monitoring Well	Shallow/Intermediate	Y	Y	6/3/10	14	4	11.35	9.62	5.62	-4.38	4	10
C-143	220233.709	2680321.499	Monitoring Well	Shallow/Intermediate	Y	Y	6/3/10	14	4	8.99	6.90	2.90	-7.10	4	10
C-144D	220107.413	2680336.744	Monitoring Well	Deep	Y	Y	7/9/10	78	4	8.67	6.14	-56.86	-71.86	63	15

NOTES:



AOI - Area of Interest

ft. - feet

bgs - below ground surface

in. - inches

msl - elevation relative to mean sea level

g/cc - grams per cubic centimeter

NA - Data not available

1. Former well IDs were derived from handwritten notes on the logs themselves or the referenced report.

2. Well classification based on the formation in which the well was screened in. Wells screened within the Middle Clay or the Farrington Sand were classified as deep wells.

Well classification for wells screened above the Lower/Middle Clay were based on the following: screened in Fill/Alluvium - Shallow, screened in Trenton Gravel - Intermediate, screened in Fill/Alluvium & Trenton Gravel - Shallow/Intermediate

3. Well construction details were taken directly from well boring logs provided by Handex, Stantec, Aquaterra or collected from available historic reports.

4. Wells were surveyed by Langan in June 2009 and July 2010.

5. Wells unable to be located.

6. Wells damaged.

7. Product characterization data obtained from the 2004 CCR, and from site characterization activities completed from 2005 through 2010 for AOIs 1 through 9.

8. For wells with no direct LNAPL density measurements, the density value in the nearest well with LNAPL data was used.

Table 3
Summary of AOI 7 Groundwater and LNAPL Elevations
July 2010
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Monitoring Point ID	Northing	Easting	Well Type	Well Classification ¹	Specific Gravity (g/cc) Used for GW Elevation Correction		Depth to Product (ft bttic)	Depth to GW (ft bttic) ⁴	Apparent LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	GW Elevation (ft amsl)	Corrected GW Elevation (ft amsl)	TIC Elevation (ft amsl)	Static/Pumping
					S.G. ²	Source ³								
AOI 7														
C-49*	218494.960	2683022.450	Monitoring Well	Shallow			NP	4.87			4.71	4.71	9.58	Static
C-50	219618.590	2682341.310	Monitoring Well	Shallow			NP	8.1			4.67	4.67	12.77	Static
C-50D	219609.420	2682342.490	Monitoring Well	Deep			NP	11.52			-0.03	-0.03	11.49	Static
C-51	220073.270	2681621.380	Monitoring Well	Shallow			NP	5.03			4.23	4.23	9.26	Static
C-52	220206.460	2681216.480	Monitoring Well	Shallow			NP	6.50			1.13	1.13	7.63	Static
C-53A	219939.830	2681030.760	Monitoring Well	Shallow			NP	4.56			4.91	4.91	9.47	Static
C-54	219458.970	2680975.300	Monitoring Well	Shallow			NP	0.91			5.70	5.70	6.61	Static
C-55	218851.050	2680863.560	Monitoring Well	Shallow			NP	5.05			4.36	4.36	9.41	Static
C-56	218775.795	2681367.141	Monitoring Well	Shallow			NP	2.23			8.49	8.49	10.72	Static
C-57	219572.120	2681650.570	Monitoring Well	Shallow			NP	2.71			5.79	5.79	8.50	Static
C-58	219017.200	2681692.060	Monitoring Well	Shallow			NP	2.05			5.37	5.37	7.42	Static
C-60	218657.010	2680150.700	Monitoring Well	Shallow			NP	3.69			3.75	3.75	7.44	Static
C-61	219306.240	2679819.480	Monitoring Well	Shallow			NP	3.90			4.03	4.03	7.93	Static
C-62	219889.700	2679892.080	Monitoring Well	Shallow			NP	4.68			6.72	6.72	11.40	Static
C-63	219610.620	2680379.050	Monitoring Well	Shallow			NP	7.52			-0.11	-0.11	7.41	Static
C-64	220166.660	2680430.900	Monitoring Well	Shallow			NP	8.80			-0.66	-0.66	8.14	Static
C-65*	220116.400	2680266.000	Monitoring Well	Shallow	0.9162	C-65	4.9	5.36	0.46	5.94	5.48	5.90	10.84	Static
C-65D	220116.050	2680259.790	Monitoring Well	Deep			NP	2.24			7.38	7.38	9.62	Static
C-95	219112.670	2682673.580	Monitoring Well	Shallow			NP	5.50			6.75	6.75	12.25	Static
C-96	219529.380	2681979.800	Monitoring Well	Shallow			NP	5.29			7.59	7.59	12.88	Static
C-97	220229.810	2680615.970	Monitoring Well	Shallow	0.9162	C-65	10.7	10.95	0.25	-0.18	-0.43	-0.20	10.52	Static
C-98	219208.250	2680220.180	Monitoring Well	Shallow			NP	5.92			4.63	4.63	10.55	Static
C-104	219187.870	2679742.000	Monitoring Well	Shallow			NP	7.00			2.53	2.53	9.53	Static
C-105	219497.380	2679690.470	Monitoring Well	Shallow			NP	4.80			4.37	4.37	9.17	Static
C-106	219755.710	2679710.260	Monitoring Well	Shallow	0.9306	C-106	8.85	10.10	1.25	2.69	1.44	2.60	11.54	Static
C-107*	220183.980	2680066.560	Monitoring Well	Shallow	0.9371	C-107	8.3	10.49	2.19	2.13	-0.06	1.99	10.43	Static
C-108	219818.810	2680855.790	Monitoring Well	Shallow			NP	4.60			3.67	3.67	8.27	Static
C-109	219230.740	2682312.460	Monitoring Well	Shallow			NP	3.76			6.24	6.24	10.00	Static
C-110	219405.770	2682469.050	Monitoring Well	Shallow			NP	5.13			7.45	7.45	12.58	Static
C-111	219231.590	2682560.890	Monitoring Well	Shallow			NP	4.46			7.71	7.71	12.17	Static
C-112	218696.610	2682431.450	Monitoring Well	Shallow			NP	4.20			6.76	6.76	10.96	Static
C-113*	218797.690	2682817.060	Monitoring Well	Shallow			NP	4.28			7.37	7.37	11.65	Static
C-114	218347.540	2683001.160	Monitoring Well	Shallow			NP	3.99			6.97	6.97	10.96	Static
C-127	220182.150	2680897.060	Monitoring Well	Shallow			NP	8.30			1.50	1.50	9.80	Static
C-129	220256.090	2680273.350	Monitoring Well	Shallow/ Intermediate			NP	9.00			-0.06	-0.06	8.94	Static
C-129D	220497.185	2681937.365	Monitoring Well	Deep			NP	5.25			3.94	3.94	9.19	Static
C-130	220492.006	2681929.233	Monitoring Well	Shallow			NP	7.35			4.63	4.63	11.98	Static
C-131	219981.051	2682139.561	Monitoring Well	Shallow			NP	3.35			6.79	6.79	10.14	Static
C-132	218971.277	2682328.675	Monitoring Well	Shallow			NP	3.07			6.90	6.90	9.97	Static
C-133	218271.326	2682247.680	Monitoring Well	Shallow			NP	2.27			5.46	5.46	7.73	Static
C-134D	218336.074	2681693.849	Monitoring Well	Shallow			NP	10.50			-1.10	-1.10	9.40	Static
C-136	218306.504	2681164.764	Monitoring Well	Shallow			NP	5.05			3.80	3.80	8.85	Static
C-137	219217.045	2680990.761	Monitoring Well	Shallow			NP	4.95			1.56	1.56	6.51	Static
C-138	219098.264	2680719.078	Monitoring Well	Shallow			NP	5.40			1.66	1.66	7.06	Static
C-139	218658.109	2680452.799	Monitoring Well	Shallow			NP	3.00			4.32	4.32	7.32	Static
C-140	219443.936	2680633.143	Monitoring Well	Shallow			NP	1.72			5.83	5.83	7.55	Static
C-142	218857.817	2679799.125	Monitoring Well	Shallow/ Intermediate			NP	9.20			2.15	2.15	11.35	Static
C-143	220134.108	2680659.962	Monitoring Well	Shallow/ Intermediate	0.8676	C-143	8.22	9.20	0.98		-0.21	0.64	8.99	Static
C-144D*	220233.709	2680321.499	Monitoring Well	Deep			NP	11.35			-2.68	-2.68	8.67	Static
River Gauge GP-2	220256.090	2680273.350	Staff Gauge	Staff Gauge			NP	9.00			-0.73	-0.73	8.27	Static

Notes:
1. Well classification was chosen based on the formation in which the well was screened. Wells screened within the Middle Clay or the Farrington Sand were classified as deep wells. Based on their total depth, wells screened above the Middle Clay were classified as either a shallow and/or intermediate well.
2. Specific Gravity (S.G.) values were determined from LNAPL samples collected by Aquaterra/Stantec as part of CCR and/or SCR/RIR.
3. For wells with no direct LNAPL density measurements, the density value in the nearest well with LNAPL data was used.
4. Depth to water and depth to LNAPL provided by Stantec July 2010. All wells gauged on 7/8/2010 unless otherwise noted.
* Wells C-49, C-65, C-107, C-113 were gauged on 7/13 & 7/14/2010. Well C-144D was gauged on 7/19/10.
g/cc = grams per cubic centimeter
<.01 = Sheen or film of product on groundwater.
LNAPL = Light Non-Aqueous Phase Liquid
ft amsl = Feet Above Mean Sea Level
GW = Groundwater
NA = Not Applicable
NM = Not Measured
NP = No Product
ft btic = Feet Below

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			
			Sample ID	BH-10-05_1.5-2.0			BH-10-06_1.2-1.7			BH-10-07_1.0-1.5			BH-10-08_1.5-2.0			BH-10-09_1.2-1.7			BH-10-10_1.5-2.0			
			Sample Date	6/9/2010			6/9/2010			6/10/2010			6/10/2010			6/10/2010			6/10/2010			
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			
			Start Depth	1.5			1.2			1			1.5			1.2			1.5			
			End Depth	2			1.7			1.5			2			1.7			2			
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result
Volatile Organic Compounds																						
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	7	J	2	2	J	1	ND	U	5	210	J	92	ND	U	1	890		93	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	2	ND	U	1	ND	U	5	ND	U	92	ND	U	1	ND	U	93	
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	2	ND	U	1	ND	U	5	ND	U	92	ND	U	1	ND	U	93	
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	6	J	2	ND	U	1	ND	U	5	ND	U	92	ND	U	1	99	J	93	
BENZENE	71-43-2	500	ug/kg	3	J	0.8	0.7	J	0.6	ND	U	5	370	J	46	2	J	0.7	160	J	47	
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	17		2	ND	U	1	ND	U	5	690		92	2	J	1	570		93	
ETHYLBENZENE	100-41-4	70000	ug/kg	2	J	2	ND	U	1	ND	U	5	150	J	92	ND	U	1	180	J	93	
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	4	J	2	ND	U	1	ND	U	5	27000		92	ND	U	1	180	J	93	
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	0.8	ND	U	0.6	ND	U	5	ND	U	46	ND	U	0.7	ND	U	47	
TOLUENE	108-88-3	100000	ug/kg	5	J	2	2	J	1	ND	U	5	120	J	92	3	J	1	700		93	
Semi-volatile Organic Compounds																						
ANTHRACENE	120-12-7	350000	ug/kg	540		39	870		42	ND	U	1900	2500		460	1500		42	1200		40	
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	1100		39	1900		42	ND	U	1900	2600		460	2600		42	1400		40	
BENZO(A)PYRENE	50-32-8	46000	ug/kg	1000		39	1900		42	ND	U	1900	2200	J	460	2700		42	1400		40	
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	1300		39	2500		42	ND	U	1900	2100	J	460	3400		42	1700		40	
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	960		39	1600		42	ND	U	1900	1600	J	460	1900		42	1000		40	
CHRYSENE	218-01-9	230000	ug/kg	1100		39	2000		42	ND	U	1900	8300		460	2600		42	1800		40	
FLUORENE	86-73-7	3800000	ug/kg	340		39	360		42	ND	U	1900	35000		460	570		42	930		40	
NAPHTHALENE	91-20-3	25000	ug/kg	1000		39	3300		42	ND	U	1900	ND	U	460	4600		42	3300		40	
PHENANTHRENE	85-01-8	10000000	ug/kg	1200		39	2300		42	ND	U	1900	20000		460	3400		42	2000		40	
PYRENE	129-00-0	2200000	ug/kg	1700		39	2800		42	ND	U	1900	8900		460	3200		42	3000		40	
Metals																						
LEAD	7439-92-1	450	mg/kg	411		0.0563	266		0.0604	305		1.12	444		0.0688	1230		0.158	725		0.117	
General Chemistry																						
MOISTURE, PERCENT	MOIST	NC	%	14.6		0.5	20.4		0.5	13		0.5	27.3		0.5	20.9		0.5	15.7		0.5	

Notes:

PADEP - Pennsylvania Department of Environmental Protection
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
MSC - PADEP's Medium Specific Concentration for Soil
RL - Reporting Limit
ND - Not Detected
NC - No Criteria
NA - Not Analyzed

Qualifiers:

Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10	Result exceeds the PADEP Non-Residential Soil MSC
10	RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			
			Sample ID	BH-10-11_1.5-2.0			BH-10-12_1.5-2.0			BH-10-13_1.5-2.0			BH-10-14_1.5-2.0			BH-10-15_1.4-1.9			BH-10-16_1.5-2.0			
			Sample Date	6/10/2010			6/10/2010			6/9/2010			6/9/2010			6/9/2010			6/9/2010			
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			
			Start Depth	1.5			1.5			1.5			1.5			1.4			1.5			
			End Depth	2			2			2			2			1.9			2			
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result
Volatile Organic Compounds																						
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	430		53	6	J	1	ND	U	1	290	J	81	ND	U	1	240	J	180	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	53	ND	U	1	ND	U	1	ND	U	81	ND	U	1	ND	U	180	
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	53	ND	U	1	ND	U	1	ND	U	81	ND	U	1	ND	U	180	
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	85	J	53	3	J	1	ND	U	1	120	J	81	ND	U	1	ND	U	180	
BENZENE	71-43-2	500	ug/kg	56	J	26	4	J	0.7	2	J	0.6	260	J	40	4	J	0.6	850	J	88	
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	300		53	7		1	ND	U	1	1100		81	ND	U	1	690	J	180	
ETHYLBENZENE	100-41-4	70000	ug/kg	90	J	53	ND	U	1	ND	U	1	220	J	81	ND	U	1	ND	U	180	
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	ND	U	53	ND	U	1	ND	U	1	ND	U	81	ND	U	1	9100		180	
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	26	ND	U	0.7	ND	U	0.6	ND	U	40	ND	U	0.6	ND	U	88	
TOLUENE	108-88-3	100000	ug/kg	190	J	53	7	J	1	3	J	1	950		81	2	J	1	340	J	180	
Semi-volatile Organic Compounds																						
ANTHRACENE	120-12-7	350000	ug/kg	1300		38	1700		40	1600		38	1000		39	570		38	1900	J	440	
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	3300		38	2400		40	5000		380	1300		39	1700		38	3500		440	
BENZO(A)PYRENE	50-32-8	46000	ug/kg	2700		38	2100		40	4200		38	1200		39	1400		38	2800		440	
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	3600		38	2700		40	5700		380	1600		39	2000		38	3500		440	
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	1400		38	1500		40	2900		38	1100		39	970		38	2200	J	440	
CHRYSENE	218-01-9	230000	ug/kg	3400		38	2500		40	4600		380	1400		39	1600		38	4700		440	
FLUORENE	86-73-7	3800000	ug/kg	640		38	1300		40	530		38	410		39	230		38	ND	U	440	
NAPHTHALENE	91-20-3	25000	ug/kg	1500		38	3800		40	1000		38	4900		390	310		38	ND	U	440	
PHENANTHRENE	85-01-8	10000000	ug/kg	2900		38	3800		40	4500		38	2600		39	2400		38	11000		440	
PYRENE	129-00-0	2200000	ug/kg	6600		380	4500		40	7300		380	1800		39	2700		38	8000		440	
Metals																						
LEAD	7439-92-1	450	mg/kg	184		0.0278	414		0.0583	320		0.0561	531		0.142	280		0.0553	616		0.131	
General Chemistry																						
MOISTURE, PERCENT	MOIST	NC	%	12.6		0.5	15.9		0.5	11.8		0.5	14.3		0.5	11.3		0.5	23.9		0.5	

Notes:
PADEP - Pennsylvania Department of Environmental Protection
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
MSC - PADEP's Medium Specific Concentration for Soil
RL - Reporting Limit
ND - Not Detected
NC - No Criteria
NA - Not Analyzed

Qualifiers:
Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

10

10

Result exceeds the PADEP Non-Residential Soil MSC
RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			
			Sample ID	BH-10-17_1.5-2.0			BH-10-18_1.5-2.0			BH-10-19_0.5-1.0			BH-10-20_1.3-1.8			BH-10-21_1.0-1.5			BH-10-22_1.5-2.0			
			Sample Date	6/9/2010			6/9/2010			6/9/2010			6/8/2010			6/8/2010			6/8/2010			
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			
			Start Depth	1.5			1.5			0.5			1.3			1			1.5			
			End Depth	2			2			1			1.7			1.5			2			
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result
Volatile Organic Compounds																						
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	4400		57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	2400		57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
BENZENE	71-43-2	500	ug/kg	460		29	0.8	J	0.7	ND	U	5	3	J	0.6	ND	U	0.7	5	J	0.7	
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	7500		57	ND	U	1	ND	U	5	ND	U	1	1	J	1	2	J	1	
ETHYLBENZENE	100-41-4	70000	ug/kg	800		57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	300		57	ND	U	1	ND	U	5	ND	U	1	ND	U	1	ND	U	1	
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	29	ND	U	0.7	ND	U	5	ND	U	0.6	ND	U	0.7	ND	U	0.7	
TOLUENE	108-88-3	100000	ug/kg	2300		57	2	J	1	ND	U	5	1	J	1	ND	U	1	14		1	
Semi-volatile Organic Compounds																						
ANTHRACENE	120-12-7	350000	ug/kg	570		36	1000		44	670		180	880		37	2900		44	790		38	
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	580		36	1400		44	2100		180	1800		37	4400		44	1100		38	
BENZO(A)PYRENE	50-32-8	46000	ug/kg	510		36	1500		44	2300		180	1700		37	3800		44	1100		38	
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	540		36	1700		44	3100		180	2300		37	4500		44	1600		38	
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	320		36	1200		44	2500		180	1400		37	2900		44	1200		38	
CHRYSENE	218-01-9	230000	ug/kg	930		36	1600		44	2200		180	1700		37	4700		44	1300		38	
FLUORENE	86-73-7	3800000	ug/kg	900		36	530		44	190		180	320		37	970		44	250		38	
NAPHTHALENE	91-20-3	25000	ug/kg	1400		36	3100		44	ND	U	180	1200		37	9200		440	3700		38	
PHENANTHRENE	85-01-8	10000000	ug/kg	2300		36	2400		44	2500		180	2600		37	4200		44	2000		38	
PYRENE	129-00-0	2200000	ug/kg	1400		36	2400		44	3500		180	2800		37	7700		440	1500		38	
Metals																						
LEAD	7439-92-1	450	mg/kg	47.8		0.0109	478		0.0634	365		1.07	179		0.0274	869		0.128	304		0.0564	
General Chemistry																						
MOISTURE, PERCENT	MOIST	NC	%	8.3		0.5	23.4		0.5	9.3		0.5	10.7		0.5	24.7		0.5	12.2		0.5	

Notes:

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ug/kg - microgram per kilogram
MSC - PADEP's Medium Specific Concentration for Soil
RL - Reporting Limit
ND - Not Detected
NC - No Criteria
NA - Not Analyzed

Qualifiers:

Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10	Result exceeds the PADEP Non-Residential Soil MSC
10	RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			
			Sample ID	BH-10-23_1.0-1.5			BH-10-24_1.0-1.5			BH-10-25_1.2-1.7			BH-10-26_1.5-2.0			BH-10-27_1.5-2.0			BH-10-28_1.5-2.0			
			Sample Date	6/7/2010			6/7/2010			6/7/2010			6/7/2010			6/8/2010			6/7/2010			
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			
			Start Depth	1			1			1.2			1.5			1.5			1.5			
			End Depth	1.5			1.5			1.7			2			2			2			
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result
Volatile Organic Compounds																						
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	ND	U	2	830		73	200	J	97	ND	U	1	16000		920	280000		7500	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	2	ND	U	73	ND	U	97	ND	U	1	ND	U	920	ND	U	75	
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	2	ND	U	73	ND	U	97	ND	U	1	ND	U	920	ND	U	75	
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	ND	U	2	340	J	73	ND	U	97	ND	U	1	8000		920	130000		750	
BENZENE	71-43-2	500	ug/kg	19		0.8	94	J	36	31000		490	3	J	0.6	ND	U	460	1600		37	
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	3	J	2	890		73	1300		97	ND	U	1	9000		920	250000		750	
ETHYLBENZENE	100-41-4	70000	ug/kg	ND	U	2	780		73	510		97	ND	U	1	2400	J	920	27000		750	
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	ND	U	2	280	J	73	ND	U	97	ND	U	1	6500		920	2100		75	
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	0.8	ND	U	36	ND	U	49	ND	U	0.6	ND	U	460	ND	U	37	
TOLUENE	108-88-3	100000	ug/kg	10		2	180	J	73	2800		97	2	J	1	1700	J	920	6500		75	
Semi-volatile Organic Compounds																						
ANTHRACENE	120-12-7	350000	ug/kg	52	J	37	83	J	36	450		49	3600		41	2600		430	ND	U	410	
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	200		37	270		36	360		49	5800		210	3400		430	610	J	410	
BENZO(A)PYRENE	50-32-8	46000	ug/kg	240		37	310		36	380		49	4300		41	3800		430	600	J	410	
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	320		37	430		36	770		49	6100		210	5500		430	1300	J	410	
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	140	J	37	180		36	270		49	1200		41	3400		430	640	J	410	
CHRYSENE	218-01-9	230000	ug/kg	210		37	280		36	440		49	5400		210	4400		430	680	J	410	
FLUORENE	86-73-7	3800000	ug/kg	ND	U	37	80	J	36	170	J	49	1100		41	1700	J	430	590	J	410	
NAPHTHALENE	91-20-3	25000	ug/kg	110	J	37	1400		36	5500		49	3300		41	21000		430	30000		410	
PHENANTHRENE	85-01-8	10000000	ug/kg	170	J	37	480		36	1600		49	2800		41	8900		430	1800	J	410	
PYRENE	129-00-0	2200000	ug/kg	310		37	440		36	540		49	8200		210	6500		430	1300	J	410	
Metals																						
LEAD	7439-92-1	450	mg/kg	623		0.11	411		0.0528	79.4		0.0144	2040		0.307	393		0.0631	155		0.0307	
General Chemistry																						
MOISTURE, PERCENT	MOIST	NC	%	8.8		0.5	8		0.5	32.1		0.5	19.3		0.5	21.6		0.5	19.4		0.5	

Notes:
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ug/kg - microgram per kilogram
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RL - Reporting Limit
ND - Not Detected
NC - No Criteria
NA - Not Analyzed

Qualifiers:
Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10

Result exceeds the PADEP Non-Residential Soil MSC

10

RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			
			Sample ID	BH-10-29_0.7-1.2			BH-10-30_1.5-2.0			BH-10-31_1.5-2.0			BH-10-32_0.5-1.0			BH-10-33_1.5-2.0			BH-10-34_1.0-1.5			
			Sample Date	6/7/2010			6/7/2010			6/8/2010			6/8/2010			6/8/2010			6/8/2010			
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			
			Start Depth	0.7			1.5			1.5			0.5			1.5			1			
			End Depth	1.2			2			2			1			2			1.5			
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result
Volatile Organic Compounds																						
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	ND	U	5	240	J	88	1100		98	2	J	1	ND	U	5	ND	U	5	
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	5	ND	U	88	ND	U	98	ND	U	1	ND	U	5	ND	U	5	
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	5	ND	U	88	ND	U	98	ND	U	1	ND	U	5	ND	U	5	
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	ND	U	5	ND	U	88	450	J	98	ND	U	1	ND	U	5	ND	U	5	
BENZENE	71-43-2	500	ug/kg	10		5	380	J	44	470	J	49	4	J	0.6	ND	U	5	ND	U	5	
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	6		5	810		88	3800		98	9		1	ND	U	5	ND	U	5	
ETHYLBENZENE	100-41-4	70000	ug/kg	ND	U	5	290	J	88	630		98	ND	U	1	ND	U	5	ND	U	5	
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	ND	U	5	ND	U	88	170	J	98	ND	U	1	ND	U	5	ND	U	5	
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	5	ND	U	44	ND	U	49	ND	U	0.6	ND	U	5	ND	U	5	
TOLUENE	108-88-3	100000	ug/kg	28		5	1700		88	1700		98	7		1	ND	U	5	ND	U	5	
Semi-volatile Organic Compounds																						
ANTHRACENE	120-12-7	350000	ug/kg	ND	U	180	1000		42	820		48	130	J	40	ND	U	180	ND	U	180	
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	210		180	1300		42	610		48	180	J	40	ND	U	180	ND	U	180	
BENZO(A)PYRENE	50-32-8	46000	ug/kg	230		180	1500		42	610		48	210		40	ND	U	180	ND	U	180	
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	360		180	2300		42	910		48	270		40	ND	U	180	ND	U	180	
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	ND	U	180	740		42	660		48	250		40	ND	U	180	ND	U	180	
CHRYSENE	218-01-9	230000	ug/kg	240		180	1600		42	800		48	270		40	ND	U	180	ND	U	180	
FLUORENE	86-73-7	3800000	ug/kg	ND	U	180	500		42	320		48	ND	U	40	ND	U	180	ND	U	180	
NAPHTHALENE	91-20-3	25000	ug/kg	200		180	11000		210	7300		480	640		40	ND	U	180	ND	U	180	
PHENANTHRENE	85-01-8	10000000	ug/kg	210		180	2900		42	2500		48	300		40	ND	U	180	ND	U	180	
PYRENE	129-00-0	2200000	ug/kg	290		180	1700		42	770		48	290		40	ND	U	180	190		180	
Metals																						
LEAD	7439-92-1	450	mg/kg	395		1.08	250		0.061	610		0.0713	298		0.0601	43.1		0.214	84.2		0.216	
General Chemistry																						
MOISTURE, PERCENT	MOIST	NC	%	9.2		0.5	21.2		0.5	30.6		0.5	17.6		0.5	9.1		0.5	9.4		0.5	

Notes:
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RL - Reporting Limit
ND - Not Detected
NC - No Criteria
NA - Not Analyzed

Qualifiers:
Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10

10

Result exceeds the PADEP Non-Residential Soil MSC
RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-7			AOI-2		
			Sample ID	BH-10-35_1.3-1.7			C-129_1-2			C-130_1-2			C-131_1-2			BH-C-135_0-2			C-136_1-2			C-137_1-2		
			Sample Date	6/8/2010			6/2/2010			6/2/2010			6/3/2010			6/10/2010			5/28/2010			5/27/2010		
			Sample Matrix	Soil			Soil			Soil			Soil			Soil			Soil			Soil		
			Start Depth	1.3			1			1			1			0			1			1		
			End Depth	1.7			2			2			2			2			2			2		
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Volatile Organic Compounds																								
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
BENZENE	71-43-2	500	ug/kg	ND	U	5	3	J	0.6	ND	U	5	ND	U	0.6	ND	U	5	7		5	ND	U	5
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
ETHYLBENZENE	100-41-4	70000	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	ND	U	5
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	ND	U	5	ND	U	1	ND	U	5	ND	U	1	ND	U	5	ND	U	5	9		5
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	5	ND	U	0.6	ND	U	5	17		0.6	ND	U	5	ND	U	5	ND	U	5
TOLUENE	108-88-3	100000	ug/kg	ND	U	5	12		1	ND	U	5	3	J	1	ND	U	5	8		5	ND	U	5
Semi-volatile Organic Compounds																								
ANTHRACENE	120-12-7	350000	ug/kg	290		180	830		42	2700		1900	940	J	220	ND	U	170	ND	U	180	1900		210
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	790		180	1900		42	9600		1900	1300		220	ND	U	170	370		180	2300		210
BENZO(A)PYRENE	50-32-8	46000	ug/kg	820		180	2300		42	8400		1900	1500		220	ND	U	170	380		180	1900		210
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	840		180	3100		42	11000		1900	2200		220	ND	U	170	550		180	2200		210
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	610		180	870		42	4900		1900	640	J	220	ND	U	170	390		180	1300		210
CHRYSENE	218-01-9	230000	ug/kg	850		180	1800		42	8700		1900	1600		220	ND	U	170	410		180	2300		210
FLUORENE	86-73-7	3800000	ug/kg	ND	U	180	280		42	ND	U	1900	350	J	220	ND	U	170	ND	U	180	1800		210
NAPHTHALENE	91-20-3	25000	ug/kg	ND	U	180	4200		42	ND	U	1900	6500		220	ND	U	170	550		180	5400		2100
PHENANTHRENE	85-01-8	10000000	ug/kg	840		180	2600		42	7300		1900	2900		220	ND	U	170	360		180	4400		2100
PYRENE	129-00-0	2200000	ug/kg	1700		180	3600		42	13000		1900	1900		220	ND	U	170	440		180	ND	U	210
Metals																								
LEAD	7439-92-1	450	mg/kg	92.5		0.215	252		0.063	814		4.67	396		0.0647	4.31		0.202	218		1.09	251		0.617
General Chemistry																								
MOISTURE, PERCENT	MOIST	NC	%	9.7		0.5	21.4		0.5	14.3		0.5	24.2		0.5	3		0.5	9.7		0.5	20.5		0.5

Notes:

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ug/kg - microgram per kilogram

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RL - Reporting Limit

ND - Not Detected

NC - No Criteria

NA - Not Analyzed

Qualifiers:

Q - Lab Qualifier

U - The analyte was analyzed but not detected

E - The analyte exceeded the calibration range of the instrument

J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10

Result exceeds the PADEP Non-Residential Soil MSC

10

RL exceeds the PADEP Non-Residential Soil MSC

Table 4
Summary of Soil Analytical Results (April - June 2010)
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Soil MSCs (TDS<2,500)	Location	AOI-7			AOI-7			AOI-7			AOI-7			AOI-7		
			Sample ID	C-138_1-2			C-139_1-2			C-140_1-2			C-142_1-2			C-143_1-2		
			Sample Date	5/27/2010			6/2/2010			5/26/2010			6/3/2010			6/3/2010		
			Sample Matrix	Soil			Soil			Soil			Soil			Soil		
			Start Depth	1			1			1			1			1		
			End Depth	2			2			2			2			2		
			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Volatile Organic Compounds																		
1,2,4-TRIMETHYLBENZENE	95-63-6	20000	ug/kg	14		2	ND	U	4	ND	U	5	180	J	61	250	J	67
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	5	ug/kg	ND	U	2	ND	U	4	ND	U	5	ND	U	61	ND	U	67
1,2-DICHLOROETHANE	107-06-2	500	ug/kg	ND	U	2	ND	U	4	ND	U	5	ND	U	61	ND	U	67
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6200	ug/kg	7	J	2	ND	U	4	ND	U	5	90	J	61	240	J	67
BENZENE	71-43-2	500	ug/kg	12	J	1	ND	U	4	ND	U	5	100	J	31	2000		33
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	1000000	ug/kg	72		2	ND	U	4	ND	U	5	220	J	61	570		67
ETHYLBENZENE	100-41-4	70000	ug/kg	14		2	ND	U	4	ND	U	5	72	J	61	150	J	67
ISOPROPYLBENZENE (CUMENE)	98-82-8	1600000	ug/kg	3	J	2	ND	U	4	ND	U	5	78	J	61	5600		67
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	2000	ug/kg	ND	U	1	ND	U	4	ND	U	5	ND	U	31	ND	U	33
TOLUENE	108-88-3	100000	ug/kg	54		2	ND	U	4	ND	U	5	630		61	220	J	67
Semi-volatile Organic Compounds																		
ANTHRACENE	120-12-7	350000	ug/kg	94	J	51	ND	U	180	380		190	2000		190	170	J	36
BENZO(A)ANTHRACENE	56-55-3	320000	ug/kg	240	J	51	ND	U	180	1200		190	3100		190	420		36
BENZO(A)PYRENE	50-32-8	46000	ug/kg	200	J	51	ND	U	180	1200		190	3400		190	520		36
BENZO(B)FLUORANTHENE	205-99-2	170000	ug/kg	320		51	ND	U	180	1400		190	4800		190	620		36
BENZO(G,H,I)PERYLENE	191-24-2	180000	ug/kg	150	J	51	ND	U	180	1000		190	1300		190	430		36
CHRYSENE	218-01-9	230000	ug/kg	300		51	ND	U	180	1300		190	2900		190	600		36
FLUORENE	86-73-7	3800000	ug/kg	ND	U	51	ND	U	180	ND	U	190	1600		190	62	J	36
NAPHTHALENE	91-20-3	25000	ug/kg	110	J	51	ND	U	180	470		190	2000		190	270		36
PHENANTHRENE	85-01-8	10000000	ug/kg	240	J	51	ND	U	180	990		190	7100		190	490		36
PYRENE	129-00-0	2200000	ug/kg	360		51	250		180	1900		190	5900		190	930		36
Metals																		
LEAD	7439-92-1	450	mg/kg	103		0.0462	98.7		0.212	98.6		0.557	1370		0.222	164		0.0513
General Chemistry																		
MOISTURE, PERCENT	MOIST	NC	%	35.1		0.5	9.5		0.5	12.9		0.5	10.9		0.5	6.2		0.5

Notes:
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NC - No Criteria
NA - Not Analyzed

Qualifiers:
Q - Lab Qualifier
U - The analyte was analyzed but not detected
E - The analyte exceeded the calibration range of the instrument
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

10	Result exceeds the PADEP Non-Residential Soil MSC
10	RL exceeds the PADEP Non-Residential Soil MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-140			C-104			C-105			C-108			C-109			C-110			C-111		
			Sample ID	C-140_072010			C-104_071910			C-105_071910			C-108_071610			C-109_071310			C-110_072710			C-111_072710		
			Sample Date	7/20/2010			7/19/2010			7/19/2010			7/16/2010			7/13/2010			7/27/2010			7/27/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Volatile Organic Compounds			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	3		2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	3		2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	89		1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	2		2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	130		2
ETHYLBENZENE	100-41-4	700	ug/l	1		1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	1		1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	15		1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	2		1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	12		1
Semi-volatile Organic Compounds																								
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	ND	U	5	9		5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
PHENANTHRENE	85-01-8	1100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	7		5
PYRENE	129-00-0	130	ug/l	6		5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	7		5
Metals																								
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	0.0013		0.001

Notes:
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RL - Reporting Limit
ND - Not Detected
NA - Not Analyzed
TDS - Total Dissolved Solids
* - Samples required an initial dilution due to sample matrix interference.
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E - The analyte exceeded the calibration range of the instrument.
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10	Result exceeds the PADEP Non-Residential Groundwater MSC
10	RL exceeds the PADEP Non-Residential Groundwater MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-112			C-113			C-114			C-127			C-129			C-130			C-131		
			Sample ID	C-112_071410			C-113_071310			C-114_071410			C-127_071510			C-129_071210			C-130_071210			C-131_071510		
			Sample Date	7/14/2010			7/13/2010			7/14/2010			7/15/2010			7/12/2010			7/12/2010			7/15/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Volatile Organic Compounds			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	ND	U	2	ND	U	2	ND	U	2	7		2	ND	U	2	ND	U	2	ND	U	2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1	16		1	6		1	ND	U	1	ND	U	1	7		1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
Semi-volatile Organic Compounds																								
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	50
FLUORENE	86-73-7	1900	ug/l	13		5	ND	U	5	5		5	5		5	ND	U	5	ND	U	5	ND	U	50
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	50
PHENANTHRENE	85-01-8	1100	ug/l	19		5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	100		50
PYRENE	129-00-0	130	ug/l	9		5	ND	U	5	5		5	ND	U	5	ND	U	5	ND	U	5	78		50
Metals																								
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	0.0025		0.001	ND	U	0.001	ND	U	0.001

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10	Result exceeds the PADEP Non-Residential Groundwater MSC
10	RL exceeds the PADEP Non-Residential Groundwater MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-132			C-133			C-137			C-138			C-142			C-64			C-49		
			Sample ID	C-132_071510			C-133_071510			C-137_071510			C-138_071610			C-142_072010			C-44_071910			C-49_071310		
			Sample Date	7/15/2010			7/15/2010			7/15/2010			7/16/2010			7/20/2010			7/19/2010			7/13/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Volatile Organic Compounds																								
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	20	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	20	ND	U	2	ND	U	2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	10	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	10	3		1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	28		2	ND	U	2	4		2	ND	U	2	78		20	ND	U	2	ND	U	2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	10	ND	U	1	ND	U	1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1	1		1	ND	U	1	ND	U	10	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	10	3		1	ND	U	1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	1		1	ND	U	1	ND	U	1	ND	U	1	ND	U	10	ND	U	1	ND	U	1
Semi-volatile Organic Compounds																								
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	8		5	ND	U	5	ND	U	5	64		52	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	ND	U	5	8		5	ND	U	5	ND	U	5	ND	U	52	ND	U	5	ND	U	5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	8		5	ND	U	5	ND	U	5	ND	U	52	ND	U	5	ND	U	5
PHENANTHRENE	85-01-8	1100	ug/l	ND	U	5	17		5	ND	U	5	ND	U	5	140		52	ND	U	5	ND	U	5
PYRENE	129-00-0	130	ug/l	ND	U	5	17		5	ND	U	5	ND	U	5	110		52	ND	U	5	ND	U	5
Metals																								
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	0.001		0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001

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10	Result exceeds the PADEP Non-Residential Groundwater MSC
10	RL exceeds the PADEP Non-Residential Groundwater MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-50			C-51			C-52			C-53A			C-54			C-55			C-56		
			Sample ID	C-50_071210			C-51_071410			C-52_071510			C-53A_071610			C-54_071510			C-55_071610			C-56_072710		
			Sample Date	7/12/2010			7/14/2010			7/15/2010			7/16/2010			7/15/2010			7/16/2010			7/27/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Volatile Organic Compounds																								
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	29		2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	13		2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	2		1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	1		1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	23		1
Semi-volatile Organic Compounds																								
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	29		5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	15		5
PHENANTHRENE	85-01-8	1100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	72		5
PYRENE	129-00-0	130	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	8		5
Metals																								
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	0.0158		0.001

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10	Result exceeds the PADEP Non-Residential Groundwater MSC
10	RL exceeds the PADEP Non-Residential Groundwater MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-57			C-58			C-60			C-61			C-62			C-63			C-95		
			Sample ID	C-57_071410			C-58_071410			C-60_071610			C-61_071910			C-62_072010			C-63_071610			C-95_071310		
			Sample Date	7/14/2010			7/14/2010			7/16/2010			7/19/2010			7/20/2010			7/16/2010			7/13/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater		
Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Volatile Organic Compounds																								
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	19		2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1	3		1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	ND	U	1	ND	U	1	ND	U	1	1		1	ND	U	1	ND	U	1	2		1
Semi-volatile Organic Compounds																								
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	6		5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
PHENANTHRENE	85-01-8	1100	ug/l	8		5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
PYRENE	129-00-0	130	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5
Metals																								
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001

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10	Result exceeds the PADEP Non-Residential Groundwater MSC
10	RL exceeds the PADEP Non-Residential Groundwater MSC

Table 5
Summary of Groundwater Analytical Results
Shallow/Intermediate Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-96			C-98		
			Sample ID	C-96_071310			C-98_071610		
			Sample Date	7/13/2010			7/16/2010		
			Sample Matrix	Groundwater			Groundwater		
Volatile Organic Compounds			Units	Result	Q	RL	Result	Q	RL
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	ND	U	2	ND	U	2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	ND	U	1	ND	U	1
Semi-volatile Organic Compounds									
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	ND	U	5	ND	U	5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5
PHENANTHRENE	85-01-8	1100	ug/l	ND	U	5	ND	U	5
PYRENE	129-00-0	130	ug/l	ND	U	5	ND	U	5
Metals									
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001

Notes:
PADEP - Pennsylvania Department of Environmental Protection
ug/l - microgram per liter
mg/l - milligram per liter
MSC - PADEP's Medium Specific Concentration for Groundwater
RL - Reporting Limit
ND - Not Detected
NA - Not Analyzed
TDS - Total Dissolved Solids
* - Samples required an initial dilution due to sample matrix interference.
** - Samples were diluted.

Qualifiers:
Q - Lab Qualifier
U - The analyte was analyzed but not detected.
E - The analyte exceeded the calibration range of the instrument.
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

10	- Result exceeds the PADEP Non-Residential Groundwater MSC
10	- RL exceeds the PADEP Non-Residential Groundwater MSC

Table 6
Summary of Groundwater Analytical Results
Deep (Lower Sand) Wells
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	PADEP Non-Residential Used Aquifer Groundwater MSCs (TDS <2,500)	Location	C-129D			C-134D			C-144D			C-50D		
			Sample ID	C-129D_071210			C-134D_072010			C-144D_071910			C-50D_071310		
			Sample Date	7/12/2010			7/20/2010			7/19/2010			7/13/2010		
			Sample Matrix	Groundwater			Groundwater			Groundwater			Groundwater		
Volatile Organic Compounds			Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
1,2,4-TRIMETHYLBENZENE	95-63-6	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	35	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2
1,2-DICHLOROETHANE	107-06-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1
BENZENE	71-43-2	5	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1
ISOPROPYLBENZENE (CUMENE)	98-82-8	2300	ug/l	ND	U	2	ND	U	2	ND	U	2	ND	U	2
ETHYLBENZENE	100-41-4	700	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	0.05	ug/l	ND	U	0.029	ND	U	0.029	ND	U	0.029	ND	U	0.029
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	20	ug/l	ND	U	1	1		1	ND	U	1	ND	U	1
TOLUENE	108-88-3	1000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1
XYLENES (TOTAL)	1330-20-7	10000	ug/l	ND	U	1	ND	U	1	ND	U	1	ND	U	1
Semi-volatile Organic Compounds															
CHRYSENE	218-01-9	1.9	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5
FLUORENE	86-73-7	1900	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5
NAPHTHALENE	91-20-3	100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5
PHENANTHRENE	85-01-8	1100	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5
PYRENE	129-00-0	130	ug/l	ND	U	5	ND	U	5	ND	U	5	ND	U	5
Metals															
LEAD	7439-92-1	0.005	mg/l	ND	U	0.001	ND	U	0.001	ND	U	0.001	ND	U	0.001

Notes:

PADEP - Pennsylvania Department of Environmental Protection
ug/l - microgram per liter
mg/l - milligram per liter
MSC - PADEP's Medium Specific Concentration for Groundwater
RL - Reporting Limit
ND - Not Detected
NA - Not Analyzed
TDS - Total Dissolved Solids
* - Samples required an initial dilution due to sample matrix interference.
** - Samples were diluted.

Qualifiers:

Q - Lab Qualifier
U - The analyte was analyzed but not detected.
E - The analyte exceeded the calibration range of the instrument.
J = Estimated value. The result is ≥ MDL and ≤ LOQ.

Exceedance Summary:

10	- Result exceeds the PADEP Non-Residential Groundwater MSC
10	- RL exceeds the PADEP Non-Residential Groundwater MSC

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	BH-10-05_1.5-2.0	BH-10-06_1.2-1.7	BH-10-07_1.0-1.5	BH-10-08_1.5-2.0	BH-10-09_1.2-1.7	BH-10-10_1.5-2.0	BH-10-11_1.5-2.0
				Sample Date	6/9/2010	6/9/2010	6/10/2010	6/10/2010	6/10/2010	6/10/2010	6/10/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	1.5	1.2	1	1.5	1.2	1.5	1.5
				End Depth	2	1.7	1.5	2	1.7	2	2
				Units	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	7	2	ND	210	ND	890	430
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	6	ND	ND	ND	ND	99	85
BENZENE	71-43-2	630	380,000	ug/kg	3	0.7	ND	370	2	160	56
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	17	ND	ND	690	2	570	300
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	2	ND	ND	150	ND	180	90
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	4	ND	ND	27000	ND	180	ND
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	110,000	240,000	ug/kg	5	2	ND	120	3	700	190
Semi-volatile Organic Compounds											
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	540	870	ND	2500	1500	1200	1300
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	1100	1900	ND	2600	2600	1400	3300
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	1000	1900	ND	2200	2700	1400	2700
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	1300	2500	ND	2100	3400	1700	3600
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	960	1600	ND	1600	1900	1000	1400
CHRYSENE	218-01-9	NCA	NCA	ug/kg	1100	2000	ND	8300	2600	1800	3400
FLUORENE	86-73-7	NOC	NOC	ug/kg	340	360	ND	35000	570	930	640
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	1000	3300	ND	ND	4600	3300	1500
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	1200	2300	ND	20000	3400	2000	2900
PYRENE	129-00-0	NCA	NCA	ug/kg	1700	2800	ND	8900	3200	3000	6600
Metals											
LEAD	7439-92-1	NCA	NCA	mg/kg	411	266	305	444	1230	725	184
General Chemistry											
MOISTURE, PERCENT	MOIST	NCA	NCA	%	14.6	20.4	13	27.3	20.9	15.7	12.6

Notes:

- ug/kg - microgram per kilogram
- mg/kg - milligram per kilogram
- ND - Not Detected
- NOC - Not of Concern
- NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	BH-10-12_1.5-2.0	BH-10-13_1.5-2.0	BH-10-14_1.5-2.0	BH-10-15_1.4-1.9	BH-10-16_1.5-2.0	BH-10-17_1.5-2.0	BH-10-18_1.5-2.0
				Sample Date	6/10/2010	6/9/2010	6/9/2010	6/9/2010	6/9/2010	6/9/2010	6/9/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	1.5	1.5	1.5	1.4	1.5	1.5	1.5
				End Depth	2	2	2	1.9	2	2	2
				Units	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	6	ND	290	ND	240	4400	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	3	ND	120	ND	ND	2400	ND
BENZENE	71-43-2	630	380,000	ug/kg	4	2	260	4	850	460	0.8
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	7	ND	1100	ND	690	7500	ND
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	ND	ND	220	ND	ND	800	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	ND	ND	ND	ND	9100	300	ND
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	110,000	240,000	ug/kg	7	3	950	2	340	2300	2
Semi-volatile Organic Compounds											
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	1700	1600	1000	570	1900	570	1000
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	2400	5000	1300	1700	3500	580	1400
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	2100	4200	1200	1400	2800	510	1500
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	2700	5700	1600	2000	3500	540	1700
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	1500	2900	1100	970	2200	320	1200
CHRYSENE	218-01-9	NCA	NCA	ug/kg	2500	4600	1400	1600	4700	930	1600
FLUORENE	86-73-7	NOC	NOC	ug/kg	1300	530	410	230	ND	900	530
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	3800	1000	4900	310	ND	1400	3100
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	3800	4500	2600	2400	11000	2300	2400
PYRENE	129-00-0	NCA	NCA	ug/kg	4500	7300	1800	2700	8000	1400	2400
Metals											
LEAD	7439-92-1	NCA	NCA	mg/kg	414	320	531	280	616	47.8	478
General Chemistry											
MOISTURE, PERCENT	MOIST	NCA	NCA	%	15.9	11.8	14.3	11.3	23.9	8.3	23.4

Notes:

- ug/kg - microgram per kilogram
- mg/kg - milligram per kilogram
- ND - Not Detected
- NOC - Not of Concern
- NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	BH-10-19_0.5-1.0	BH-10-20_1.3-1.8	BH-10-21_1.0-1.5	BH-10-22_1.5-2.0	BH-10-23_1.0-1.5	BH-10-24_1.0-1.5	BH-10-25_1.2-1.7
				Sample Date	6/9/2010	6/8/2010	6/8/2010	6/8/2010	6/7/2010	6/7/2010	6/7/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	0.5	1.3	1	1.5	1	1	1.2
				End Depth	1	1.7	1.5	2	1.5	1.5	1.7
				Units	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	ND	ND	ND	ND	ND	830	200
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	ND	ND	ND	ND	ND	340	ND
BENZENE	71-43-2	630	380,000	ug/kg	ND	3	ND	5	19	94	31,000
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	ND	ND	1	2	3	890	1300
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	ND	ND	ND	ND	ND	780	510
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	ND	ND	ND	ND	ND	280	ND
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	110,000	240,000	ug/kg	ND	1	ND	14	10	180	2800
Semi-volatile Organic Compounds											
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	670	880	2900	790	52	83	450
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	2100	1800	4400	1100	200	270	360
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	2300	1700	3800	1100	240	310	380
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	3100	2300	4500	1600	320	430	770
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	2500	1400	2900	1200	140	180	270
CHRYSENE	218-01-9	NCA	NCA	ug/kg	2200	1700	4700	1300	210	280	440
FLUORENE	86-73-7	NOC	NOC	ug/kg	190	320	970	250	ND	80	170
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	ND	1200	9200	3700	110	1400	5500
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	2500	2600	4200	2000	170	480	1600
PYRENE	129-00-0	NCA	NCA	ug/kg	3500	2800	7700	1500	310	440	540
Metals											
LEAD	7439-92-1	NCA	NCA	mg/kg	365	179	869	304	623	411	79.4
General Chemistry											
MOISTURE, PERCENT	MOIST	NCA	NCA	%	9.3	10.7	24.7	12.2	8.8	8	32.1

Notes:
ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	BH-10-26_1.5-2.0	BH-10-27_1.5-2.0	BH-10-28_1.5-2.0	BH-10-29_0.7-1.2	BH-10-30_1.5-2.0	BH-10-31_1.5-2.0	BH-10-32_0.5-1.0
				Sample Date	6/7/2010	6/8/2010	6/7/2010	6/7/2010	6/7/2010	6/8/2010	6/8/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	1.5	1.5	1.5	0.7	1.5	1.5	0.5
				End Depth	2	2	2	1.2	2	2	1
				Units	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	ND	16000	280000	ND	240	1100	2
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	ND	8000	130,000	ND	ND	450	ND
BENZENE	71-43-2	630	380,000	ug/kg	3	ND	1,600	10	380	470	4
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	ND	9000	250,000	6	810	3800	9
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	ND	2400	27,000	ND	290	630	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	ND	6500	2100	ND	ND	170	ND
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	110,000	240,000	ug/kg	2	1700	6500	28	1700	1700	7
Semi-volatile Organic Compounds											
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	3600	2600	ND	ND	1000	820	130
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	5800	3400	610	210	1300	610	180
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	4300	3800	600	230	1500	610	210
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	6100	5500	1300	360	2300	910	270
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	1200	3400	640	ND	740	660	250
CHRYSENE	218-01-9	NCA	NCA	ug/kg	5400	4400	680	240	1600	800	270
FLUORENE	86-73-7	NOC	NOC	ug/kg	1100	1700	590	ND	500	320	ND
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	3300	21000	30000	200	11000	7300	640
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	2800	8900	1800	210	2900	2500	300
PYRENE	129-00-0	NCA	NCA	ug/kg	8200	6500	1300	290	1700	770	290
Metals											
LEAD	7439-92-1	NCA	NCA	mg/kg	2040	393	155	395	250	610	298
General Chemistry											
MOISTURE, PERCENT	MOIST	NCA	NCA	%	19.3	21.6	19.4	9.2	21.2	30.6	17.6

Notes:
ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	BH-10-33_1.5-2.0	BH-10-34_1.0-1.5	BH-10-35_1.3-1.7	C-129_1-2	C-130_1-2	C-131_1-2
				Sample Date	6/8/2010	6/8/2010	6/8/2010	6/2/2010	6/2/2010	6/3/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	1.5	1	1.3	1	1	1
				End Depth	2	1.5	1.7	2	2	2
				Units	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds										
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	ND	ND	ND	ND	ND	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	630	380,000	ug/kg	ND	ND	ND	3	ND	ND
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	ND	ND	ND	ND	ND	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	17
TOLUENE	108-88-3	110,000	240,000	ug/kg	ND	ND	ND	12	ND	3
Semi-volatile Organic Compounds										
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	ND	ND	290	830	2700	940
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	ND	ND	790	1900	9600	1300
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	ND	ND	820	2300	8400	1500
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	ND	ND	840	3100	11000	2200
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	ND	ND	610	870	4900	640
CHRYSENE	218-01-9	NCA	NCA	ug/kg	ND	ND	850	1800	8700	1600
FLUORENE	86-73-7	NOC	NOC	ug/kg	ND	ND	ND	280	ND	350
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	ND	ND	ND	4200	ND	6500
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	ND	ND	840	2600	7300	2900
PYRENE	129-00-0	NCA	NCA	ug/kg	ND	190	1700	3600	13000	1900
Metals										
LEAD	7439-92-1	NCA	NCA	mg/kg	43.1	84.2	92.5	252	814	396
General Chemistry										
MOISTURE, PERCENT	MOIST	NCA	NCA	%	9.1	9.4	9.7	21.4	14.3	24.2

Notes:

ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 7
Summary of Soil Analytical Results Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen Screening Limit	Location	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7	AOI-7
				Sample ID	C-136_1-2	C-138_1-2	C-139_1-2	C-140_1-2	C-142_1-2	C-143_1-2
				Sample Date	5/28/2010	5/27/2010	6/2/2010	5/26/2010	6/3/2010	6/3/2010
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
				Start Depth	1	1	1	1	1	1
				End Depth	2	2	2	2	2	2
				Units	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds										
1,2,4-TRIMETHYLBENZENE	95-63-6	29,000	310,000	ug/kg	ND	14	ND	ND	180	250
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	290	1,000,000	ug/kg	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	73	8,300	ug/kg	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	6,400	87,000	ug/kg	ND	7	ND	ND	90	240
BENZENE	71-43-2	630	380,000	ug/kg	7	12	ND	ND	100	2000
DIMETHYL BENZENE/ XYLENES, TOTAL	1330-20-7	77,000	170,000	ug/kg	ND	72	ND	ND	220	570
ETHYLBENZENE	100-41-4	9,500	110,000	ug/kg	ND	14	ND	ND	72	150
ISOPROPYLBENZENE (CUMENE)	98-82-8	360,000	360,000	ug/kg	ND	3	ND	ND	78	5600
TERT-BUTYL METHYL ETHER	1634-04-4	86,000	6,400,000	ug/kg	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	110,000	240,000	ug/kg	8	54	ND	ND	630	220
Semi-volatile Organic Compounds										
ANTHRACENE	120-12-7	NOC	NOC	ug/kg	ND	94	ND	380	2000	170
BENZO(A)ANTHRACENE	56-55-3	NCA	NCA	ug/kg	370	240	ND	1200	3100	420
BENZO(A)PYRENE	50-32-8	NCA	NCA	ug/kg	380	200	ND	1200	3400	520
BENZO(B)FLUORANTHENE	205-99-2	NCA	NCA	ug/kg	550	320	ND	1400	4800	620
BENZO(G,H,I)PERYLENE	191-24-2	NCA	NCA	ug/kg	390	150	ND	1000	1300	430
CHRYSENE	218-01-9	NCA	NCA	ug/kg	410	300	ND	1300	2900	600
FLUORENE	86-73-7	NOC	NOC	ug/kg	ND	ND	ND	ND	1600	62
NAPHTHALENE	91-20-3	NOC	NOC	ug/kg	550	110	ND	470	2000	270
PHENANTHRENE	85-01-8	NOC	NOC	ug/kg	360	240	ND	990	7100	490
PYRENE	129-00-0	NCA	NCA	ug/kg	440	360	250	1900	5900	930
Metals										
LEAD	7439-92-1	NCA	NCA	mg/kg	218	103	98.7	98.6	1370	164
General Chemistry										
MOISTURE, PERCENT	MOIST	NCA	NCA	%	9.7	35.1	9.5	12.9	10.9	6.2

Notes:

ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Result exceeds the USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screen

Table 8
Summary of Groundwater Analytical Results
Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screening Limit	Location	C-140	C-104	C-105	C-108	C-109	C-110	C-111	C-112	C-113
				Sample ID	C-140_072010	C-104_071910	C-105_071910	C-108_071610	C-109_071310	C-110_072710	C-111_072710	C-112_071410	C-113_071310
				Sample Date	7/20/2010	7/19/2010	7/19/2010	7/16/2010	7/13/2010	7/27/2010	7/27/2010	7/14/2010	7/13/2010
				Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Volatile Organic Compounds				Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,4-TRIMETHYLBENZENE	95-63-6	12,000	NOC	ug/l	3	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	10,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	3	ND	ND
1,2-DICHLOROETHANE	107-06-2	4,600	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	5,900	NOC	ug/l	ND	ND	ND	ND	ND	ND	89	ND	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	NOC	NOC	ug/l	2	ND	ND	ND	ND	ND	130	ND	ND
ETHYLBENZENE	100-41-4	45,000	NOC	ug/l	1	ND	ND	ND	ND	ND	1	ND	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	1,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	640,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	15	ND	ND
XYLENES (TOTAL)	1330-20-7	NOC	NOC	ug/l	2	ND	ND	ND	ND	ND	12	ND	ND
Semi-volatile Organic Compounds													
CHRYSENE	218-01-9	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORENE	86-73-7	NOC	NOC	ug/l	ND	9	ND	ND	ND	ND	ND	13	ND
NAPHTHALENE	91-20-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	85-01-8	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	7	19	ND
PYRENE	129-00-0	NCA	NCA	ug/l	6	ND	ND	ND	ND	ND	7	9	ND
Metals													
LEAD	7439-92-1	NCA	NCA	mg/l	ND	ND	ND	ND	ND	ND	0.0013	ND	ND

Notes:
ug/l - microgram per liter
mg/l - milligram per liter
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	- Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	- Results exceeds USEPA-PA Default Nonresidential PELs Volatilization to Indoor Air

Table 8
Summary of Groundwater Analytical Results
Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screening Limit	Location	C-114	C-127	C-129	C-130	C-131	C-132	C-133	C-137	C-138	C-142
				Sample ID	C-114_071410	C-127_071510	C-129_071210	C-130_071210	C-131_071510	C-132_071510	C-133_071510	C-137_071510	C-138_071610	C-142_072010
				Sample Date	7/14/2010	7/15/2010	7/12/2010	7/12/2010	7/15/2010	7/15/2010	7/15/2010	7/15/2010	7/16/2010	7/20/2010
				Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Volatile Organic Compounds				Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,4-TRIMETHYLBENZENE	95-63-6	12,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	10,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	4,600	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	5,900	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	NOC	NOC	ug/l	ND	7	ND	ND	ND	28	ND	4	ND	78
ETHYLBENZENE	100-41-4	45,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	1,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	640,000	NOC	ug/l	16	6	ND	ND	7	ND	ND	1	ND	ND
TOLUENE	108-88-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
XYLENES (TOTAL)	1330-20-7	NOC	NOC	ug/l	ND	ND	ND	ND	ND	1	ND	ND	ND	ND
Semi-volatile Organic Compounds														
CHRYSENE	218-01-9	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	8	ND	ND	64
FLUORENE	86-73-7	NOC	NOC	ug/l	5	5	ND	ND	ND	ND	8	ND	ND	ND
NAPHTHALENE	91-20-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	8	ND	ND	ND
PHENANTHRENE	85-01-8	NOC	NOC	ug/l	ND	ND	ND	ND	100	ND	17	ND	ND	140
PYRENE	129-00-0	NCA	NCA	ug/l	5	ND	ND	ND	78	ND	17	ND	ND	110
Metals														
LEAD	7439-92-1	NCA	NCA	mg/l	ND	ND	0.0025	ND	ND	ND	ND	ND	0.001	ND

Notes:
ug/l - microgram per liter
mg/l - milligram per liter
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	Results exceeds USEPA-PA Default Nonresidential PELs Volatilization to Indoor Air

Table 8
Summary of Groundwater Analytical Results
Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screening Limit	Location	C-44	C-49	C-50	C-51	C-52	C-53A	C-54	C-55	C-56
				Sample ID	C-44_071910	C-49_071310	C-50_071210	C-51_071410	C-52_071510	C-53A_071610	C-54_071510	C-55_071610	C-56_072710
				Sample Date	7/19/2010	7/13/2010	7/12/2010	7/14/2010	7/15/2010	7/16/2010	7/15/2010	7/16/2010	7/27/2010
				Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Volatile Organic Compounds				Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,4-TRIMETHYLBENZENE	95-63-6	12,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	29
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	10,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	13
1,2-DICHLOROETHANE	107-06-2	4,600	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	5,900	NOC	ug/l	3	ND	ND	ND	ND	ND	ND	ND	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	100-41-4	45,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	2
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	1,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	640,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	NOC	NOC	ug/l	3	ND	ND	ND	ND	ND	ND	ND	1
XYLENES (TOTAL)	1330-20-7	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	23
Semi-volatile Organic Compounds													
CHRYSENE	218-01-9	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORENE	86-73-7	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	29
NAPHTHALENE	91-20-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	15
PHENANTHRENE	85-01-8	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	72
PYRENE	129-00-0	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	8
Metals													
LEAD	7439-92-1	NCA	NCA	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	0.0158

Notes:

ug/l - microgram per liter

mg/l - milligram per liter

ND - Not Detected

NOC - Not of Concern

NCA - No Criterion Available

Exceedance Summary:

10	- Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
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10	- Results exceeds USEPA-PA Default Nonresidential PELs Volatilization to Indoor Air
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Table 8
Summary of Groundwater Analytical Results
Screened for Protection of Indoor Air
AOI-7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	CAS No	USEPA-PA Defaults Nonresidential Volatilization to Indoor Air Screening Limit	USEPA-PA Defaults Nonresidential PELs Volatilization to Indoor Air Screening Limit	Location	C-57	C-58	C-60	C-61	C-62	C-63	C-95	C-96	C-98
				Sample ID	C-57_071410	C-58_071410	C-60_071610	C-61_071910	C-62_072010	C-63_071610	C-95_071310	C-96_071310	C-98_071610
				Sample Date	7/14/2010	7/14/2010	7/16/2010	7/19/2010	7/20/2010	7/16/2010	7/13/2010	7/13/2010	7/16/2010
				Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Volatile Organic Compounds				Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,4-TRIMETHYLBENZENE	95-63-6	12,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-TRIMETHYLBENZENE (MESITYLENE)	108-67-8	10,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	107-06-2	4,600	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	71-43-2	5,900	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
ISOPROPYLBENZENE (CUMENE)	98-82-8	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	19	ND	ND
ETHYLBENZENE	100-41-4	45,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	106-93-4	1,000	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER (MTBE)	1634-04-4	640,000	NOC	ug/l	ND	ND	3	ND	ND	ND	ND	ND	ND
TOLUENE	108-88-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
XYLENES (TOTAL)	1330-20-7	NOC	NOC	ug/l	ND	ND	ND	1	ND	ND	2	ND	ND
Semi-volatile Organic Compounds													
CHRYSENE	218-01-9	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORENE	86-73-7	NOC	NOC	ug/l	6	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	91-20-3	NOC	NOC	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	85-01-8	NOC	NOC	ug/l	8	ND	ND	ND	ND	ND	ND	ND	ND
PYRENE	129-00-0	NCA	NCA	ug/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals													
LEAD	7439-92-1	NCA	NCA	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND

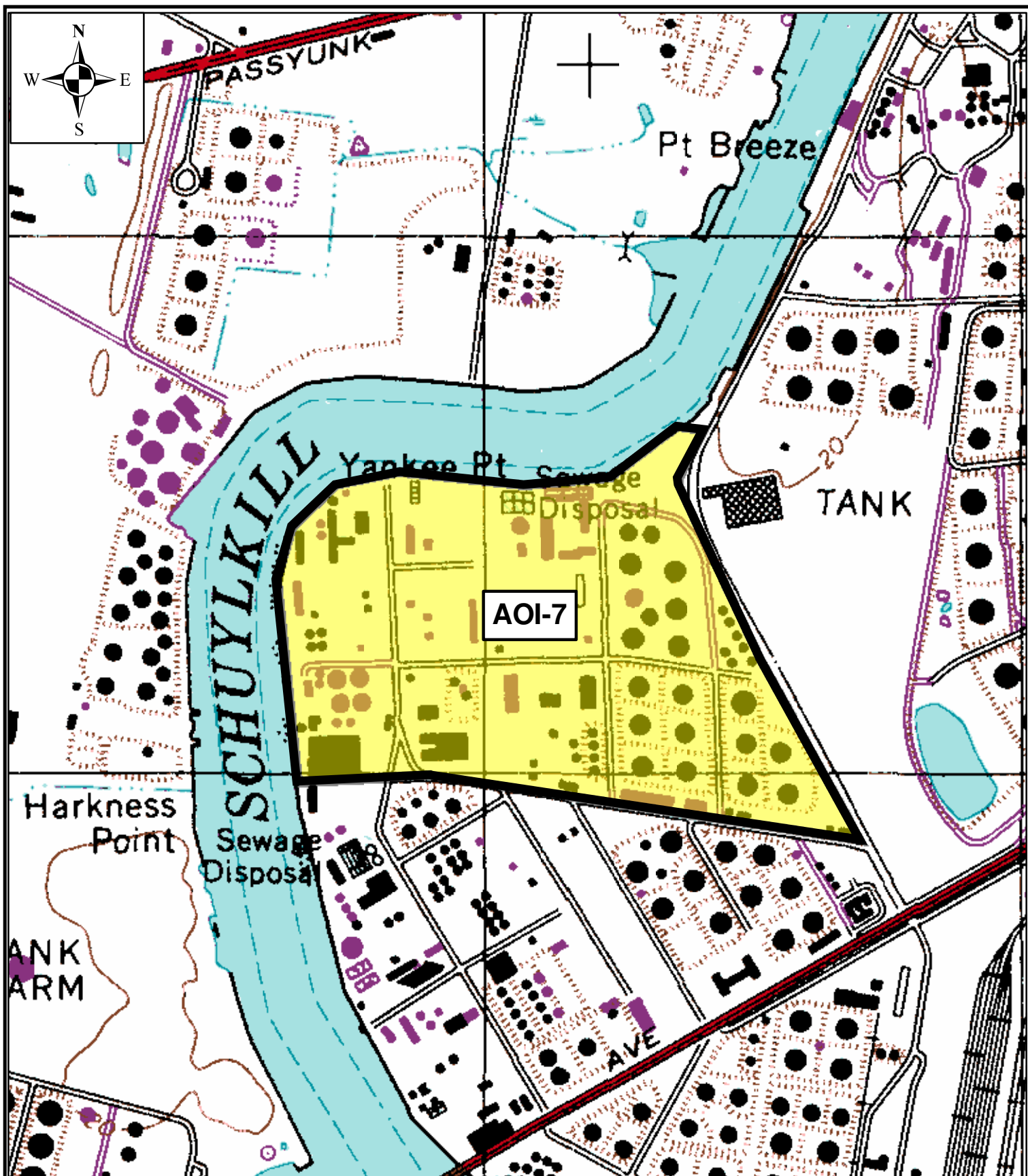
Notes:

ug/l - microgram per liter
mg/l - milligram per liter
ND - Not Detected
NOC - Not of Concern
NCA - No Criterion Available

Exceedance Summary:

10	- Result exceeds the USEPA-PA Default Nonresidential Volatilization to Indoor Air
10	- Results exceeds USEPA-PA Default Nonresidential PELs Volatilization to Indoor Air

FIGURES



USGS Topographic Map, Philadelphia, PA. Quadrangle, USGS 1995



Sunoco, Inc. (R&M) Philadelphia Refinery

3144 Passyunk Avenue
Philadelphia, PA. 19145

Figure 1: Site Location Map: AOI-7
AOI-7 Site Characterization Report/
Remedial Investigation Report

Philadelphia

Pennsylvania

Job Number

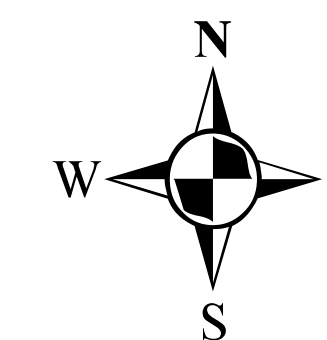
2574601

Scale: 1" = 800'

0 400 800
Feet

Date

July 1, 2010




SCHUYLKILL RIVER

AOI-3

AOI-7

AOI-6

Legend

 AOI Boundary

Notes:
1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).

Figure 2: Site Plan
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

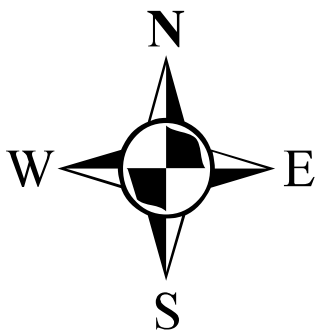


Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145

0 70 140 280
Feet

SCALE: 1"=100'
DATE: JUN 21, 2010
DWN BY: MW
CDD BY: DW
JOB#: 2010001

C:\data\201401\AccGIS\MapDocuments\AOI7_SCR\Figure 2 - Site Plan - AOI7.mxd



Legend

- New Deep Monitoring Well Location With No Shallow Soil Sample
- New Shallow/Intermediate Groundwater Monitoring Well With Shallow Soil Sample
- New Shallow/Intermediate Groundwater Monitoring Well With No Soil Sample
- New Shallow Soil Boring and Sample Locations (0-2 ft.)
- Deep Monitoring Well
- Shallow Monitoring Well
- Abandoned/Damaged/Unable to Locate
- Staff Gauge
- Bulkhead
- Solid Waste Management Unit
- Area of Interest (AOI)

Notes:
1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).

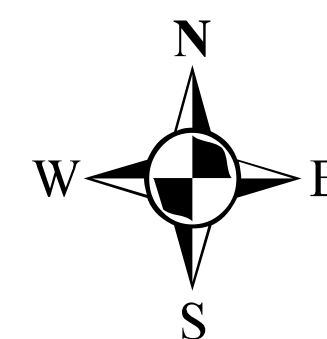
Figure 3 - Completed Activities Plan
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania















Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145

0 70 140 280
Feet

SCALE: 1" = 140'
DATE: 9/13/2010
DWN BY: MAM
CDD BY: DAW
JOB#: 2574801



Legend

-  Deep Monitoring Well
-  Intermediate Monitoring Well
-  Shallow Monitoring Well
-  Shallow/Intermediate Monitoring Well
-  Shallow/Intermediate Recovery Well
-  Intermediate Recovery Well
-  Piezometer
-  Damaged/Abandoned/Unable to Locate
-  Cross Section Location (AA - AA')
-  Cross Section Location (CC - CC')
-  Cross Section Location (Z - Z')
-  Area of Interest (AOI) Boundary

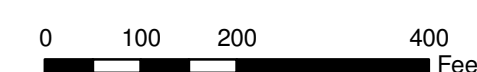
Notes:

1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).
2. Groundwater elevations based on groundwater gauging data provided by Stantec July 2010.

Figure 4 - Cross Section Location Plan
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania



Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145



SCALE: 1" = 20'
DATE: 9/13/20
DRN. BY: MH
CKD. BY: DW
JOB#: 26346

LEGEND:

WATER

FILL / ALLUVIUM

TRENTON GRAVEL

CLAY

SAND

WEATHERED BEDROCK

C-129D

LOCATION ID

WELL CASING/BOREHOLE

WELL SCREEN

BOTTOM OF BOREHOLE

INFERRED CONTACTS

GROUNDWATER LEVEL

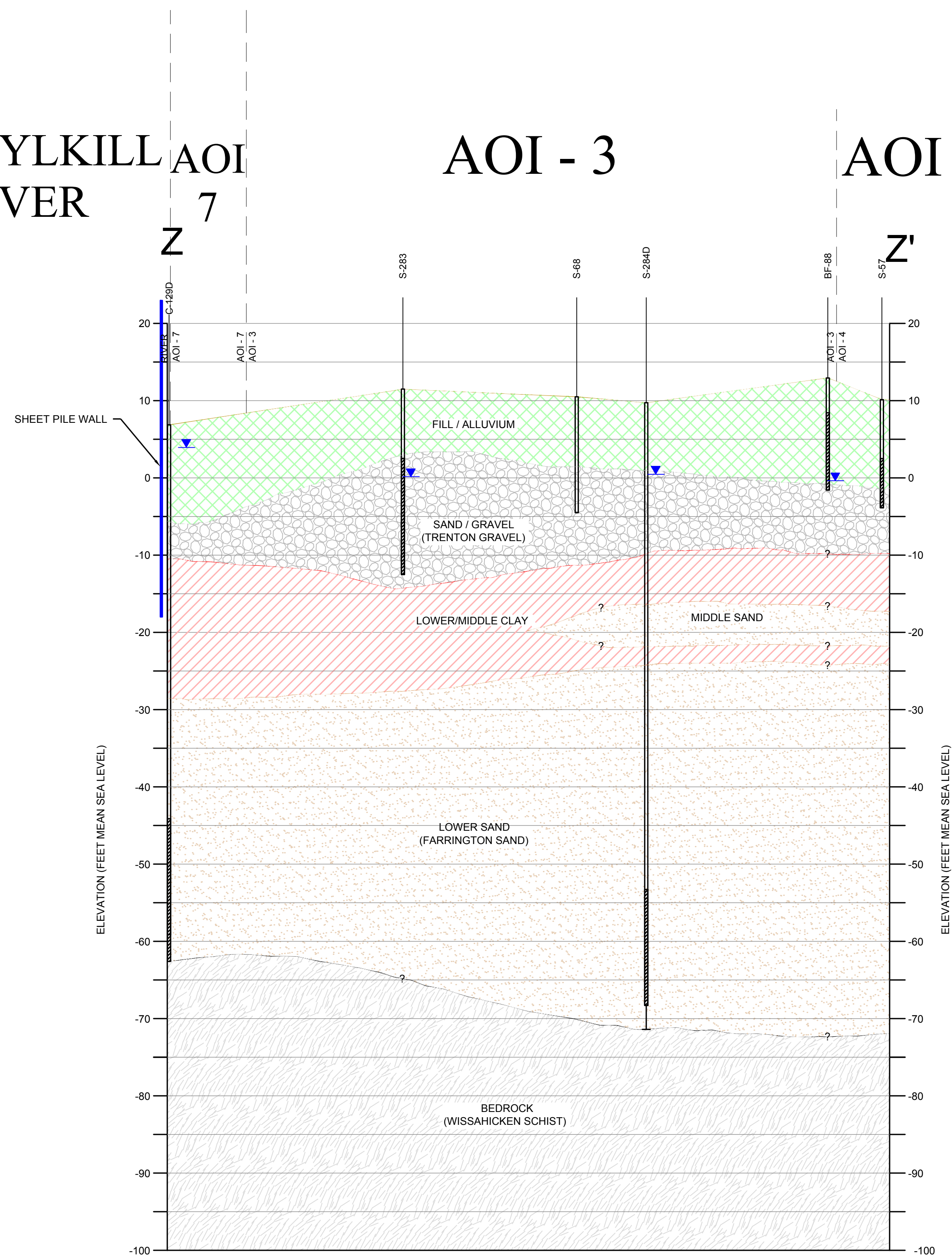
SHEET PILE WALL

- NOTES:
- LITHOLOGY BASED ON INTERPOLATION FROM AVAILABLE NEW AND HISTORIC WELL / SOIL BORING LOGS.
 - WELL SCREEN INTERVAL INFORMATION NOT AVAILABLE FOR S-2 AND S-68
 - DEPTH OF SHEET PILE WAS DETERMINED FROM FIGURE 2-8 GENERALIZED GEOLOGICAL CROSS SECTION A-C DATED NOVEMBER 13, 1992 FROM DAMES AND MOORE, RCRA VERIFICATION INVESTIGATION REPORT, CHEVERON REFINERY, 1992, CROSS SECTION RENAMED C-J IN CCR.
 - GROUNDWATER ELEVATIONS COLLECTED IN JULY 2010.

SCHUYLKILL RIVER

AOI - 3

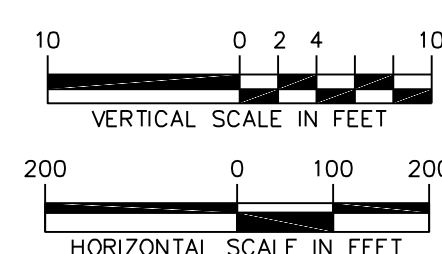
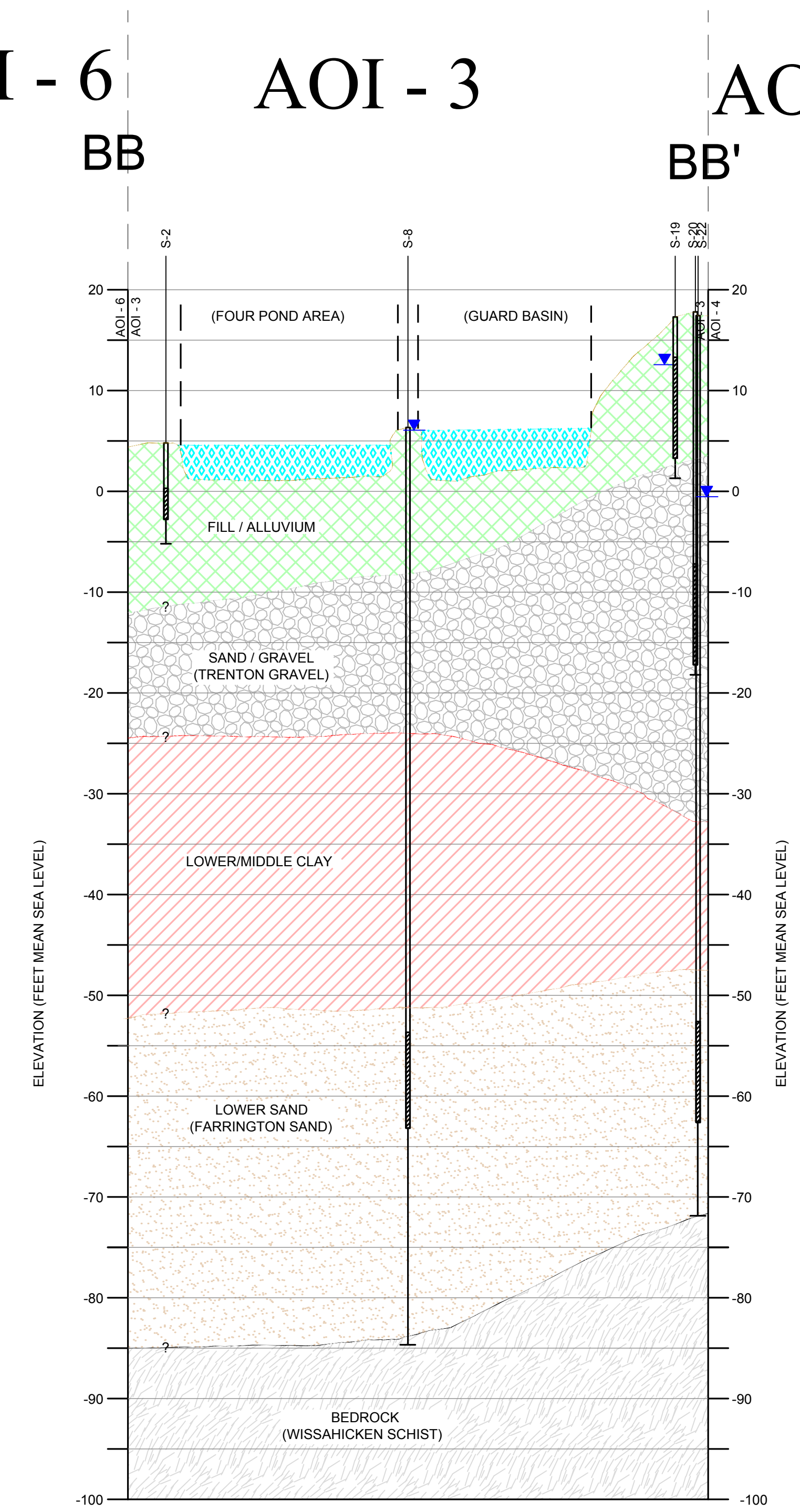
AOI - 4



AOI - 6

AOI - 3

AOI - 4



Project

SUNOCO
PHILADELPHIA
REFINERY

PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title

GEOLOGIC CROSS
SECTION Z-Z'
&
GEOLOGIC CROSS
SECTION BB-BB'

Project No. 2574601

Date 8/26/10

Scale 1" = 200' HOR.
1" = 10' VER.

Drn. By JEM

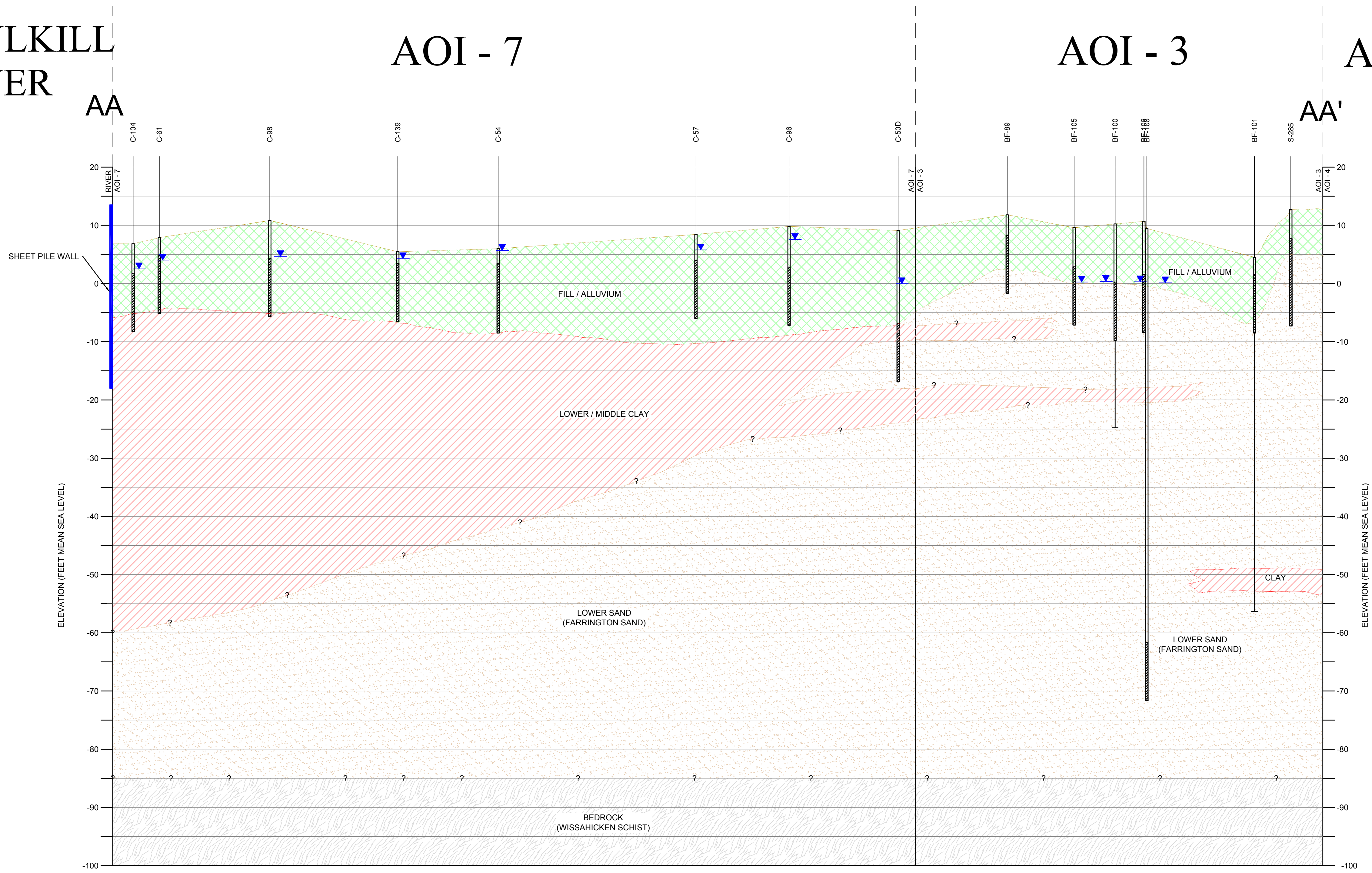
Last Revised X

Figure No.

5A

Of

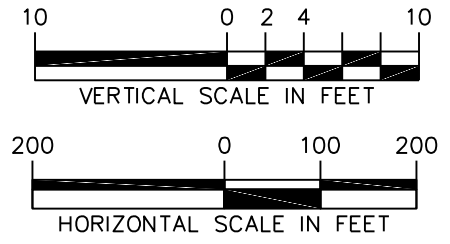
SCHUYLKILL
RIVER



- NOTES:
1. LITHOLOGY BASED ON INTERPOLATION FROM AVAILABLE NEW AND HISTORIC WELL / SOIL BORING LOGS.
 2. DEPTH OF SHEET PILE WAS DETERMINED FROM FIGURE 2-8 GENERALIZED GEOLOGICAL CROSS SECTION A-C DATED NOVEMBER 13, 1992 FROM DAMES AND MOORE, RCRA VERIFICATION INVESTIGATION REPORT, CHEVRON REFINERY, 1992, CROSS SECTION RENAMED C-J IN CCR
 3. GROUNDWATER ELEVATIONS COLLECTED IN JULY 2010.
 4. THICKNESS OF LOWER / MIDDLE CLAY IN AOI-7 IS ESTIMATED FROM DEEP MONITORING WELLS C-144D, C-134D, AND C-50D.

LEGEND:

	FILL / ALLUVIUM	C-129D	LOCATION ID
	SAND / GRAVEL (TRENTON GRAVEL)		WELL CASING/BOREHOLE
	CLAY		WELL SCREEN
	SAND		BOTTOM OF BOREHOLE
	BEDROCK (WISSAHICKON SCHIST)		INFERRED CONTACTS
			GROUNDWATER LEVEL
			SHEET PILE WALL

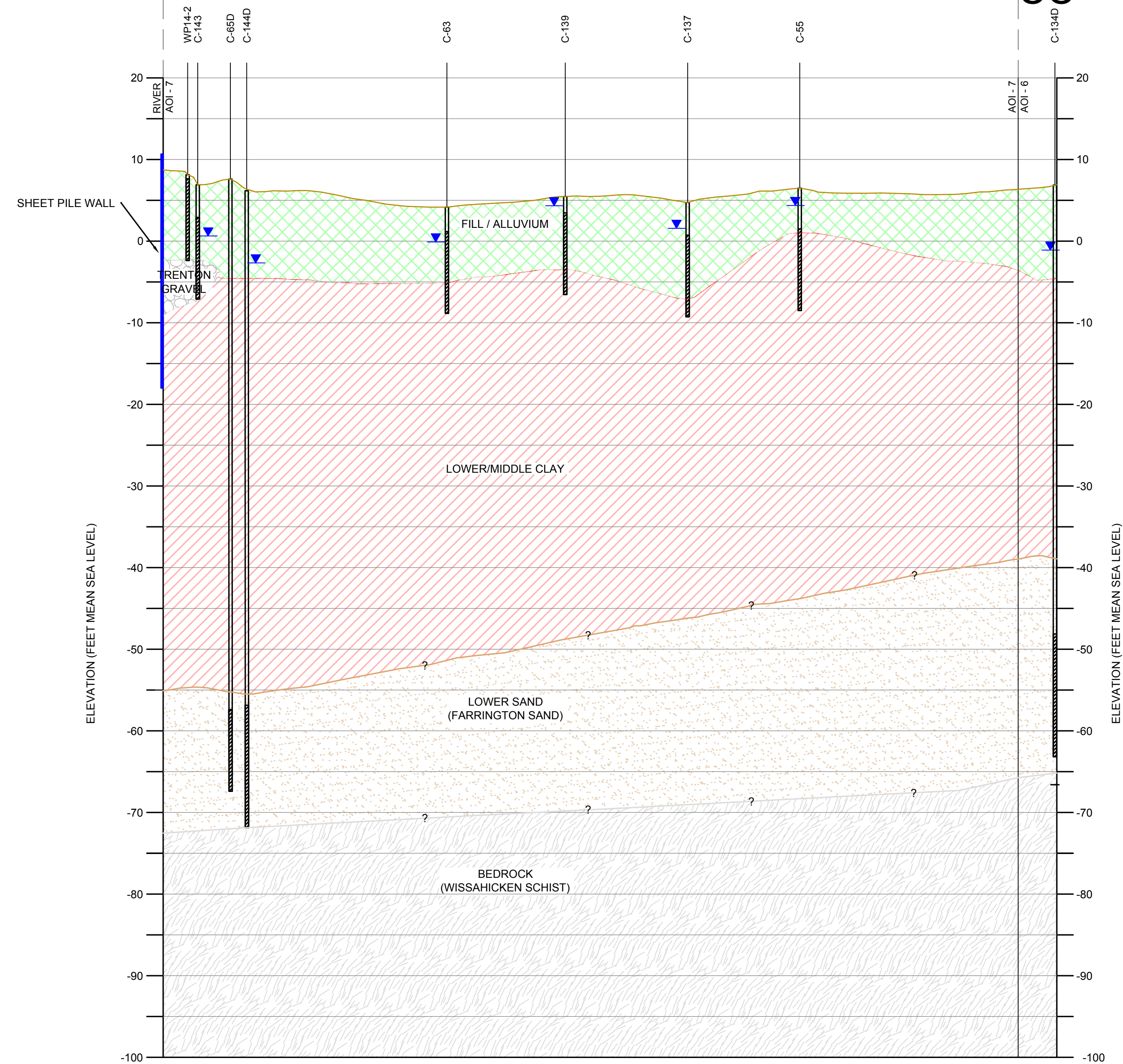


Project SUNOCO PHILADELPHIA REFINERY PHILADELPHIA COUNTY PENNSYLVANIA	Drawing Title GEOLOGIC CROSS SECTION AA-AA'		Project No. 2574601	Figure No. 5B
	Date 8/26/10			
	Scale 1" = 200' HOR. 1" = 10' VER.			
	Drn. By JEM			
	Last Revised X			Of

SCHUYLKILL
RIVER

AOI - 7

AOI - 6

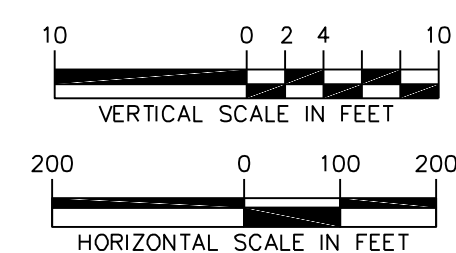


- NOTES:
1. LITHOLOGY BASED ON INTERPOLATION FROM AVAILABLE NEW AND HISTORIC WELL / SOIL BORING LOGS.
 2. DEPTH OF SHEET PILE WAS DETERMINED FROM FIGURE 2-8 GENERALIZED GEOLOGICAL CROSS SECTION A-C DATED NOVEMBER 13, 1992 FROM DAMES AND MOORE, RCRA VERIFICATION INVESTIGATION REPORT, CHEVERON REFINERY, 1992, CROSS SECTION RENAMED C-J IN CCR
 3. GROUNDWATER ELEVATIONS COLLECTED IN JULY 2010.

LEGEND:

- FILL / ALLUVIUM
- SAND / GRAVEL (TRENTON GRAVEL)
- CLAY
- SAND
- WEATHERED BEDROCK (WISSAHICKON SCHIST)

- C-129D LOCATION ID
- WELL CASING/BOREHOLE
 - WELL SCREEN
 - BOTTOM OF BOREHOLE
 - INFERRED CONTACTS
 - GROUNDWATER LEVEL
 - SHEET PILE WALL



Project

SUNOCO
PHILADELPHIA
REFINERY

PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title

GEOLOGIC CROSS
SECTION CC-CC'

Project No. 2574601

Date 8/26/10

Scale 1" = 200' HOR.
1" = 10' VER.

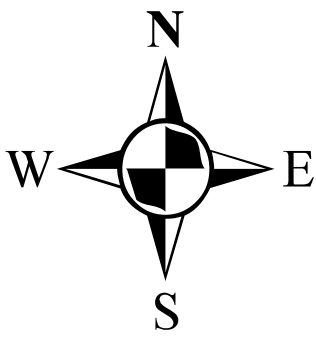
Drn. By JEM

Last Revised X

Figure No.

5C

Of



Legend

- C-56 8.49 Shallow Monitoring Well and Groundwater Elevation (ft. amsl)
- C-130 4.63 Shallow/Intermediate Monitoring Well and Groundwater Elevation (ft. amsl)
- PH-40 Abandoned/Damaged/Unable to Locate
- 2 Groundwater Contour (ft. amsl)
- 2 Groundwater Contour Depression (ft. amsl)
- 5 Inferred Groundwater Contour (ft. amsl)
- Inferred Groundwater Flow Direction
- Bulkhead
- Solid Waste Management Unit (SWMU)
- Area of Interest (AOI) Boundary

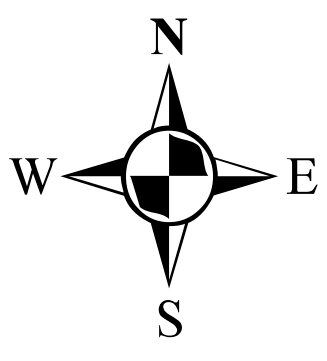
Notes:
1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).
2. Groundwater elevations based on groundwater gauging data provided by Stantec July 2010.
3. Groundwater contours were developed on a site wide basis for AOIs 2, 3, and 7 as all three AOIs were gauged in July 2010. Contours for each AOI were then cropped to show AOI contours separately.

Figure 6 - Shallow/Intermediate Groundwater Elevations
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania







Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145

0 70 140 280
Feet

SCALE: 1" = 140'
DATE: 8/10/2010
DWN BY: BAW
CDD BY: DAW
JOB#: 2574601



Legend

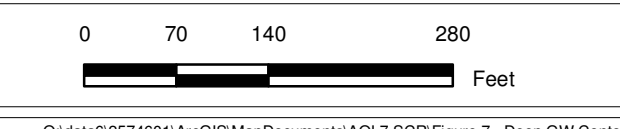
-  Deep (Lower Sand) Monitoring Well and Groundwater Elevation (ft amsl)
-  Groundwater Contour (ft. amsl)
-  Inferred Groundwater Flow Direction
-  Bulkhead
-  Solid Waste Management Unit
-  Area of Interest (AOI) Boundary

- Notes:
- 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).
 - Groundwater elevations based on groundwater gauging data provided by Stantec, July 2010.
 - Groundwater contours were developed on a site wide basis for AOIs 2, 3, and 7 as all three AOIs were gauged in July 2010. Contours for each AOI were then cropped to show AOI contours separately.

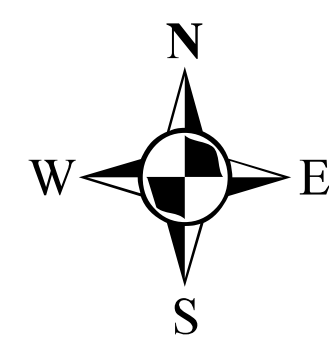
Figure 7 - Deep (Lower Sand) Groundwater Elevations
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania



Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145



SCALE: 1" = 140'
DATE: 9/10/2010
DRAWN BY: MHA
CHECKED BY: DW
JOB#: 2574601



Legend

- Shallow/Intermediate Monitoring Well With Apparent LNAPL Thickness (ft.)
- Shallow Monitoring Well With Apparent LNAPL Thickness (ft.)
- Monitoring Wells With No LNAPL
- Staff Gauge
- Bulkhead
- Occupied Buildings
- Solid Waste Management Unit
- Area of Interest (AOI) Boundary
- Light Non-Aqueous Phase Liquids (LNAPL) Types**
 - Lube Oil
 - Residual Oil
 - Middle Distillate

Notes:
1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).
2. LNAPL thickness based on the July 2010 groundwater gauging event.

Figure 10 - Apparent LNAPL Thickness and Types
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

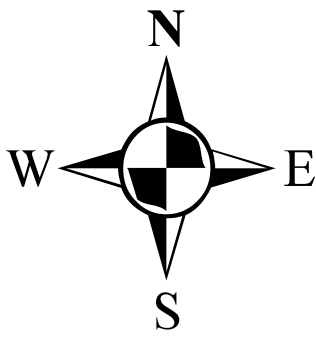
Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145

0 70 140 280 Feet

SCALE: 1" = 140'
DATE: August 20, 2010
DRAWN BY: KAH
CHECKED BY: DMW
JOB#: 2010001

APPENDIX A

Current, Historic Use/Historic Investigation, and
Impervious Surface Plan



Legend

- New Deep Monitoring Well Location With No Shallow Soil Sample
- New Shallow/Intermediate Groundwater Monitoring Well With Shallow Soil Sample
- New Shallow/Intermediate Groundwater Monitoring Well With No Soil Sample
- New Shallow Soil Boring and Sample Locations (0-2 ft.)
- Deep Monitoring Well
- Shallow Monitoring Well
- Abandoned/Damaged/Unable to Locate
- Staff Gauge
- Bulkhead
- Area of Interest (AOI)

- Existing, Historical Investigation and Historic Use Areas**
- Impervious Surfaces
 - Tank 270 Historic Investigation Area
 - Tank 271 Historic Investigation Area
 - Occupied Buildings
 - Historic Use Areas
 - Solid Waste Management Unit (SWMU)

Notes:
1. 2005 aerial photography provided by the Delaware Valley Regional Planning Commission (DVRPC).

Appendix A - Current, Historic Use/Historic Investigation, and Impervious Surface Plan
AOI-7 Site Characterization/
Remedial Investigation Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania



Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA.
19145

0 70 140 280 Feet
SCALE: 1" = 140'
DATE: 9/13/2010
DRA: BY: MAM
CDD: BY: DAW
JOB#: 2574601

Please see separate file on CD

APPENDIX B

Soil Boring Logs and Monitoring Well Construction Summaries

APPENDIX C
USGS Plate 20

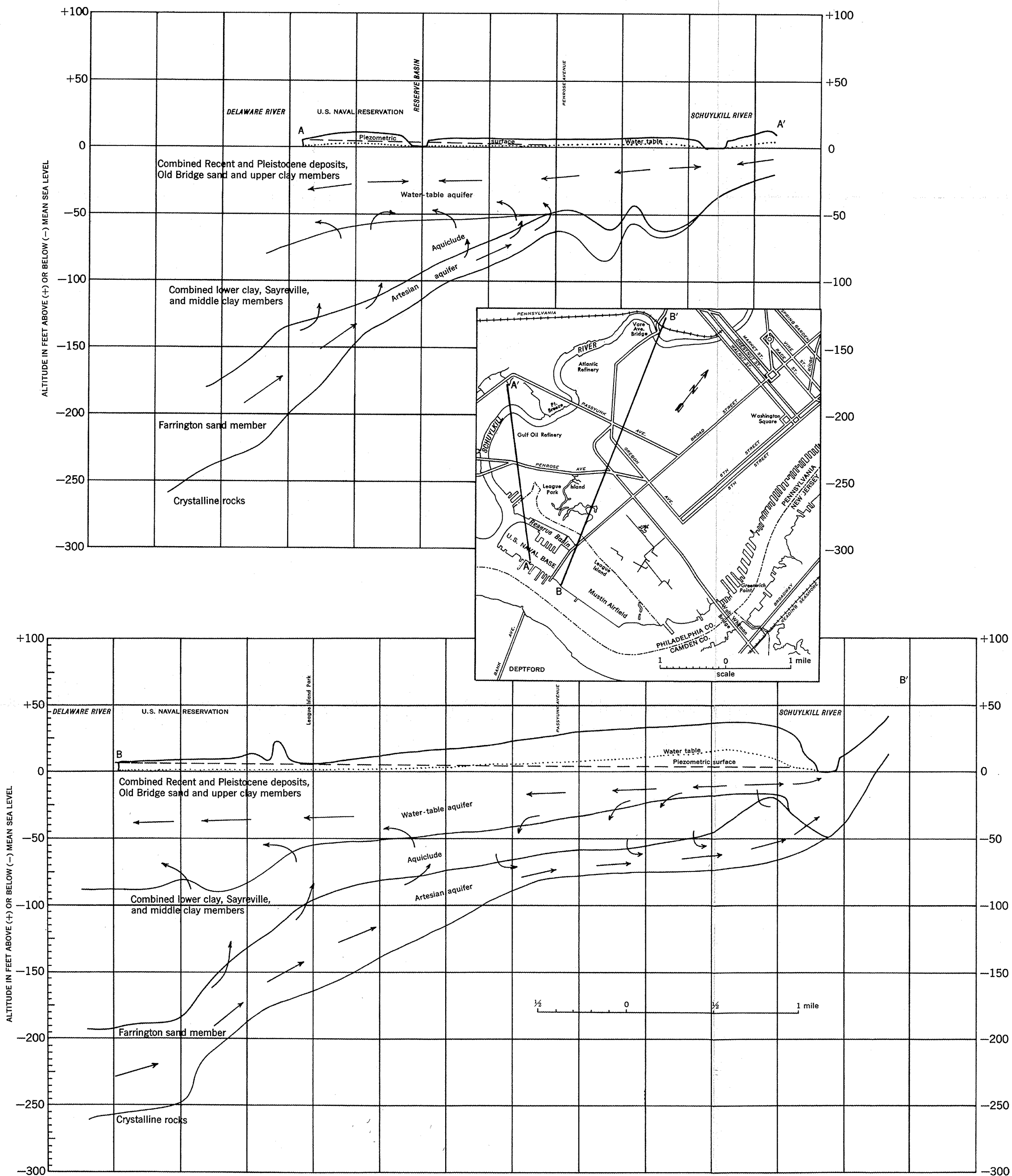


Plate 20 Cross sections showing probable directions of ground water movement in and between aquifers under natural conditions near the junction of the Delaware and Schuylkill Rivers in Pennsylvania.

APPENDIX D

Soil and Groundwater Analytical Reports (on CD)

REVISED

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 16, 2010

Project: SUN: Philadelphia Refinery AOI-2/AOI-7

Submittal Date: 06/01/2010
Group Number: 1196722
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionS-298_1-2' Grab Soil
C-140_1-2' Grab Soil
C-138_1-2' Grab Soil
C-137_1-2' Grab Soil
C-136_1-2' Grab SoilLancaster Labs (LLI) #5994011
5994012
5994013
5994014
5994015

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

ELECTRONIC Aquaterra Tech

COPY TO

Attn: Loretta Belfiglio

REVISED

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Adrienne Kuhl
Specialist Group Leader



Analysis Report

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

Page 1 of 2

REVISED

Sample Description: S-298_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 S-298_1-2'

LLI Sample # SW 5994011
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/25/2010 08:30 by SS

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/01/2010 14:35

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9298

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	1,200	J 530	5,300	952.62
10950	1,2-Dibromoethane	106-93-4	N.D.	1,100	5,300	952.62
10950	1,2-Dichloroethane	107-06-2	N.D.	1,100	5,300	952.62
10950	Ethylbenzene	100-41-4	N.D.	1,100	5,300	952.62
10950	Isopropylbenzene	98-82-8	N.D.	1,100	5,300	952.62
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	530	5,300	952.62
10950	Toluene	108-88-3	N.D.	1,100	5,300	952.62
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1,100	5,300	952.62
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1,100	5,300	952.62
10950	Xylene (Total)	1330-20-7	N.D.	1,100	5,300	952.62

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,600	37	190	1
10724	Benzo(a)anthracene	56-55-3	2,500	37	190	1
10724	Benzo(a)pyrene	50-32-8	1,500	37	190	1
10724	Benzo(b)fluoranthene	205-99-2	2,100	37	190	1
10724	Benzo(g,h,i)perylene	191-24-2	660	37	190	1
10724	Chrysene	218-01-9	2,700	37	190	1
10724	Fluorene	86-73-7	3,300	37	190	1
10724	Naphthalene	91-20-3	1,400	37	190	1
10724	Phenanthrene	85-01-8	6,900	370	1,900	10
10724	Pyrene	129-00-0	5,500	370	1,900	10

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	96.0	0.0336	0.224	2

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	10.7	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
---------	---------------	--------	--------	--------	------------------------	---------	-----------------

*=This limit was used in the evaluation of the final result

Sample Description: S-298_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 S-298_1-2'

LLI Sample # SW 5994011
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/25/2010 08:30 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9298

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201015321304	05/25/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201015321304	05/25/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201015321304	05/25/2010 08:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101581AA	06/07/2010 19:38	Nicholas R Rossi	952.62
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/08/2010 21:19	William T Parker	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/09/2010 06:51	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10153SLE026	06/03/2010 09:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101536150003A	06/09/2010 08:29	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101536150003	06/02/2010 20:34	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10154820002A	06/03/2010 17:47	Scott W Freisher	1



Analysis Report

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

Page 1 of 2

REVISED

Sample Description: C-140_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-140_1-2'

LLI Sample # SW 5994012
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/26/2010 14:00 by SS

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/01/2010 14:35

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9140

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	< 5	5	0.5	0.85
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.85
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.85
10950	Ethylbenzene	100-41-4	< 5	5	1	0.85
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.85
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.85
10950	Toluene	108-88-3	< 5	5	1	0.85
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.85
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.85
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.85

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	380	190	38	1
10724	Benzo(a)anthracene	56-55-3	1,200	190	38	1
10724	Benzo(a)pyrene	50-32-8	1,200	190	38	1
10724	Benzo(b)fluoranthene	205-99-2	1,400	190	38	1
10724	Benzo(g,h,i)perylene	191-24-2	1,000	190	38	1
10724	Chrysene	218-01-9	1,300	190	38	1
10724	Fluorene	86-73-7	< 190	190	38	1
10724	Naphthalene	91-20-3	470	190	38	1
10724	Phenanthrene	85-01-8	990	190	38	1
10724	Pyrene	129-00-0	1,900	190	38	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	98.6	0.557	0.0836	5

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	12.9	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
---------	---------------	--------	--------	--------	------------------------	---------	-----------------

*=This limit was used in the evaluation of the final result

Sample Description: C-140_1-2' Grab Soil
 Philadelphia Refinery AOI-2/AOI-7
 DUNS# COC: 235827 C-140_1-2'

LLI Sample # SW 5994012
 LLI Group # 1196722
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/26/2010 14:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9140

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201015321304	05/26/2010 14:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201015321304	05/26/2010 14:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201015321304	05/26/2010 14:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101571AA	06/07/2010 07:11	Angela D Sneeringer	0.85
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/08/2010 22:34	William T Parker	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10153SLE026	06/03/2010 09:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101536150003A	06/09/2010 09:00	Choon Y Tian	5
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101536150003	06/02/2010 20:34	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10154820002A	06/03/2010 17:47	Scott W Freisher	1

Sample Description: C-138_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-138_1-2'

LLI Sample # SW 5994013
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/27/2010 09:00 by SS

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/01/2010 14:35

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9138

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	12 J	1	12	1.53
10950	1,2-Dibromoethane	106-93-4	N.D.	2	12	1.53
10950	1,2-Dichloroethane	107-06-2	N.D.	2	12	1.53
10950	Ethylbenzene	100-41-4	14	2	12	1.53
10950	Isopropylbenzene	98-82-8	3 J	2	12	1.53
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	1	12	1.53
10950	Toluene	108-88-3	54	2	12	1.53
10950	1,2,4-Trimethylbenzene	95-63-6	14	2	12	1.53
10950	1,3,5-Trimethylbenzene	108-67-8	7 J	2	12	1.53
10950	Xylene (Total)	1330-20-7	72	2	12	1.53

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	94 J	51	260	1
10724	Benzo(a)anthracene	56-55-3	240 J	51	260	1
10724	Benzo(a)pyrene	50-32-8	200 J	51	260	1
10724	Benzo(b)fluoranthene	205-99-2	320	51	260	1
10724	Benzo(g,h,i)perylene	191-24-2	150 J	51	260	1
10724	Chrysene	218-01-9	300	51	260	1
10724	Fluorene	86-73-7	N.D.	51	260	1
10724	Naphthalene	91-20-3	110 J	51	260	1
10724	Phenanthrene	85-01-8	240 J	51	260	1
10724	Pyrene	129-00-0	360	51	260	1

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	103	0.0462	0.308	2

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	35.1	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result



Analysis Report

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REVISED

Sample Description: C-138_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-138_1-2'

LLI Sample # SW 5994013
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/27/2010 09:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9138

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201015321304	05/27/2010 09:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201015321304	05/27/2010 09:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201015321304	05/27/2010 09:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101571AA	06/07/2010 06:48	Angela D Sneeringer	1.53
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/08/2010 22:59	William T Parker	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10153SLE026	06/03/2010 09:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101536150003A	06/09/2010 08:42	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101536150003	06/02/2010 20:34	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10154820002A	06/03/2010 17:47	Scott W Freisher	1

*=This limit was used in the evaluation of the final result



Analysis Report

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REVISED

Sample Description: C-137_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-137_1-2'

LLI Sample # SW 5994014
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/27/2010 13:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9137

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.76
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.76
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.76
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.76
10950	Isopropylbenzene	98-82-8	9	5	0.9	0.76
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.76
10950	Toluene	108-88-3	< 5	5	0.9	0.76
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.76
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.76
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.76
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	1,900	210	42	1
10724	Benzo(a)anthracene	56-55-3	2,300	210	42	1
10724	Benzo(a)pyrene	50-32-8	1,900	210	42	1
10724	Benzo(b)fluoranthene	205-99-2	2,200	210	42	1
10724	Benzo(g,h,i)perylene	191-24-2	1,300	210	42	1
10724	Chrysene	218-01-9	2,300	210	42	1
10724	Fluorene	86-73-7	1,800	210	42	1
10724	Naphthalene	91-20-3	5,400	2,100	420	10
10724	Phenanthrene	85-01-8	4,400	2,100	420	10
10724	Pyrene	129-00-0	< 210	210	42	1
Metals SW-846 6020						
06135	Lead	7439-92-1	251	0.617	0.0925	5
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	20.5	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201015321304	05/27/2010 13:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: C-137_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-137_1-2'

LLI Sample # SW 5994014
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/27/2010 13:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9137

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 5035	1	201015321304	05/27/2010	13:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201015321304	05/27/2010	13:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101591AA	06/09/2010	02:50	Lauren C Temple	0.76
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/08/2010	23:24	William T Parker	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/09/2010	07:16	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10153SLE026	06/03/2010	09:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101536150003A	06/09/2010	09:15	Choon Y Tian	5
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101536150003	06/02/2010	20:34	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10154820002A	06/03/2010	17:47	Scott W Freisher	1



Analysis Report

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Sample Description: C-136_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-136_1-2'

LLI Sample # SW 5994015
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/28/2010 08:30 by SS

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/01/2010 14:35

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9136

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	7	5	0.5	0.87
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.87
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.87
10950	Ethylbenzene	100-41-4	< 5	5	1	0.87
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.87
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.87
10950	Toluene	108-88-3	8	5	1	0.87
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.87
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.87
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.87

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	< 180	180	37	1
10724	Benzo(a)anthracene	56-55-3	370	180	37	1
10724	Benzo(a)pyrene	50-32-8	380	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	550	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	390	180	37	1
10724	Chrysene	218-01-9	410	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	550	180	37	1
10724	Phenanthrene	85-01-8	360	180	37	1
10724	Pyrene	129-00-0	440	180	37	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	218	1.09	0.163	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	9.7	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result



Analysis Report

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REVISED

Sample Description: C-136_1-2' Grab Soil
Philadelphia Refinery AOI-2/AOI-7
DUNS# COC: 235827 C-136_1-2'

LLI Sample # SW 5994015
LLI Group # 1196722
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 05/28/2010 08:30 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/01/2010 14:35

West Chester PA 19381

Reported: 07/16/2010 09:51

Discard: 09/15/2010

I9136

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201015321304	05/28/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201015321304	05/28/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201015321304	05/28/2010 08:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101571AA	06/07/2010 02:16	Angela D Sneeringer	0.87
10724	PAH 8270 (microwave)	SW-846 8270C	1	10153SLE026	06/08/2010 23:49	William T Parker	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10153SLE026	06/03/2010 09:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101536150003A	06/09/2010 09:05	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101536150003	06/02/2010 20:34	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10154820002A	06/03/2010 17:47	Scott W Freisher	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:51 AM

Group Number: 1196722

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

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank LOQ**</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: X101591AA	Sample number(s): 5994014								
Benzene	< 5	5.	0.5	ug/kg	99	97	80-120	2	30
1,2-Dibromoethane	< 5	5.	1	ug/kg	99	96	80-120	2	30
1,2-Dichloroethane	< 5	5.	1	ug/kg	102	102	71-129	0	30
Ethylbenzene	< 5	5.	1	ug/kg	103	98	80-120	5	30
Isopropylbenzene	< 5	5.	1	ug/kg	102	98	76-120	4	30
Methyl Tertiary Butyl Ether	< 5	5.	0.5	ug/kg	97	98	74-121	1	30
Toluene	< 5	5.	1	ug/kg	100	98	80-120	3	30
1,2,4-Trimethylbenzene	< 5	5.	1	ug/kg	99	95	79-120	4	30
1,3,5-Trimethylbenzene	< 5	5.	1	ug/kg	101	96	78-120	4	30
Xylene (Total)	< 5	5.	1	ug/kg	103	99	80-120	4	30

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: R101581AA	Sample number(s): 5994011								
Benzene	N.D.	25.	250	ug/kg	95	100	80-120	5	30
1,2-Dibromoethane	N.D.	50.	250	ug/kg	97	101	80-120	4	30
1,2-Dichloroethane	N.D.	50.	250	ug/kg	99	103	71-129	4	30
Ethylbenzene	N.D.	50.	250	ug/kg	96	100	80-120	4	30
Isopropylbenzene	N.D.	50.	250	ug/kg	96	99	76-120	3	30
Methyl Tertiary Butyl Ether	N.D.	25.	250	ug/kg	97	102	74-121	4	30
Toluene	N.D.	50.	250	ug/kg	96	99	80-120	4	30
1,2,4-Trimethylbenzene	N.D.	50.	250	ug/kg	96	100	79-120	3	30
1,3,5-Trimethylbenzene	N.D.	50.	250	ug/kg	96	99	78-120	4	30
Xylene (Total)	N.D.	50.	250	ug/kg	96	100	80-120	4	30
Batch number: X101571AA	Sample number(s): 5994012-5994013, 5994015								
Benzene	N.D.	0.5	5	ug/kg	94		80-120		
1,2-Dibromoethane	N.D.	1.	5	ug/kg	94		80-120		
1,2-Dichloroethane	N.D.	1.	5	ug/kg	109		71-129		
Ethylbenzene	N.D.	1.	5	ug/kg	98		80-120		
Isopropylbenzene	N.D.	1.	5	ug/kg	99		76-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	95		74-121		
Toluene	N.D.	1.	5	ug/kg	94		80-120		
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	97		79-120		
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	98		78-120		
Xylene (Total)	N.D.	1.	5	ug/kg	98		80-120		
Batch number: 10153SLE026	Sample number(s): 5994011-5994015								
Anthracene	N.D.	33.	170	ug/kg	98		89-109		
Benzo(a)anthracene	N.D.	33.	170	ug/kg	95		86-113		
Benzo(a)pyrene	N.D.	33.	170	ug/kg	84		63-138		

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:51 AM

Group Number: 1196722

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Benzo(b) fluoranthene	N.D.	33.	170	ug/kg	85		61-133		
Benzo(g,h,i) perylene	N.D.	33.	170	ug/kg	84		63-130		
Chrysene	N.D.	33.	170	ug/kg	96		84-117		
Fluorene	N.D.	33.	170	ug/kg	101		84-113		
Naphthalene	N.D.	33.	170	ug/kg	96		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	95		86-109		
Pyrene	N.D.	33.	170	ug/kg	91		86-122		
Batch number: 101536150003A	Sample number(s): 5994011-5994015								
Lead	N.D.	0.0300	0.200	mg/kg	105		80-120		
Batch number: 10154820002A	Sample number(s): 5994011-5994015								
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

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: X101591AA	Sample number(s): 5994014 UNSPK: P996965								
Benzene	106		55-143						
1,2-Dibromoethane	109		54-129						
1,2-Dichloroethane	111		53-143						
Ethylbenzene	105		44-141						
Isopropylbenzene	99		38-144						
Methyl Tertiary Butyl Ether	106		55-129						
Toluene	113		50-146						
1,2,4-Trimethylbenzene	118		37-149						
1,3,5-Trimethylbenzene	122		38-150						
Xylene (Total)	102		44-136						
Batch number: X101571AA	Sample number(s): 5994012-5994013,5994015 UNSPK: P993546								
Benzene	94	108	55-143	11	30				
1,2-Dibromoethane	82	96	54-129	13	30				
1,2-Dichloroethane	107	118	53-143	7	30				
Ethylbenzene	95	111	44-141	13	30				
Isopropylbenzene	95	111	38-144	12	30				
Methyl Tertiary Butyl Ether	87	102	55-129	13	30				
Toluene	92	107	50-146	12	30				
1,2,4-Trimethylbenzene	94	109	37-149	12	30				
1,3,5-Trimethylbenzene	95	111	38-150	13	30				
Xylene (Total)	93	109	44-136	12	30				
Batch number: 10153SLE026	Sample number(s): 5994011-5994015 UNSPK: 5994011								
Anthracene	74*	72*	76-111	1	30				
Benzo(a)anthracene	71*	65*	78-111	3	30				
Benzo(a)pyrene	60	58	57-129	1	30				
Benzo(b)fluoranthene	53	39*	53-131	9	30				
Benzo(g,h,i) perylene	73	76	60-123	3	30				
Chrysene	66*	49*	76-114	8	30				

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

- (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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:51 AM

Group Number: 1196722

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	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Fluorene	56*	45*	75-111	5	30				
Naphthalene	76	70	33-140	4	30				
Phenanthrene	72	39*	69-115	8	30				
Pyrene	72*	45*	76-124	7	30				
Batch number: 101536150003A	Sample number(s): 5994011-5994015 UNSPK: 5994011 BKG: 5994011								
Lead	272 (2)	-233 (2)	75-125	18	20	85.8	79.6	7	20
Batch number: 10154820002A	Sample number(s): 5994011-5994015 BKG: P996043								
Moisture					41.5	49.5	18*	15	

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(4.3)by 8260(soil)
Batch number: R101581AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5994011	85	80	94	92
Blank	82	84	81	85
LCS	94	94	92	93
LCSD	98	99	96	96
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101571AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5994012	108	104	110	70
5994013	106	101	107	88
5994015	106	100	115	73
Blank	109	97	93	96
LCS	105	105	103	102
MS	106	95	102	101
MSD	103	99	103	98
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101591AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5994014	99	104	120	108
Blank	100	99	95	98
LCS	102	98	103	102
LCSD	101	104	102	100

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:51 AM

Group Number: 1196722

Surrogate Quality Control

MS	101	100	109	87
Limits:	71-114	70-109	70-123	70-111
Analysis Name: PAH 8270 (microwave)				
Batch number: 10153SLE026				
	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14	
5994011	93	90	82	
5994012	88	94	79	
5994013	94	101	88	
5994014	77	79	64	
5994015	96	106	86	
Blank	92	96	87	
LCS	92	99	82	
MS	87	82	75	
MSD	92	92	80	
Limits:	55-121	74-110	57-112	

*- Outside of specification

** This limit was used in the evaluation of the final result for the blank

(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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group# 1196722 Sample # 5994011-15

COC # 235827

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

1 Client: <u>SUN-AQUATERRA</u> Acct. #: _____ Project Name/Ref: <u>Philadelphia Refinery AOI-3</u> PWSID #: _____ Project Manager: <u>T. DOERR</u> P.O.#: _____ Sampler: <u>S. SYKES</u> Quote #: _____ Name of state where samples were collected: <u>PA</u>										5 Analyses Requested <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="10">Preservation Codes</th> </tr> <tr> <td>Lead (35mm)</td> <td>OTEX, MTBE, Cumene</td> <td>1,2 dichloroethane</td> <td>1,2,4 trichloroethane</td> <td>1,2,4,5 tetrachloroethane</td> <td>Chrysene</td> <td>Fluorene</td> <td>Naphthalene</td> <td>Phenanthrene</td> <td>Pyrene</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table>										Preservation Codes										Lead (35mm)	OTEX, MTBE, Cumene	1,2 dichloroethane	1,2,4 trichloroethane	1,2,4,5 tetrachloroethane	Chrysene	Fluorene	Naphthalene	Phenanthrene	Pyrene	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	For Lab Use Only FSC: _____ SCR#: _____ <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2">Preservation Codes</th> </tr> <tr> <td>H=HCl</td> <td>T=Thiosulfate</td> </tr> <tr> <td>N=HNO₃</td> <td>B=NaOH</td> </tr> <tr> <td>S=H₂SO₄</td> <td>O=Other</td> </tr> </table>										Preservation Codes		H=HCl	T=Thiosulfate	N=HNO ₃	B=NaOH	S=H ₂ SO ₄	O=Other																																																																																																								
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Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	Lead (35mm)	OTEX, MTBE, Cumene	1,2 dichloroethane	1,2,4 trichloroethane	1,2,4,5 tetrachloroethane	Chrysene	Fluorene	Naphthalene	Phenanthrene	Pyrene																																																																																																																																																									
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C-138-1-2'	5/27/10	900	X		X			4	X	X	X	X	X	X	X	X																																																																																																																																																											
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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: _____										Relinquished by: <u>[Signature]</u> / AQT Date <u>5/28/10</u> Time <u>1400</u> Relinquished by: <u>[Signature]</u> / AQT Date <u>6/1/10</u> Time <u>1010</u> Relinquished by: <u>[Signature]</u> Date <u>6/1</u> Time <u>1435</u> Relinquished by: _____ Date _____ Time _____										Received by: <u>Fridge</u> Date <u>5/28/10</u> Time <u>1400</u> Received by: <u>J. Lyday</u> Date <u>6/1</u> Time <u>1040</u> Received by: _____ Date _____ Time _____ Received by: <u>Deborah A. V...</u> Date <u>6/1/10</u> Time <u>142</u>																																																																																																																																																							
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Type IV (CLP SOW) Type VI (Raw Data Only)										SDG Complete? Yes No Site-specific QC (MS/MSD/Dup)? Yes No (If yes, indicate QC sample and submit triplicate volume.) Internal COC Required? Yes / No										9																																																																																																																																																							

Explanation of Symbols and Abbreviations

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

RL	Rounded Lead	BMQL	Bottom Material
N.D.	Not Determined	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Chemical Process Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Tolerances are indicated by the symbol < (e.g., 0.001 inches) indicating that the tolerance is less than the value indicated.		
>	Greater than		
J	Joint - Tolerances are indicated by the symbol J (MDL) indicating that the tolerance is less than the value indicated (LO).		
ppm	Parts per million - Ozone is measured in parts per million (ppm) and is defined as the mass of ozone in a given volume of air divided by the mass of the air (F).		
ppb	Parts per billion		
Dry weight basis	Residue is reported on a dry weight basis. Tolerances are indicated by the symbol T (A) indicating that the tolerance is less than the value indicated.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a qualitative measure of organic compounds	B	Volatile (CRDL) ≥ IDL
B	Aromatic is a qualitative measure of organic compounds	E	Elemental is a qualitative measure of organic compounds
C	Pesticide is a qualitative measure of organic compounds	M	Dioxin is a qualitative measure of organic compounds
D	Chlorinated is a qualitative measure of organic compounds	N	Sulfur is a qualitative measure of organic compounds
E	Chlorinated is a qualitative measure of organic compounds	S	Metallic is a qualitative measure of organic compounds (MSA) indicating that the tolerance is less than the value indicated.
N	Pesticide is a qualitative measure of organic compounds (TIC is indicated)	U	Chlorinated is a qualitative measure of organic compounds
P	Chlorinated is a qualitative measure of organic compounds (TIC is indicated)	W	Pesticide is a qualitative measure of organic compounds
U	Chlorinated is a qualitative measure of organic compounds	*	Dioxin is a qualitative measure of organic compounds
X,Y,Z	Dioxin is a qualitative measure of organic compounds	+	Chlorinated is a qualitative measure of organic compounds (MSA) ≥ 0.995

Aromatic is a qualitative measure of organic compounds. NELAC is a qualitative measure of organic compounds.

Metallic is a qualitative measure of organic compounds. MSA is a qualitative measure of organic compounds.

TIC is a qualitative measure of organic compounds. C is a qualitative measure of organic compounds. U is a qualitative measure of organic compounds. W is a qualitative measure of organic compounds. T is a qualitative measure of organic compounds. S is a qualitative measure of organic compounds. N is a qualitative measure of organic compounds. E is a qualitative measure of organic compounds. B is a qualitative measure of organic compounds. D is a qualitative measure of organic compounds. A is a qualitative measure of organic compounds. P is a qualitative measure of organic compounds. X, Y, Z is a qualitative measure of organic compounds.

WARRANTY AND LIMITS OF LIABILITY - Lancaster Laboratories warrants that the products and services it provides are free from defects in materials and workmanship. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESS 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. Warranties are limited to the products and services provided by Lancaster Laboratories. No warranty is made for products or services not provided by Lancaster Laboratories. Lancaster Laboratories is not responsible for damages caused by the use of its products or services. Lancaster Laboratories is not responsible for damages caused by the use of its products or services. Lancaster Laboratories is not responsible for damages caused by the use of its products or services.

REVISED

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 16, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 06/08/2010
Group Number: 1197775
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionC-130_1-2' Grab Soil
C-129_1-2' Grab Soil
C-139_1-2' Grab Soil
C-143_1-2' Grab Soil
C-142_1-2' Grab Soil
C-131_1-2' Grab SoilLancaster Labs (LLI) #6000419
6000420
6000421
6000422
6000423
6000424

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

ELECTRONIC Aquaterra Tech

COPY TO

Attn: Loretta Belfiglio

REVISED

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Adrienne Kuhl
Specialist Group Leader



Analysis Report

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

Page 1 of 2

REVISED

Sample Description: C-130_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-130_1-2'

LLI Sample # SW 6000419
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 08:30 by SS

SUN: Aquaterra Tech.

Submitted: 06/08/2010 16:00

PO Box 744

Reported: 07/16/2010 09:47

West Chester PA 19381

Discard: 09/15/2010

130-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.81
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.81
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.81
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.81
10950	Isopropylbenzene	98-82-8	< 5	5	0.9	0.81
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.81
10950	Toluene	108-88-3	< 5	5	0.9	0.81
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.81
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.81
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.81
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	2,700	1,900	390	10
10724	Benzo(a)anthracene	56-55-3	9,600	1,900	390	10
10724	Benzo(a)pyrene	50-32-8	8,400	1,900	390	10
10724	Benzo(b)fluoranthene	205-99-2	11,000	1,900	390	10
10724	Benzo(g,h,i)perylene	191-24-2	4,900	1,900	390	10
10724	Chrysene	218-01-9	8,700	1,900	390	10
10724	Fluorene	86-73-7	< 1,900	1,900	390	10
10724	Naphthalene	91-20-3	< 1,900	1,900	390	10
10724	Phenanthrene	85-01-8	7,300	1,900	390	10
10724	Pyrene	129-00-0	13,000	1,900	390	10
Metals SW-846 6020						
06135	Lead	7439-92-1	814	4.67	0.233	40
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	14.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/02/2010 08:30	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: C-130_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-130_1-2'

LLI Sample # SW 6000419
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 08:30 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

130-C

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 5035	1	201016021364	06/02/2010	08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/02/2010	08:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101651AA	06/14/2010	09:28	Holly Berry	0.81
10724	PAH 8270 (microwave)	SW-846 8270C	1	10160SLX026	06/18/2010	17:40	Barton C Conner	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10160SLX026	06/09/2010	14:00	Wanda F Oswald	1
06135	Lead	SW-846 6020	1	101616150001A	06/18/2010	08:54	Choon Y Tian	40
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010	21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010	16:34	Scott W Freisher	1



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Sample Description: C-129_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-129_1-2'

LLI Sample # SW 6000420
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 11:00 by SS

SUN: Aquaterra Tech.

Submitted: 06/08/2010 16:00

PO Box 744

Reported: 07/16/2010 09:47

West Chester PA 19381

Discard: 09/15/2010

129-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	3 J	0.6	6	0.93
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	0.93
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	0.93
10950	Ethylbenzene	100-41-4	N.D.	1	6	0.93
10950	Isopropylbenzene	98-82-8	N.D.	1	6	0.93
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	0.93
10950	Toluene	108-88-3	12	1	6	0.93
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	0.93
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	0.93
10950	Xylene (Total)	1330-20-7	N.D.	1	6	0.93

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	830	42	210	1
10724	Benzo(a)anthracene	56-55-3	1,900	42	210	1
10724	Benzo(a)pyrene	50-32-8	2,300	42	210	1
10724	Benzo(b)fluoranthene	205-99-2	3,100	42	210	1
10724	Benzo(g,h,i)perylene	191-24-2	870	42	210	1
10724	Chrysene	218-01-9	1,800	42	210	1
10724	Fluorene	86-73-7	280	42	210	1
10724	Naphthalene	91-20-3	4,200	42	210	1
10724	Phenanthrene	85-01-8	2,600	42	210	1
10724	Pyrene	129-00-0	3,600	42	210	1

Surrogate recoveries are outside of QC limits for the initial GC/MS semivolatile analysis. The analysis was repeated outside of the required hold time and the surrogate recoveries are within the limits. The data reported is from the initial extraction of the sample.

The GC/MS semivolatile internal standard peak areas were outside of the QC limits for both the initial injection and the re-injection. The values here are from the initial injection of the sample.

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	252	0.0630	1.26	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	21.4	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

*=This limit was used in the evaluation of the final result



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Sample Description: C-129_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-129_1-2'

LLI Sample # SW 6000420
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 11:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

129-C

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/02/2010 11:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016021364	06/02/2010 11:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/02/2010 11:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101621AA	06/11/2010 13:28	Angela D Sneeringer	0.93
10724	PAH 8270 (microwave)	SW-846 8270C	1	10160SLA026	06/14/2010 23:15	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10160SLA026	06/09/2010 14:00	Wanda F Oswald	1
06135	Lead	SW-846 6020	1	101616150001A	06/18/2010 09:05	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010 21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010 16:34	Scott W Freisher	1

*=This limit was used in the evaluation of the final result



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Sample Description: C-139_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-139_1-2'

LLI Sample # SW 6000421
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 14:30 by SS

SUN: Aquaterra Tech.

Submitted: 06/08/2010 16:00

PO Box 744

Reported: 07/16/2010 09:47

West Chester PA 19381

Discard: 09/15/2010

139-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	< 4	4	0.4	0.8
10950	1,2-Dibromoethane	106-93-4	< 4	4	0.9	0.8
10950	1,2-Dichloroethane	107-06-2	< 4	4	0.9	0.8
10950	Ethylbenzene	100-41-4	< 4	4	0.9	0.8
10950	Isopropylbenzene	98-82-8	< 4	4	0.9	0.8
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 4	4	0.4	0.8
10950	Toluene	108-88-3	< 4	4	0.9	0.8
10950	1,2,4-Trimethylbenzene	95-63-6	< 4	4	0.9	0.8
10950	1,3,5-Trimethylbenzene	108-67-8	< 4	4	0.9	0.8
10950	Xylene (Total)	1330-20-7	< 4	4	0.9	0.8

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	< 180	180	37	1
10724	Benzo(a)anthracene	56-55-3	< 180	180	37	1
10724	Benzo(a)pyrene	50-32-8	< 180	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	< 180	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	< 180	180	37	1
10724	Chrysene	218-01-9	< 180	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	< 180	180	37	1
10724	Phenanthrene	85-01-8	< 180	180	37	1
10724	Pyrene	129-00-0	250	180	37	1

The GC/MS semivolatile internal standard peak areas were outside of the QC limits for both the initial injection and the re-injection. The values here are from the initial injection of the sample.

Surrogate recoveries are outside of QC limits for the initial GC/MS semivolatile analysis. The analysis was repeated outside of the required hold time and surrogate recoveries are again outside of QC limits, indicating a matrix effect. The data reported is from the initial extraction of the sample.

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	98.7	0.212	0.0319	2
Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	9.5	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

*=This limit was used in the evaluation of the final result



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Sample Description: C-139_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-139_1-2'

LLI Sample # SW 6000421
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/02/2010 14:30 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

139-C

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/02/2010 14:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016021364	06/02/2010 14:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/02/2010 14:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101621AA	06/11/2010 12:42	Angela D Sneeringer	0.8
10724	PAH 8270 (microwave)	SW-846 8270C	1	10160SLA026	06/15/2010 00:09	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10160SLA026	06/09/2010 14:00	Wanda F Oswald	1
06135	Lead	SW-846 6020	1	101616150001A	06/14/2010 23:08	David K Beck	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010 21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010 16:34	Scott W Freisher	1

*=This limit was used in the evaluation of the final result

Sample Description: C-143_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-143_1-2'

LLI Sample # SW 6000422
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 09:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

143-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	2,000	33	330	62.48
10950	1,2-Dibromoethane	106-93-4	N.D.	67	330	62.48
10950	1,2-Dichloroethane	107-06-2	N.D.	67	330	62.48
10950	Ethylbenzene	100-41-4	150 J	67	330	62.48
10950	Isopropylbenzene	98-82-8	5,600	67	330	62.48
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	33	330	62.48
10950	Toluene	108-88-3	220 J	67	330	62.48
10950	1,2,4-Trimethylbenzene	95-63-6	250 J	67	330	62.48
10950	1,3,5-Trimethylbenzene	108-67-8	240 J	67	330	62.48
10950	Xylene (Total)	1330-20-7	570	67	330	62.48
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	170 J	36	180	1
10724	Benzo(a)anthracene	56-55-3	420	36	180	1
10724	Benzo(a)pyrene	50-32-8	520	36	180	1
10724	Benzo(b)fluoranthene	205-99-2	620	36	180	1
10724	Benzo(g,h,i)perylene	191-24-2	430	36	180	1
10724	Chrysene	218-01-9	600	36	180	1
10724	Fluorene	86-73-7	62 J	36	180	1
10724	Naphthalene	91-20-3	270	36	180	1
10724	Phenanthrene	85-01-8	490	36	180	1
10724	Pyrene	129-00-0	930	36	180	1
Metals SW-846 6020						
06135	Lead	7439-92-1	164	0.0513	1.03	10
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	6.2	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/03/2010 09:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: C-143_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-143_1-2'

LLI Sample # SW 6000422
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 09:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

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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 5035	1	201016021364	06/03/2010	09:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/03/2010	09:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101652AA	06/14/2010	20:06	Nicholas R Rossi	62.48
10724	PAH 8270 (microwave)	SW-846 8270C	1	10168SLA026	06/22/2010	12:30	Ryan P Byrne	1
10814	BNA Soil Microwave PAH	SW-846 3546	2	10168SLA026	06/17/2010	16:45	JoElla L Rice	1
06135	Lead	SW-846 6020	2	101616150001A	06/18/2010	09:07	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010	21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010	16:34	Scott W Freisher	1



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Sample Description: C-142_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-142_1-2'

LLI Sample # SW 6000423
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 11:00 by SS

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/08/2010 16:00

Reported: 07/16/2010 09:47

Discard: 09/15/2010

142-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	100 J	31	310	54.59
10950	1,2-Dibromoethane	106-93-4	N.D.	61	310	54.59
10950	1,2-Dichloroethane	107-06-2	N.D.	61	310	54.59
10950	Ethylbenzene	100-41-4	72 J	61	310	54.59
10950	Isopropylbenzene	98-82-8	78 J	61	310	54.59
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	31	310	54.59
10950	Toluene	108-88-3	630	61	310	54.59
10950	1,2,4-Trimethylbenzene	95-63-6	180 J	61	310	54.59
10950	1,3,5-Trimethylbenzene	108-67-8	90 J	61	310	54.59
10950	Xylene (Total)	1330-20-7	220 J	61	310	54.59

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	2,000	190	940	5
10724	Benzo(a)anthracene	56-55-3	3,100	190	940	5
10724	Benzo(a)pyrene	50-32-8	3,400	190	940	5
10724	Benzo(b)fluoranthene	205-99-2	4,800	190	940	5
10724	Benzo(g,h,i)perylene	191-24-2	1,300	190	940	5
10724	Chrysene	218-01-9	2,900	190	940	5
10724	Fluorene	86-73-7	1,600	190	940	5
10724	Naphthalene	91-20-3	2,000	190	940	5
10724	Phenanthrene	85-01-8	7,100	190	940	5
10724	Pyrene	129-00-0	5,900	190	940	5

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	1,370	0.222	4.44	40

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	10.9	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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Sample Description: C-142_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-142_1-2'

LLI Sample # SW 6000423
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 11:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

142-C

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/03/2010 11:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016021364	06/03/2010 11:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/03/2010 11:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101652AA	06/14/2010 20:28	Nicholas R Rossi	54.59
10724	PAH 8270 (microwave)	SW-846 8270C	1	10160SLX026	06/18/2010 20:13	Barton C Conner	5
10814	BNA Soil Microwave PAH	SW-846 3546	1	10160SLX026	06/09/2010 14:00	Wanda F Oswald	1
06135	Lead	SW-846 6020	1	101616150001A	06/18/2010 09:09	Choon Y Tian	40
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010 21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010 16:34	Scott W Freisher	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 1 of 2

REVISED

Sample Description: C-131_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-131_1-2'

LLI Sample # SW 6000424
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 14:30 by SS

SUN: Aquaterra Tech.

Submitted: 06/08/2010 16:00

PO Box 744

Reported: 07/16/2010 09:47

West Chester PA 19381

Discard: 09/15/2010

131-C

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	N.D.	0.6	6	0.94
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	0.94
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	0.94
10950	Ethylbenzene	100-41-4	N.D.	1	6	0.94
10950	Isopropylbenzene	98-82-8	N.D.	1	6	0.94
10950	Methyl Tertiary Butyl Ether	1634-04-4	17	0.6	6	0.94
10950	Toluene	108-88-3	3 J	1	6	0.94
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	0.94
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	0.94
10950	Xylene (Total)	1330-20-7	N.D.	1	6	0.94

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample. A surrogate recovery was also outside of QC limits for the re-analysis.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	940 J	220	1,100	5
10724	Benzo(a)anthracene	56-55-3	1,300	220	1,100	5
10724	Benzo(a)pyrene	50-32-8	1,500	220	1,100	5
10724	Benzo(b)fluoranthene	205-99-2	2,200	220	1,100	5
10724	Benzo(g,h,i)perylene	191-24-2	640 J	220	1,100	5
10724	Chrysene	218-01-9	1,600	220	1,100	5
10724	Fluorene	86-73-7	350 J	220	1,100	5
10724	Naphthalene	91-20-3	6,500	220	1,100	5
10724	Phenanthrene	85-01-8	2,900	220	1,100	5
10724	Pyrene	129-00-0	1,900	220	1,100	5

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	396	0.0647	1.29

Wet Chemistry	SM20 2540 G	%	%	%	
00111	Moisture	n.a.	24.2	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

*=This limit was used in the evaluation of the final result



Analysis Report

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

Page 2 of 2

REVISED

Sample Description: C-131_1-2' Grab Soil
Philadelphia Refinery AOI-7
COC: 232891 C-131_1-2'

LLI Sample # SW 6000424
LLI Group # 1197775
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/03/2010 14:30 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/08/2010 16:00

West Chester PA 19381

Reported: 07/16/2010 09:47

Discard: 09/15/2010

131-C

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016021364	06/03/2010 14:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016021364	06/03/2010 14:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016021364	06/03/2010 14:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101621AA	06/11/2010 13:51	Angela D Sneeringer	0.94
10724	PAH 8270 (microwave)	SW-846 8270C	1	10160SLX026	06/18/2010 21:04	Barton C Conner	5
10814	BNA Soil Microwave PAH	SW-846 3546	1	10160SLX026	06/09/2010 14:00	Wanda F Oswald	1
06135	Lead	SW-846 6020	1	101616150001A	06/18/2010 09:15	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101616150001	06/10/2010 21:27	Debra A Bryan	1
00111	Moisture	SM20 2540 G	1	10162820004B	06/11/2010 16:34	Scott W Freisher	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:47 AM

Group Number: 1197775

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X101651AA	Sample number(s): 6000419								
Benzene	< 5	5.	0.5	ug/kg	98	97	80-120	1	30
1,2-Dibromoethane	< 5	5.	1	ug/kg	96	94	80-120	2	30
1,2-Dichloroethane	< 5	5.	1	ug/kg	105	103	71-129	3	30
Ethylbenzene	< 5	5.	1	ug/kg	95	95	80-120	1	30
Isopropylbenzene	< 5	5.	1	ug/kg	95	94	76-120	1	30
Methyl Tertiary Butyl Ether	< 5	5.	0.5	ug/kg	94	92	74-121	3	30
Toluene	< 5	5.	1	ug/kg	95	95	80-120	0	30
1,2,4-Trimethylbenzene	< 5	5.	1	ug/kg	91	91	79-120	0	30
1,3,5-Trimethylbenzene	< 5	5.	1	ug/kg	92	92	78-120	0	30
Xylene (Total)	< 5	5.	1	ug/kg	96	95	80-120	1	30

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL**	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: R101652AA	Sample number(s): 6000422-6000423								
Benzene	N.D.	25.	250	ug/kg	96	93	80-120	4	30
1,2-Dibromoethane	N.D.	50.	250	ug/kg	108	104	80-120	4	30
1,2-Dichloroethane	N.D.	50.	250	ug/kg	103	99	71-129	4	30
Ethylbenzene	N.D.	50.	250	ug/kg	106	101	80-120	5	30
Isopropylbenzene	N.D.	50.	250	ug/kg	104	101	76-120	3	30
Methyl Tertiary Butyl Ether	N.D.	25.	250	ug/kg	100	95	74-121	5	30
Toluene	N.D.	50.	250	ug/kg	105	112	80-120	6	30
1,2,4-Trimethylbenzene	N.D.	50.	250	ug/kg	107	99	79-120	8	30
1,3,5-Trimethylbenzene	N.D.	50.	250	ug/kg	106	96	78-120	10	30
Xylene (Total)	N.D.	50.	250	ug/kg	106	101	80-120	5	30
Batch number: X101621AA	Sample number(s): 6000420-6000421, 6000424								
Benzene	N.D.	0.5	5	ug/kg	97	97	80-120	0	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	98	99	80-120	1	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	106	106	71-129	0	30
Ethylbenzene	N.D.	1.	5	ug/kg	97	99	80-120	2	30
Isopropylbenzene	N.D.	1.	5	ug/kg	96	96	76-120	1	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	99	98	74-121	0	30
Toluene	N.D.	1.	5	ug/kg	95	96	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	96	96	79-120	0	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	96	96	78-120	0	30
Xylene (Total)	N.D.	1.	5	ug/kg	98	98	80-120	1	30
Batch number: 10160SLA026	Sample number(s): 6000420-6000421								
Anthracene	N.D.	33.	170	ug/kg	101		89-109		
Benzo(a)anthracene	N.D.	33.	170	ug/kg	101		86-113		
Benzo(a)pyrene	N.D.	33.	170	ug/kg	101		63-138		

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:47 AM

Group Number: 1197775

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Benzo(b) fluoranthene	N.D.	33.	170	ug/kg	107		61-133		
Benzo(g,h,i) perylene	N.D.	33.	170	ug/kg	117		63-130		
Chrysene	N.D.	33.	170	ug/kg	99		84-117		
Fluorene	N.D.	33.	170	ug/kg	100		84-113		
Naphthalene	N.D.	33.	170	ug/kg	97		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	101		86-109		
Pyrene	N.D.	33.	170	ug/kg	114		86-122		
Batch number: 10160SLX026 Sample number(s): 6000419,6000423-6000424									
Anthracene	N.D.	33.	170	ug/kg	94		89-109		
Benzo(a) anthracene	N.D.	33.	170	ug/kg	101		86-113		
Benzo(a) pyrene	N.D.	33.	170	ug/kg	97		63-138		
Benzo(b) fluoranthene	N.D.	33.	170	ug/kg	108		61-133		
Benzo(g,h,i) perylene	N.D.	33.	170	ug/kg	110		63-130		
Chrysene	N.D.	33.	170	ug/kg	99		84-117		
Fluorene	N.D.	33.	170	ug/kg	106		84-113		
Naphthalene	N.D.	33.	170	ug/kg	91		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	96		86-109		
Pyrene	N.D.	33.	170	ug/kg	98		86-122		
Batch number: 10168SLA026 Sample number(s): 6000422									
Anthracene	N.D.	33.	170	ug/kg	100		89-109		
Benzo(a) anthracene	N.D.	33.	170	ug/kg	99		86-113		
Benzo(a) pyrene	N.D.	33.	170	ug/kg	103		63-138		
Benzo(b) fluoranthene	N.D.	33.	170	ug/kg	113		61-133		
Benzo(g,h,i) perylene	N.D.	33.	170	ug/kg	125		63-130		
Chrysene	N.D.	33.	170	ug/kg	100		84-117		
Fluorene	N.D.	33.	170	ug/kg	94		84-113		
Naphthalene	N.D.	33.	170	ug/kg	97		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	100		86-109		
Pyrene	N.D.	33.	170	ug/kg	98		86-122		
Batch number: 101616150001A Sample number(s): 6000419-6000424									
Lead	N.D.	0.0300	0.200	mg/kg	106		80-120		
Batch number: 10162820004B Sample number(s): 6000419-6000424									
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

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: X101651AA Sample number(s): 6000419 UNSPK: P000370									
Benzene	107		55-143						
1,2-Dibromoethane	109		54-129						
1,2-Dichloroethane	118		53-143						
Ethylbenzene	105		44-141						
Isopropylbenzene	103		38-144						
Methyl Tertiary Butyl Ether	108		55-129						

*- Outside of specification

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Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:47 AM

Group Number: 1197775

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
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<u>Analysis Name</u>	<u>MS</u> <u>%REC</u>	<u>MSD</u> <u>%REC</u>	<u>MS/MSD</u> <u>Limits</u>	<u>RPD</u>	<u>RPD</u> <u>MAX</u>	<u>BKG</u> <u>Conc</u>	<u>DUP</u> <u>Conc</u>	<u>DUP</u> <u>RPD</u>	<u>Dup RPD</u> <u>Max</u>
Toluene	103		50-146						
1,2,4-Trimethylbenzene	102		37-149						
1,3,5-Trimethylbenzene	101		38-150						
Xylene (Total)	104		44-136						
Batch number: X101621AA Sample number(s): 6000420-6000421,6000424 UNSPK: P997282									
Benzene	107		55-143						
1,2-Dibromoethane	107		54-129						
1,2-Dichloroethane	117		53-143						
Ethylbenzene	107		44-141						
Isopropylbenzene	107		38-144						
Methyl Tertiary Butyl Ether	103		55-129						
Toluene	106		50-146						
1,2,4-Trimethylbenzene	105		37-149						
1,3,5-Trimethylbenzene	105		38-150						
Xylene (Total)	107		44-136						
Batch number: 10160SLA026 Sample number(s): 6000420-6000421 UNSPK: P60LAUS									
Anthracene	89	32*	76-111	30	30				
Benzo(a)anthracene	-58 (2)	-232 (2)	78-111	47*	30				
Benzo(a)pyrene	-75 (2)	-200 (2)	57-129	40*	30				
Benzo(b)fluoranthene	-144 (2)	-321 (2)	53-131	40*	30				
Benzo(g,h,i)perylene	-5*	-41*	60-123	33*	30				
Chrysene	-79 (2)	-242 (2)	76-114	45*	30				
Fluorene	94	74*	75-111	15	30				
Naphthalene	78	70	33-140	6	30				
Phenanthrene	181*	-87*	69-115	63*	30				
Pyrene	-117 (2)	-369 (2)	76-124	28	30				
Batch number: 10160SLX026 Sample number(s): 6000419,6000423-6000424 UNSPK: 6000419									
Anthracene	83	32*	76-111	26	30				
Benzo(a)anthracene	-39 (2)	-207 (2)	78-111	45*	30				
Benzo(a)pyrene	-61 (2)	-167 (2)	57-129	33*	30				
Benzo(b)fluoranthene	-116 (2)	-257 (2)	53-131	37*	30				
Benzo(g,h,i)perylene	16*	-73*	60-123	39*	30				
Chrysene	-2 (2)	-162 (2)	76-114	43*	30				
Fluorene	107	86	75-111	14	30				
Naphthalene	83	72	33-140	9	30				
Phenanthrene	162*	-80*	69-115	58*	30				
Pyrene	45 (2)	-212 (2)	76-124	42*	30				
Batch number: 10168SLA026 Sample number(s): 6000422 UNSPK: P000420									
Anthracene	70*	99	76-111	27	30				

*- Outside of specification

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Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:47 AM

Group Number: 1197775

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	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Benzo(a)anthracene	129*	102	78-111	15	30				
Benzo(a)pyrene	128	96	57-129	17	30				
Benzo(b)fluoranthene	135*	105	53-131	14	30				
Benzo(g,h,i)perylene	141*	111	60-123	16	30				
Chrysene	131*	96	76-114	18	30				
Fluorene	92	91	75-111	1	30				
Naphthalene	140	136	33-140	2	30				
Phenanthrene	135*	108	69-115	15	30				
Pyrene	134*	103	76-124	16	30				

Batch number: 101616150001A Sample number(s): 6000419-6000424 UNSPK: 6000419 BKG: 6000419
Lead 1200 8187 75-125 25* 20 698 1,310 61* 20
(2) (2)

Batch number: 10162820004B Sample number(s): 6000419-6000424 BKG: P999935
Moisture 19.9 20.4 2 15

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(4.3)by 8260(soil)
Batch number: R101652AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6000422	84	85	82	104
6000423	88	87	92	98
Blank	92	90	99	103
LCS	95	98	101	102
LCSD	91	93	98	99
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6000420	99	101	105	85
6000421	100	107	97	96
6000424	101	99	118	78
Blank	98	101	97	98
LCS	101	104	102	98
LCSD	100	104	103	99
MS	99	101	104	100
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101651AA

*- Outside of specification

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Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:47 AM

Group Number: 1197775

Surrogate Quality Control

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6000419	101	103	100	85
Blank	100	102	94	92
LCS	99	105	101	98
LCSD	98	104	102	97
MS	100	109	101	100
Limits:	71-114	70-109	70-123	70-111

Analysis Name: PAH 8270 (microwave)

Batch number: 10160SLA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6000420	89	98	134*
6000421	90	97	134*
Blank	96	102	93
LCS	93	103	93
MS	90	96	117*
MSD	89	94	134*
Limits:	55-121	74-110	57-112

Analysis Name: PAH 8270 (microwave)

Batch number: 10160SLX026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6000419	89	103	83
6000423	78	79	69
6000424	71	80	71
Blank	89	96	78
LCS	87	93	76
MS	90	103	92
MSD	94	101	87
Limits:	55-121	74-110	57-112

Analysis Name: PAH 8270 (microwave)

Batch number: 10168SLA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6000422	98	97	82
Blank	96	101	87
LCS	92	102	85
MS	97	107	72
MSD	94	97	71
Limits:	55-121	74-110	57-112

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group # 1197775 Sample # 6080419-24

COC # 232891

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

0.8-1.2°C

1 Client: <u>SUN-AQUATERRA</u> Acct. #: _____ Project Name/ #: <u>PHILA REF AOI-7 (SUNCO)</u> PWSID #: _____ Project Manager: <u>T. DOERR</u> P.O. #: _____ Sampler: <u>S. SYKES</u> Quote #: _____ Name of state where samples were collected: <u>PA</u>				4 Matrix: _____ Check if Applicable: <input type="checkbox"/> NPDES <input type="checkbox"/> Other: _____ Total # of Containers: _____		5 Analyses Requested <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="10">Preservation Codes</th> </tr> <tr> <td>Lead (Total)</td> <td>1/2 Di-Chloromethane</td> <td>Ethylene Dichloride</td> <td>1,2,4-Trichlorobenzene</td> <td>Benzene, Cumene, Ethylbenzene, m,p-Xylene, Toluene, Xylenes</td> <td>Anthracene, Benzo(a)anthracene</td> <td>Benz(a)pyrene</td> <td>Benzo(a)pyrene</td> <td>Benzo(b)fluoranthene</td> <td>Chrysene, Fluorene</td> <td>Naphthalene, Phenanthrene</td> </tr> </table>										Preservation Codes										Lead (Total)	1/2 Di-Chloromethane	Ethylene Dichloride	1,2,4-Trichlorobenzene	Benzene, Cumene, Ethylbenzene, m,p-Xylene, Toluene, Xylenes	Anthracene, Benzo(a)anthracene	Benz(a)pyrene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene, Fluorene	Naphthalene, Phenanthrene	For Lab Use Only FSC: _____ SCR#: _____ Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other	
Preservation Codes																																						
Lead (Total)	1/2 Di-Chloromethane	Ethylene Dichloride	1,2,4-Trichlorobenzene	Benzene, Cumene, Ethylbenzene, m,p-Xylene, Toluene, Xylenes	Anthracene, Benzo(a)anthracene	Benz(a)pyrene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene, Fluorene	Naphthalene, Phenanthrene																												
2 Sample Identification				3 Date Collected Time Collected		6 Remarks		Temperature of samples upon receipt (if requested)																														
Date Collected Time Collected		Date Collected Time Collected		Date Collected Time Collected		Date Collected Time Collected																																
C-130-1-2'		6/2/2010 830		X		X																																
C-129-1-2'		6/2/2010 1100		X		X																																
C-139-1-2'		6/2/2010 1430		X		X																																
C-143-1-2'		6/3/2010 900		X		X																																
C-142-1-2'		6/3/2010 1100		X		X																																
C-131-1-2'		6/3/2010 1430		X		X		X																														
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: _____				Relinquished by: <u>[Signature]</u> Date: <u>6/14/10</u> Time: <u>1300</u> Relinquished by: <u>[Signature]</u> Date: <u>6/18/10</u> Time: <u>950</u> Relinquished by: <u>[Signature]</u> Date: <u>6/18/10</u> Time: <u>1600</u> Relinquished by: _____ Date: _____ Time: _____				Received by: <u>Fridge</u> Date: <u>6/14/10</u> Time: <u>1300</u> Received by: <u>[Signature]</u> Date: <u>6/18/10</u> Time: <u>950</u> Received by: <u>[Signature]</u> Date: <u>6/18/10</u> Time: <u>1600</u> Received by: _____ Date: _____ Time: _____																														
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes No Type IV (CLP SOW) (If yes, indicate QC sample and submit triplicate volume.) Type VI (Raw Data Only) Internal COC Required? Yes / No				SDG Complete? Yes No																																		

10132/1197775/6000419-24

Table 1 (continued)
Constituents of Concern for Soil
AOI 7 Work Plan for Site Characterization
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

METALS	CAS No.
Lead (total)	7439-92-1

VOLATILE ORGANIC COMPOUNDS	CAS No.
1,2-dichloroethane	107-06-2
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Ethylene dibromide	106-93-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

SEMI-VOLATILE ORGANIC COMPOUNDS	CAS No.
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo (g,h,i) perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

Notes:

1. Constituents are from Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E (pgs. 29-30) of PADEP Document, *Closure Requirements for Underground Storage Tank Systems*, effective April 1, 1998 and the March 18, 2008 revised PADEP Petroleum Short List.

Explanation of Symbols and Abbreviations

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

RL	Rounded Lead	BMQL	Bottom Material
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Tolerances are indicated by the symbol < (e.g., 0.001 inches) or the symbol < (e.g., 0.001 inches) indicating a tolerance of 0.001 inches.		
>	Greater than		
J	Joint - Tolerances are indicated by the symbol ≥ (e.g., 0.001 inches) or the symbol ≤ (e.g., 0.001 inches) indicating a tolerance of 0.001 inches.		
ppm	Parts per million - Ozone is measured in parts per million (ppm) or in milligrams per liter (mg/l). The symbol ppm is used for all other substances.		
ppb	Parts per billion		
Dry weight basis	Residue is reported on a dry weight basis. The symbol T is used for total residue and the symbol A is used for ash-free residue.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a total ion chromatogram.	B	Volatile is CRDL ≥ IDL
B	Absence of a peak is indicated by the symbol B.	E	Elemental is indicated by the symbol E.
C	Peak is indicated by the symbol C.	M	Detection limit is indicated by the symbol M.
D	Concentration is indicated by the symbol D.	N	Sample is indicated by the symbol N.
E	Concentration is indicated by the symbol E.	S	Material is indicated by the symbol S.
N	Peak is indicated by the symbol N.	U	Concentration is indicated by the symbol U.
P	Concentration is indicated by the symbol P.	W	Peak is indicated by the symbol W.
U	Concentration is indicated by the symbol U.	*	Detection limit is indicated by the symbol *.
X,Y,Z	Detection limit is indicated by the symbol X,Y,Z.	+	Concentration is indicated by the symbol +.

Absence of a peak is indicated by the symbol B.

Material is indicated by the symbol S.

Total ion chromatogram is indicated by the symbol TIC. The symbol C is used for concentration and the symbol U is used for unit. The symbol W is used for weight and the symbol T is used for total. The symbol A is used for ash-free.

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Analysis Report

REVISED

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 16, 2010

Project: SUN: Philadelphia Refinery AOI-2/AOI-7

Submittal Date: 06/15/2010
Group Number: 1198981
PO Number: PHILADELPHIA
State of Sample Origin: PA

Client Sample Description

S-307_0-2 Grab Soil
S-135_0-2 Grab Soil
S-299_0-2 Grab Soil

Lancaster Labs (LLI)

6007699
6007700
6007701

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Langan	Attn: Dennis Webster
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Megan Breen
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Tiffani Doerr
ELECTRONIC COPY TO	LLI	Attn: EDD Group
ELECTRONIC COPY TO	Langan	Attn: Kristen Ward

REVISED

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Adrienne Kuhl
Specialist Group Leader



Analysis Report

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Sample Description: S-307_0-2 Grab Soil
Philadelphia Refinery AOI-2
COC: 234217 S-307_0-2

LLI Sample # SW 6007699
LLI Group # 1198981
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/10/2010 12:00 by JRW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP307

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	< 5	5	0.5	0.88
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.88
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.88
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.88
10950	Isopropylbenzene	98-82-8	< 5	5	0.9	0.88
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.88
10950	Toluene	108-88-3	< 5	5	0.9	0.88
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.88
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.88
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.88

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	< 180	180	36	1
10724	Benzo(a)anthracene	56-55-3	320	180	36	1
10724	Benzo(a)pyrene	50-32-8	290	180	36	1
10724	Benzo(b)fluoranthene	205-99-2	340	180	36	1
10724	Benzo(g,h,i)perylene	191-24-2	< 180	180	36	1
10724	Chrysene	218-01-9	300	180	36	1
10724	Fluorene	86-73-7	< 180	180	36	1
10724	Naphthalene	91-20-3	< 180	180	36	1
10724	Phenanthrene	85-01-8	570	180	36	1
10724	Pyrene	129-00-0	560	180	36	1

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	48.4	0.211	0.0106	2

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	6.2	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
---------	---------------	--------	--------	--------	------------------------	---------	-----------------

*=This limit was used in the evaluation of the final result

Sample Description: S-307_0-2 Grab Soil
 Philadelphia Refinery AOI-2
 COC: 234217 S-307_0-2

LLI Sample # SW 6007699
 LLI Group # 1198981
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/10/2010 12:00 by JRW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP307

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 12:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010 12:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010 12:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101731AA	06/22/2010 18:03	Kelly E Keller	0.88
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/24/2010 21:05	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150001A	06/23/2010 15:48	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1

Sample Description: S-135_0-2 Grab Soil
Philadelphia Refinery AOI-7
COC: 234217 S-135_0-2

LLI Sample # SW 6007700
LLI Group # 1198981
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/10/2010 09:15 by JRW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP135

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.88
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.88
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.88
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.88
10950	Isopropylbenzene	98-82-8	< 5	5	0.9	0.88
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.88
10950	Toluene	108-88-3	< 5	5	0.9	0.88
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.88
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.88
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.88
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	< 170	170	34	1
10724	Benzo(a)anthracene	56-55-3	< 170	170	34	1
10724	Benzo(a)pyrene	50-32-8	< 170	170	34	1
10724	Benzo(b)fluoranthene	205-99-2	< 170	170	34	1
10724	Benzo(g,h,i)perylene	191-24-2	< 170	170	34	1
10724	Chrysene	218-01-9	< 170	170	34	1
10724	Fluorene	86-73-7	< 170	170	34	1
10724	Naphthalene	91-20-3	< 170	170	34	1
10724	Phenanthrene	85-01-8	< 170	170	34	1
10724	Pyrene	129-00-0	< 170	170	34	1
Metals SW-846 6020						
06135	Lead	7439-92-1	4.31	0.202	0.0101	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	3.0	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 09:15	Client Supplied	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Sample Description: S-135_0-2 Grab Soil
Philadelphia Refinery AOI-7
COC: 234217 S-135_0-2

LLI Sample # SW 6007700
LLI Group # 1198981
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/10/2010 09:15 by JRW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP135

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis		Analyst	Dilution Factor
					Date	Time		
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010	09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010	09:15	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101731AA	06/22/2010	18:26	Kelly E Keller	0.88
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/24/2010	21:55	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150001A	06/23/2010	15:49	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010	20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010	18:33	Scott W Freisher	1

*=This limit was used in the evaluation of the final result



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Sample Description: S-299_0-2 Grab Soil
Philadelphia Refinery AOI-2
COC: 234217 S-299_0-2

LLI Sample # SW 6007701
LLI Group # 1198981
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/08/2010 13:00 by JRW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP299

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.9
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.9
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.9
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.9
10950	Isopropylbenzene	98-82-8	< 5	5	0.9	0.9
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.9
10950	Toluene	108-88-3	< 5	5	0.9	0.9
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.9
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.9
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.9
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	< 170	170	34	1
10724	Benzo(a)anthracene	56-55-3	< 170	170	34	1
10724	Benzo(a)pyrene	50-32-8	< 170	170	34	1
10724	Benzo(b)fluoranthene	205-99-2	< 170	170	34	1
10724	Benzo(g,h,i)perylene	191-24-2	< 170	170	34	1
10724	Chrysene	218-01-9	< 170	170	34	1
10724	Fluorene	86-73-7	< 170	170	34	1
10724	Naphthalene	91-20-3	< 170	170	34	1
10724	Phenanthrene	85-01-8	< 170	170	34	1
10724	Pyrene	129-00-0	< 170	170	34	1
Metals SW-846 6020						
06135	Lead	7439-92-1	12.2	0.202	0.0101	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	2.1	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 13:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: S-299_0-2 Grab Soil
 Philadelphia Refinery AOI-2
 COC: 234217 S-299_0-2

LLI Sample # SW 6007701
 LLI Group # 1198981
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-2/AOI-7

Collected: 06/08/2010 13:00 by JRW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:44

Discard: 09/15/2010

SP299

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 5035	1	201016721436	06/08/2010 13:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 13:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 09:34	Angela D Sneeringer	0.9
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/24/2010 22:44	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:35	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:44 AM

Group Number: 1198981

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X101691AA	Sample number(s): 6007701								
Benzene	< 5	5.	0.5	ug/kg	92	90	80-120	2	30
1,2-Dibromoethane	< 5	5.	1	ug/kg	90	86	80-120	4	30
1,2-Dichloroethane	< 5	5.	1	ug/kg	96	93	71-129	4	30
Ethylbenzene	< 5	5.	1	ug/kg	92	90	80-120	2	30
Isopropylbenzene	< 5	5.	1	ug/kg	90	91	76-120	0	30
Methyl Tertiary Butyl Ether	< 5	5.	0.5	ug/kg	107	102	74-121	5	30
Toluene	< 5	5.	1	ug/kg	90	87	80-120	4	30
1,2,4-Trimethylbenzene	< 5	5.	1	ug/kg	88	87	79-120	1	30
1,3,5-Trimethylbenzene	< 5	5.	1	ug/kg	88	86	78-120	2	30
Xylene (Total)	< 5	5.	1	ug/kg	93	92	80-120	1	30
Batch number: X101731AA	Sample number(s): 6007699-6007700								
Benzene	< 5	5.	0.5	ug/kg	91	87	80-120	4	30
1,2-Dibromoethane	< 5	5.	1	ug/kg	91	88	80-120	3	30
1,2-Dichloroethane	< 5	5.	1	ug/kg	94	90	71-129	4	30
Ethylbenzene	< 5	5.	1	ug/kg	93	89	80-120	4	30
Isopropylbenzene	< 5	5.	1	ug/kg	93	89	76-120	5	30
Methyl Tertiary Butyl Ether	< 5	5.	0.5	ug/kg	104	100	74-121	4	30
Toluene	< 5	5.	1	ug/kg	89	87	80-120	3	30
1,2,4-Trimethylbenzene	< 5	5.	1	ug/kg	87	86	79-120	2	30
1,3,5-Trimethylbenzene	< 5	5.	1	ug/kg	87	86	78-120	1	30
Xylene (Total)	< 5	5.	1	ug/kg	93	90	80-120	4	30
Batch number: 10167SLF026	Sample number(s): 6007699-6007701								
Anthracene	< 170	170.	33	ug/kg	94		89-109		
Benzo(a)anthracene	< 170	170.	33	ug/kg	100		86-113		
Benzo(a)pyrene	< 170	170.	33	ug/kg	92		63-138		
Benzo(b)fluoranthene	< 170	170.	33	ug/kg	104		61-133		
Benzo(g,h,i)perylene	< 170	170.	33	ug/kg	103		63-130		
Chrysene	< 170	170.	33	ug/kg	96		84-117		
Fluorene	< 170	170.	33	ug/kg	106		84-113		
Naphthalene	< 170	170.	33	ug/kg	91		83-112		
Phenanthrene	< 170	170.	33	ug/kg	93		86-109		
Pyrene	< 170	170.	33	ug/kg	101		86-122		
Batch number: 101676150001A	Sample number(s): 6007699-6007701								
Lead	< 0.200	0.200	0.0100	mg/kg	110		80-120		
Batch number: 10168820006A	Sample number(s): 6007699-6007701								
Moisture					100		99-101		

Sample Matrix Quality Control

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.

Group Number: 1198981

Reported: 07/16/10 at 09:44 AM

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Background (BKG) = the sample used in conjunction with the duplicate

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: X101691AA	Sample number(s): 6007701 UNSPK: P004640								
Benzene	78		55-143						
1,2-Dibromoethane	76		54-129						
1,2-Dichloroethane	86		53-143						
Ethylbenzene	83		44-141						
Isopropylbenzene	88		38-144						
Methyl Tertiary Butyl Ether	90		55-129						
Toluene	57		50-146						
1,2,4-Trimethylbenzene	70		37-149						
1,3,5-Trimethylbenzene	76		38-150						
Xylene (Total)	79		44-136						
Batch number: X101731AA	Sample number(s): 6007699-6007700 UNSPK: P007872								
Benzene	104		55-143						
1,2-Dibromoethane	102		54-129						
1,2-Dichloroethane	107		53-143						
Ethylbenzene	101		44-141						
Isopropylbenzene	101		38-144						
Methyl Tertiary Butyl Ether	120		55-129						
Toluene	100		50-146						
1,2,4-Trimethylbenzene	99		37-149						
1,3,5-Trimethylbenzene	100		38-150						
Xylene (Total)	102		44-136						
Batch number: 10167SLF026	Sample number(s): 6007699-6007701 UNSPK: P007702								
Anthracene	94	95	76-111	1	30				
Benzo(a)anthracene	88	86	78-111	2	30				
Benzo(a)pyrene	76	76	57-129	0	30				
Benzo(b)fluoranthene	79	81	53-131	2	30				
Benzo(g,h,i)perylene	93	80	60-123	13	30				
Chrysene	89	87	76-114	2	30				
Fluorene	98	96	75-111	1	30				
Naphthalene	57	36	33-140	16	30				
Phenanthrene	85	81	69-115	3	30				
Pyrene	93	89	76-124	3	30				
Batch number: 101676150001A	Sample number(s): 6007699-6007701 UNSPK: P007928 BKG: P007928								
Lead	150 (2)	489 (2)	75-125	15	20	58.2	98.7	52*	20
Batch number: 10168820006A	Sample number(s): 6007699-6007701 BKG: P007707								
Moisture						21.2	23.6	11	15

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(4.3)by 8260(soil)

Batch number: X101691AA

Dibromofluoromethane

1,2-Dichloroethane-d4

Toluene-d8

4-Bromofluorobenzene

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:44 AM

Group Number: 1198981

Surrogate Quality Control

6007701	102	108	89	88
Blank	100	97	94	93
LCS	102	102	99	95
LCSD	99	99	99	96
MS	102	111*	98	99

Limits:	71-114	70-109	70-123	70-111
---------	--------	--------	--------	--------

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101731AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007699	98	102	102	83
6007700	101	107	96	82
Blank	101	93	91	91
LCS	103	97	99	96
LCSD	100	99	97	96
MS	101	102	98	94

Limits:	71-114	70-109	70-123	70-111
---------	--------	--------	--------	--------

Analysis Name: PAH 8270 (microwave)
Batch number: 10167SLF026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6007699	88	97	80
6007700	88	92	83
6007701	85	95	84
Blank	92	95	84
LCS	92	95	87
MS	86	96	89
MSD	86	99	88

Limits:	55-121	74-110	57-112
---------	--------	--------	--------

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

- (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.



**Lancaster
Laboratories**

Acct. # 10132 Group# 1198981 Sample # 6007699-701 **COC #** 234217

0.9-1.4°

FSC: _____
SCR#: _____

H=HCl **T=Thiosulfate**
N=HNO₃ **B=NaOH**
S=H₂SO₄ **O=Other**

6

temperature of samples

[illegible]

2102.03

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Material or Blank Material Limit
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony-Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Test results are reported as less than the <u>MDL</u> (Method Detection Limit) or the LOQ (Limit of Quantitation) when the concentration is below the detection limit.		
>	Greater than		
J	Joint Factories and Chemicals Association (JFCA) Method Detection Limit (MDL) or the LOQ (Limit of Quantitation)		
ppm	Parts per million - One part in one million (g/g) or one millionth (g/l) of a substance. For example, 1 ppm of a substance in water means there is 1 gram of the substance in 1,000,000 grams of water.		
ppb	Parts per billion		
Dry weight basis	Reported as dry weight basis (DWB) means the concentration is based on the dry weight of the sample, not the wet weight. The dry weight is determined by drying the sample to a constant weight at 105°C for 24 hours.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC (Total Ion Chromatogram) results are reported as A.	B	V (Volatility) results are reported as B.
B	A (Absorbance) results are reported as B.	E	E (Elemental) results are reported as E.
C	P (Peak) results are reported as C.	M	D (Detection) results are reported as M.
D	C (Concentration) results are reported as D.	N	S (Sample) results are reported as N.
E	C (Concentration) results are reported as E.	S	M (Method) results are reported as S.
N	P (Peak) results are reported as N.	U	C (Concentration) results are reported as U.
P	C (Concentration) results are reported as P.	W	P (Peak) results are reported as W.
U	C (Concentration) results are reported as U.	*	D (Detection) results are reported as *.
X,Y,Z	D (Detection) results are reported as X,Y,Z.	+	C (Concentration) results are reported as +.

A (Absorbance) results are reported as A. NELAC (National Environmental Laboratories Accreditation Council) results are reported as NELAC.

M (Method) results are reported as M. NELAC (National Environmental Laboratories Accreditation Council) results are reported as NELAC.

T (Total Ion Chromatogram) results are reported as T. C (Concentration) results are reported as C. U (Volatility) results are reported as U. W (Peak) results are reported as W. D (Detection) results are reported as D. S (Sample) results are reported as S. M (Method) results are reported as M. C (Concentration) results are reported as C. P (Peak) results are reported as P. A (Absorbance) results are reported as A. B (Volatility) results are reported as B. E (Elemental) results are reported as E. V (Volatility) results are reported as V. CRDL (Critical Response Detection Limit) results are reported as CRDL.

WARRANTY AND LIMITS OF LIABILITY - Lancaster Laboratories warrants that the products and services it provides are free from defects in materials and workmanship for a period of 24 months from the date of purchase. This warranty is limited to the products and services provided by Lancaster Laboratories and does not extend to any other products or services. Lancaster Laboratories disclaims 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. W (Warranty) results are reported as W. L (Limit) results are reported as L. S (Sample) results are reported as S. T (Total Ion Chromatogram) results are reported as T. C (Concentration) results are reported as C. P (Peak) results are reported as P. A (Absorbance) results are reported as A. B (Volatility) results are reported as B. E (Elemental) results are reported as E. V (Volatility) results are reported as V. CRDL (Critical Response Detection Limit) results are reported as CRDL.

REVISED

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 16, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 06/15/2010
Group Number: 1198982
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionLancaster Labs (LLI) #

BH-10-24_1.0-1.5 Grab Soil	6007702
BH-10-23_1.0-1.5 Grab Soil	6007703
BH-10-25_1.2-1.7 Grab Soil	6007704
BH-10-26_1.5-2.0 Grab Soil	6007705
BH-10-29_0.7-1.2 Grab Soil	6007706
BH-10-30_1.5-2.0 Grab Soil	6007707
BH-10-28_1.5-2.0 Grab Soil	6007708
BH-10-27_1.5-2.0 Grab Soil	6007709
BH-10-33_1.5-2.0 Grab Soil	6007710
BH-10-35_1.3-1.7 Grab Soil	6007711
BH-10-34_1.0-1.5 Grab Soil	6007712
BH-10-32_0.5-1.0 Grab Soil	6007713
BH-10-31_1.5-2.0 Grab Soil	6007714
BH-10-22_1.5-2.0 Grab Soil	6007715
BH-10-21_1.0-1.5 Grab Soil	6007716
BH-10-20_1.3-1.8 Grab Soil	6007717
BH-10-19_0.5-1.0 Grab Soil	6007718
BH-10-18_1.5-2.0 Grab Soil	6007719
BH-10-17_1.5-2.0 Grab Soil	6007720
BH-10-06_1.2-1.7 Grab Soil	6007721
BH-10-05_1.5-2.0 Grab Soil	6007722
BH-10-13_1.5-2.0 Grab Soil	6007723
BH-10-14_1.5-2.0 Grab Soil	6007724
BH-10-15_1.4-1.9 Grab Soil	6007725
BH-10-16_1.5-2.0 Grab Soil	6007726
BH-10-12_1.5-2.0 Grab Soil	6007727
BH-10-11_1.5-2.0 Grab Soil	6007728
BH-10-10_1.5-2.0 Grab Soil	6007729
BH-10-08_1.5-2.0 Grab Soil	6007730

BH-10-09_1.2-1.7 Grab Soil
BH-10-07_1.0-1.5 Grab Soil

6007731
6007732

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The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Langan	Attn: Dennis Webster
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Megan Breen
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Tiffani Doerr
ELECTRONIC COPY TO	LLI	Attn: EDD Group
ELECTRONIC COPY TO	Langan	Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Adrienne Kuhl
Specialist Group Leader



Analysis Report

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

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Sample Description: BH-10-24_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-24_1.0-1.5

LLI Sample # SW 6007702
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 08:45 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI24

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	94 J	36	360	66.83
10950	1,2-Dibromoethane	106-93-4	N.D.	73	360	66.83
10950	1,2-Dichloroethane	107-06-2	N.D.	73	360	66.83
10950	Ethylbenzene	100-41-4	780	73	360	66.83
10950	Isopropylbenzene	98-82-8	280 J	73	360	66.83
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	36	360	66.83
10950	Toluene	108-88-3	180 J	73	360	66.83
10950	1,2,4-Trimethylbenzene	95-63-6	830	73	360	66.83
10950	1,3,5-Trimethylbenzene	108-67-8	340 J	73	360	66.83
10950	Xylene (Total)	1330-20-7	890	73	360	66.83

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	83 J	36	180	1
10724	Benzo(a)anthracene	56-55-3	270	36	180	1
10724	Benzo(a)pyrene	50-32-8	310	36	180	1
10724	Benzo(b)fluoranthene	205-99-2	430	36	180	1
10724	Benzo(g,h,i)perylene	191-24-2	180	36	180	1
10724	Chrysene	218-01-9	280	36	180	1
10724	Fluorene	86-73-7	80 J	36	180	1
10724	Naphthalene	91-20-3	1,400	36	180	1
10724	Phenanthrene	85-01-8	480	36	180	1
10724	Pyrene	129-00-0	440	36	180	1

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	411	0.0528	1.06	10

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	8.0	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
---------	---------------	--------	--------	--------	------------------------	---------	-----------------

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-24_1.0-1.5 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-24_1.0-1.5

LLI Sample # SW 6007702
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 08:45 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI24

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 08:45	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/07/2010 08:45	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010 08:45	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 07:50	Holly Berry	66.83
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/23/2010 10:37	Linda M Hartenstine	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:37	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1



Analysis Report

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Sample Description: BH-10-23_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-23_1.0-1.5

LLI Sample # SW 6007703
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 09:45 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI23

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	19	0.8	8	1.48
10950	1,2-Dibromoethane	106-93-4	N.D.	2	8	1.48
10950	1,2-Dichloroethane	107-06-2	N.D.	2	8	1.48
10950	Ethylbenzene	100-41-4	N.D.	2	8	1.48
10950	Isopropylbenzene	98-82-8	N.D.	2	8	1.48
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.8	8	1.48
10950	Toluene	108-88-3	10	2	8	1.48
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	2	8	1.48
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	2	8	1.48
10950	Xylene (Total)	1330-20-7	3 J	2	8	1.48

The GC/MS volatile analysis was performed outside of the method specified 14 day holding time.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	52 J	37	180	1
10724	Benzo(a)anthracene	56-55-3	200	37	180	1
10724	Benzo(a)pyrene	50-32-8	240	37	180	1
10724	Benzo(b)fluoranthene	205-99-2	320	37	180	1
10724	Benzo(g,h,i)perylene	191-24-2	140 J	37	180	1
10724	Chrysene	218-01-9	210	37	180	1
10724	Fluorene	86-73-7	N.D.	37	180	1
10724	Naphthalene	91-20-3	110 J	37	180	1
10724	Phenanthrene	85-01-8	170 J	37	180	1
10724	Pyrene	129-00-0	310	37	180	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	623	0.110	2.19	20

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	8.8	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-23_1.0-1.5 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-23_1.0-1.5

LLI Sample # SW 6007703
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 09:45 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI23

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 09:45	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/07/2010 09:45	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010 09:45	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101752AA	06/24/2010 18:02	Sara E Johnson	1.48
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/24/2010 23:34	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:39	Choon Y Tian	20
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1



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Sample Description: BH-10-25_1.2-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-25_1.2-1.7

LLI Sample # SW 6007704
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 11:00 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI25

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	31,000	490	4,900	661.42
10950	1,2-Dibromoethane	106-93-4	N.D.	97	490	66.14
10950	1,2-Dichloroethane	107-06-2	N.D.	97	490	66.14
10950	Ethylbenzene	100-41-4	510	97	490	66.14
10950	Isopropylbenzene	98-82-8	N.D.	97	490	66.14
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	49	490	66.14
10950	Toluene	108-88-3	2,800	97	490	66.14
10950	1,2,4-Trimethylbenzene	95-63-6	200 J	97	490	66.14
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	97	490	66.14
10950	Xylene (Total)	1330-20-7	1,300	97	490	66.14
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	450	49	250	1
10724	Benzo(a)anthracene	56-55-3	360	49	250	1
10724	Benzo(a)pyrene	50-32-8	380	49	250	1
10724	Benzo(b)fluoranthene	205-99-2	770	49	250	1
10724	Benzo(g,h,i)perylene	191-24-2	270	49	250	1
10724	Chrysene	218-01-9	440	49	250	1
10724	Fluorene	86-73-7	170 J	49	250	1
10724	Naphthalene	91-20-3	5,500	49	250	1
10724	Phenanthrene	85-01-8	1,600	49	250	1
10724	Pyrene	129-00-0	540	49	250	1
Metals SW-846 6020						
06135	Lead	7439-92-1	79.4	0.0144	0.289	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	32.1	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 11:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-25_1.2-1.7 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-25_1.2-1.7

LLI Sample # SW 6007704
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 11:00 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI25

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 5035	1	201016721436	06/07/2010 11:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010 11:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 10:07	Holly Berry	66.14
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 10:29	Holly Berry	661.42
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 00:24	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:41	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1

Sample Description: BH-10-26_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-26_1.5-2.0

LLI Sample # SW 6007705
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 11:35 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI26

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	3 J	0.6	6	0.92
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	0.92
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	0.92
10950	Ethylbenzene	100-41-4	N.D.	1	6	0.92
10950	Isopropylbenzene	98-82-8	N.D.	1	6	0.92
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	0.92
10950	Toluene	108-88-3	2 J	1	6	0.92
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	0.92
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	0.92
10950	Xylene (Total)	1330-20-7	N.D.	1	6	0.92
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	3,600	41	210	1
10724	Benzo(a)anthracene	56-55-3	5,800	210	1,000	5
10724	Benzo(a)pyrene	50-32-8	4,300	41	210	1
10724	Benzo(b)fluoranthene	205-99-2	6,100	210	1,000	5
10724	Benzo(g,h,i)perylene	191-24-2	1,200	41	210	1
10724	Chrysene	218-01-9	5,400	210	1,000	5
10724	Fluorene	86-73-7	1,100	41	210	1
10724	Naphthalene	91-20-3	3,300	41	210	1
10724	Phenanthrene	85-01-8	2,800	41	210	1
10724	Pyrene	129-00-0	8,200	210	1,000	5
Metals SW-846 6020						
06135	Lead	7439-92-1	2,040	0.307	6.13	50
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	19.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 11:35	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-26_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-26_1.5-2.0

LLI Sample # SW 6007705
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 11:35 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI26

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 5035	1	201016721436	06/07/2010 11:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010 11:35	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 09:57	Angela D Sneeringer	0.92
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 01:14	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 21:14	Barton C Conner	5
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:43	Choon Y Tian	50
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1



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Sample Description: BH-10-29_0.7-1.2 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-29_0.7-1.2

LLI Sample # SW 6007706
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 13:25 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI29

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	10	5	0.5	0.99
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.99
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.99
10950	Ethylbenzene	100-41-4	< 5	5	1	0.99
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.99
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.99
10950	Toluene	108-88-3	28	5	1	0.99
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.99
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.99
10950	Xylene (Total)	1330-20-7	6	5	1	0.99
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	< 180	180	37	1
10724	Benzo(a)anthracene	56-55-3	210	180	37	1
10724	Benzo(a)pyrene	50-32-8	230	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	360	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	< 180	180	37	1
10724	Chrysene	218-01-9	240	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	200	180	37	1
10724	Phenanthrene	85-01-8	210	180	37	1
10724	Pyrene	129-00-0	290	180	37	1
Metals SW-846 6020						
06135	Lead	7439-92-1	395	1.08	0.0540	10
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	9.2	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 13:25	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-29_0.7-1.2 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-29_0.7-1.2

LLI Sample # SW 6007706
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 13:25 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI29

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 5035	1	201016721436	06/07/2010 13:25	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010 13:25	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 08:04	Angela D Sneeringer	0.99
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 02:04	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:44	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1



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Sample Description: BH-10-30_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-30_1.5-2.0

LLI Sample # SW 6007707
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 14:00 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI30

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
			ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	380 J	44	440	69
10950	1,2-Dibromoethane	106-93-4	N.D.	88	440	69
10950	1,2-Dichloroethane	107-06-2	N.D.	88	440	69
10950	Ethylbenzene	100-41-4	290 J	88	440	69
10950	Isopropylbenzene	98-82-8	N.D.	88	440	69
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	44	440	69
10950	Toluene	108-88-3	1,700	88	440	69
10950	1,2,4-Trimethylbenzene	95-63-6	240 J	88	440	69
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	88	440	69
10950	Xylene (Total)	1330-20-7	810	88	440	69
GC/MS Semivolatiles SW-846 8270C						
			ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,000	42	210	1
10724	Benzo(a)anthracene	56-55-3	1,300	42	210	1
10724	Benzo(a)pyrene	50-32-8	1,500	42	210	1
10724	Benzo(b)fluoranthene	205-99-2	2,300	42	210	1
10724	Benzo(g,h,i)perylene	191-24-2	740	42	210	1
10724	Chrysene	218-01-9	1,600	42	210	1
10724	Fluorene	86-73-7	500	42	210	1
10724	Naphthalene	91-20-3	11,000	210	1,100	5
10724	Phenanthrene	85-01-8	2,900	42	210	1
10724	Pyrene	129-00-0	1,700	42	210	1
Metals SW-846 6020						
			mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	250	0.0610	1.22	10
Wet Chemistry SM20 2540 G						
			%	%	%	
00111	Moisture	n.a.	21.2	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 14:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-30_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-30_1.5-2.0

LLI Sample # SW 6007707
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 14:00 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI30

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 5035	1	201016721436	06/07/2010	14:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/07/2010	14:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010	10:52	Holly Berry	69
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010	02:54	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010	22:04	Barton C Conner	5
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010	09:46	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010	20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010	18:33	Scott W Freisher	1

Sample Description: BH-10-28_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-28_1.5-2.0

LLI Sample # SW 6007708
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 14:30 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI28

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	1,600	37	370	60.1
10950	1,2-Dibromoethane	106-93-4	N.D.	75	370	60.1
10950	1,2-Dichloroethane	107-06-2	N.D.	75	370	60.1
10950	Ethylbenzene	100-41-4	27,000	750	3,700	601.01
10950	Isopropylbenzene	98-82-8	2,100	75	370	60.1
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	37	370	60.1
10950	Toluene	108-88-3	6,500	75	370	60.1
10950	1,2,4-Trimethylbenzene	95-63-6	280,000	7,500	37,000	6010.08
10950	1,3,5-Trimethylbenzene	108-67-8	130,000	750	3,700	601.01
10950	Xylene (Total)	1330-20-7	250,000	750	3,700	601.01
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	N.D.	410	2,100	10
10724	Benzo(a)anthracene	56-55-3	610	J 410	2,100	10
10724	Benzo(a)pyrene	50-32-8	600	J 410	2,100	10
10724	Benzo(b)fluoranthene	205-99-2	1,300	J 410	2,100	10
10724	Benzo(g,h,i)perylene	191-24-2	640	J 410	2,100	10
10724	Chrysene	218-01-9	680	J 410	2,100	10
10724	Fluorene	86-73-7	590	J 410	2,100	10
10724	Naphthalene	91-20-3	30,000	410	2,100	10
10724	Phenanthrene	85-01-8	1,800	J 410	2,100	10
10724	Pyrene	129-00-0	1,300	J 410	2,100	10
Metals SW-846 6020						
06135	Lead	7439-92-1	155	0.0307	0.614	5
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	19.4	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/07/2010 14:30	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-28_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-28_1.5-2.0

LLI Sample # SW 6007708
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/07/2010 14:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI28

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 5035	1	201016721436	06/07/2010 14:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 11:38	Holly Berry	60.1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 12:01	Holly Berry	601.01
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	Q101721AA	06/21/2010 19:17	Lauren C Temple	6010.08
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 22:54	Barton C Conner	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:48	Choon Y Tian	5
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006A	06/17/2010 18:33	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-27_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-27_1.5-2.0

LLI Sample # SW 6007709
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 08:10 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI27

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
			ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	N.D.	460	4,600	720.59
10950	1,2-Dibromoethane	106-93-4	N.D.	920	4,600	720.59
10950	1,2-Dichloroethane	107-06-2	N.D.	920	4,600	720.59
10950	Ethylbenzene	100-41-4	2,400	J 920	4,600	720.59
10950	Isopropylbenzene	98-82-8	6,500	920	4,600	720.59
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	460	4,600	720.59
10950	Toluene	108-88-3	1,700	J 920	4,600	720.59
10950	1,2,4-Trimethylbenzene	95-63-6	16,000	920	4,600	720.59
10950	1,3,5-Trimethylbenzene	108-67-8	8,000	920	4,600	720.59
10950	Xylene (Total)	1330-20-7	9,000	920	4,600	720.59
GC/MS Semivolatiles SW-846 8270C						
			ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	2,600	430	2,100	10
10724	Benzo(a)anthracene	56-55-3	3,400	430	2,100	10
10724	Benzo(a)pyrene	50-32-8	3,800	430	2,100	10
10724	Benzo(b)fluoranthene	205-99-2	5,500	430	2,100	10
10724	Benzo(g,h,i)perylene	191-24-2	3,400	430	2,100	10
10724	Chrysene	218-01-9	4,400	430	2,100	10
10724	Fluorene	86-73-7	1,700	J 430	2,100	10
10724	Naphthalene	91-20-3	21,000	430	2,100	10
10724	Phenanthrene	85-01-8	8,900	430	2,100	10
10724	Pyrene	129-00-0	6,500	430	2,100	10
Metals SW-846 6020						
			mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	393	0.0631	1.26	10
Wet Chemistry SM20 2540 G						
			%	%	%	
00111	Moisture	n.a.	21.6	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 08:10	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-27_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-27_1.5-2.0

LLI Sample # SW 6007709
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 08:10 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI27

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 5035	1	201016721436	06/08/2010	08:10	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010	08:10	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010	12:24	Holly Berry	720.59
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010	23:44	Barton C Conner	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010	09:50	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010	20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010	18:33	Scott W Freisher	1

Sample Description: BH-10-33_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-33_1.5-2.0

LLI Sample # SW 6007710
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 08:50 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI33

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.93
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.93
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.93
10950	Ethylbenzene	100-41-4	< 5	5	1	0.93
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.93
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.93
10950	Toluene	108-88-3	< 5	5	1	0.93
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.93
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.93
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.93
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	< 180	180	37	1
10724	Benzo(a)anthracene	56-55-3	< 180	180	37	1
10724	Benzo(a)pyrene	50-32-8	< 180	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	< 180	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	< 180	180	37	1
10724	Chrysene	218-01-9	< 180	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	< 180	180	37	1
10724	Phenanthrene	85-01-8	< 180	180	37	1
10724	Pyrene	129-00-0	< 180	180	37	1
Metals SW-846 6020						
06135	Lead	7439-92-1	43.1	0.214	0.0107	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	9.1	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 08:50	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-33_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-33_1.5-2.0

LLI Sample # SW 6007710
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 08:50 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI33

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 5035	1	201016721436	06/08/2010 08:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 08:50	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 10:19	Angela D Sneeringer	0.93
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/25/2010 05:23	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:55	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-35_1.3-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-35_1.3-1.7

LLI Sample # SW 6007711
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 09:30 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI35

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.83
10950	1,2-Dibromoethane	106-93-4	< 5	5	0.9	0.83
10950	1,2-Dichloroethane	107-06-2	< 5	5	0.9	0.83
10950	Ethylbenzene	100-41-4	< 5	5	0.9	0.83
10950	Isopropylbenzene	98-82-8	< 5	5	0.9	0.83
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.83
10950	Toluene	108-88-3	< 5	5	0.9	0.83
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	0.9	0.83
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	0.9	0.83
10950	Xylene (Total)	1330-20-7	< 5	5	0.9	0.83
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	290	180	37	1
10724	Benzo(a)anthracene	56-55-3	790	180	37	1
10724	Benzo(a)pyrene	50-32-8	820	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	840	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	610	180	37	1
10724	Chrysene	218-01-9	850	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	< 180	180	37	1
10724	Phenanthrene	85-01-8	840	180	37	1
10724	Pyrene	129-00-0	1,700	180	37	1
Metals SW-846 6020						
06135	Lead	7439-92-1	92.5	0.215	0.0108	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	9.7	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 09:30	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-35_1.3-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-35_1.3-1.7

LLI Sample # SW 6007711
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 09:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI35

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 5035	1	201016721436	06/08/2010	09:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010	09:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010	08:27	Angela D Sneeringer	0.83
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/26/2010	00:34	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010	09:57	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010	20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010	18:33	Scott W Freisher	1

Sample Description: BH-10-34_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-34_1.0-1.5

LLI Sample # SW 6007712
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 09:50 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI34

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.97
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.97
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.97
10950	Ethylbenzene	100-41-4	< 5	5	1	0.97
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.97
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.97
10950	Toluene	108-88-3	< 5	5	1	0.97
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.97
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.97
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.97
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	< 180	180	37	1
10724	Benzo(a)anthracene	56-55-3	< 180	180	37	1
10724	Benzo(a)pyrene	50-32-8	< 180	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	< 180	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	< 180	180	37	1
10724	Chrysene	218-01-9	< 180	180	37	1
10724	Fluorene	86-73-7	< 180	180	37	1
10724	Naphthalene	91-20-3	< 180	180	37	1
10724	Phenanthrene	85-01-8	< 180	180	37	1
10724	Pyrene	129-00-0	190	180	37	1
Metals SW-846 6020						
06135	Lead	7439-92-1	84.2	0.216	0.0108	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	9.4	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 09:50	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-34_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-34_1.0-1.5

LLI Sample # SW 6007712
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 09:50 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI34

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 5035	1	201016721436	06/08/2010 09:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 09:50	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 08:49	Angela D Sneeringer	0.97
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLF026	06/26/2010 01:23	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLF026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150001A	06/24/2010 09:59	Choon Y Tian	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150001	06/16/2010 20:38	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-32_0.5-1.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-32_0.5-1.0

LLI Sample # SW 6007713
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 10:30 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI32

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	4 J	0.6	6	0.93
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	0.93
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	0.93
10950	Ethylbenzene	100-41-4	N.D.	1	6	0.93
10950	Isopropylbenzene	98-82-8	N.D.	1	6	0.93
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	0.93
10950	Toluene	108-88-3	7	1	6	0.93
10950	1,2,4-Trimethylbenzene	95-63-6	2 J	1	6	0.93
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	0.93
10950	Xylene (Total)	1330-20-7	9	1	6	0.93

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	130 J	40	200	1
10724	Benzo(a)anthracene	56-55-3	180 J	40	200	1
10724	Benzo(a)pyrene	50-32-8	210	40	200	1
10724	Benzo(b)fluoranthene	205-99-2	270	40	200	1
10724	Benzo(g,h,i)perylene	191-24-2	250	40	200	1
10724	Chrysene	218-01-9	270	40	200	1
10724	Fluorene	86-73-7	N.D.	40	200	1
10724	Naphthalene	91-20-3	640	40	200	1
10724	Phenanthrene	85-01-8	300	40	200	1
10724	Pyrene	129-00-0	290	40	200	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	298	0.0601	1.20	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	17.6	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-32_0.5-1.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-32_0.5-1.0

LLI Sample # SW 6007713
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 10:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI32

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 10:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/08/2010 10:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 10:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 10:42	Angela D Sneeringer	0.93
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 16:27	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:07	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1

Sample Description: BH-10-31_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-31_1.5-2.0

LLI Sample # SW 6007714
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 11:05 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI31

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	470 J	49	490	68.05
10950	1,2-Dibromoethane	106-93-4	N.D.	98	490	68.05
10950	1,2-Dichloroethane	107-06-2	N.D.	98	490	68.05
10950	Ethylbenzene	100-41-4	630	98	490	68.05
10950	Isopropylbenzene	98-82-8	170 J	98	490	68.05
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	49	490	68.05
10950	Toluene	108-88-3	1,700	98	490	68.05
10950	1,2,4-Trimethylbenzene	95-63-6	1,100	98	490	68.05
10950	1,3,5-Trimethylbenzene	108-67-8	450 J	98	490	68.05
10950	Xylene (Total)	1330-20-7	3,800	98	490	68.05
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	820	48	240	1
10724	Benzo(a)anthracene	56-55-3	610	48	240	1
10724	Benzo(a)pyrene	50-32-8	610	48	240	1
10724	Benzo(b)fluoranthene	205-99-2	910	48	240	1
10724	Benzo(g,h,i)perylene	191-24-2	660	48	240	1
10724	Chrysene	218-01-9	800	48	240	1
10724	Fluorene	86-73-7	320	48	240	1
10724	Naphthalene	91-20-3	7,300	480	2,400	10
10724	Phenanthrene	85-01-8	2,500	48	240	1
10724	Pyrene	129-00-0	770	48	240	1
Metals SW-846 6020						
06135	Lead	7439-92-1	610	0.0713	1.43	10
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	30.6	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 11:05	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-31_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-31_1.5-2.0

LLI Sample # SW 6007714
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 11:05 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI31

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 5035	1	201016721436	06/08/2010	11:05	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010	11:05	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010	08:13	Holly Berry	68.05
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010	17:42	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010	09:01	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010	02:09	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010	21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010	18:33	Scott W Freisher	1



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Sample Description: BH-10-22_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-22_1.5-2.0

LLI Sample # SW 6007715
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 13:20 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI22

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	5 J	0.7	7	1.16
10950	1,2-Dibromoethane	106-93-4	N.D.	1	7	1.16
10950	1,2-Dichloroethane	107-06-2	N.D.	1	7	1.16
10950	Ethylbenzene	100-41-4	N.D.	1	7	1.16
10950	Isopropylbenzene	98-82-8	N.D.	1	7	1.16
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.7	7	1.16
10950	Toluene	108-88-3	14	1	7	1.16
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	7	1.16
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	7	1.16
10950	Xylene (Total)	1330-20-7	2 J	1	7	1.16

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	790	38	190	1
10724	Benzo(a)anthracene	56-55-3	1,100	38	190	1
10724	Benzo(a)pyrene	50-32-8	1,100	38	190	1
10724	Benzo(b)fluoranthene	205-99-2	1,600	38	190	1
10724	Benzo(g,h,i)perylene	191-24-2	1,200	38	190	1
10724	Chrysene	218-01-9	1,300	38	190	1
10724	Fluorene	86-73-7	250	38	190	1
10724	Naphthalene	91-20-3	3,700	38	190	1
10724	Phenanthrene	85-01-8	2,000	38	190	1
10724	Pyrene	129-00-0	1,500	38	190	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	304	0.0564	1.13	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	12.2	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result



Analysis Report

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REVISED

Sample Description: BH-10-22_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-22_1.5-2.0

LLI Sample # SW 6007715
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 13:20 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI22

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 13:20	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/08/2010 13:20	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 13:20	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 11:05	Angela D Sneeringer	1.16
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 18:07	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:11	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-21_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-21_1.0-1.5

LLI Sample # SW 6007716
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 14:00 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI21

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	N.D.	0.7	7	1.06
10950	1,2-Dibromoethane	106-93-4	N.D.	1	7	1.06
10950	1,2-Dichloroethane	107-06-2	N.D.	1	7	1.06
10950	Ethylbenzene	100-41-4	N.D.	1	7	1.06
10950	Isopropylbenzene	98-82-8	N.D.	1	7	1.06
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.7	7	1.06
10950	Toluene	108-88-3	N.D.	1	7	1.06
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	7	1.06
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	7	1.06
10950	Xylene (Total)	1330-20-7	1 J	1	7	1.06

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. In addition, there was a surrogate recovery outside of QC limits in the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	2,900	44	220	1
10724	Benzo(a)anthracene	56-55-3	4,400	44	220	1
10724	Benzo(a)pyrene	50-32-8	3,800	44	220	1
10724	Benzo(b)fluoranthene	205-99-2	4,500	44	220	1
10724	Benzo(g,h,i)perylene	191-24-2	2,900	44	220	1
10724	Chrysene	218-01-9	4,700	44	220	1
10724	Fluorene	86-73-7	970	44	220	1
10724	Naphthalene	91-20-3	9,200	440	2,200	10
10724	Phenanthrene	85-01-8	4,200	44	220	1
10724	Pyrene	129-00-0	7,700	440	2,200	10

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	869	0.128	2.55	20

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	24.7	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Sample Description: BH-10-21_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-21_1.0-1.5

LLI Sample # SW 6007716
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 14:00 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI21

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/08/2010 14:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/08/2010 14:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 14:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 11:50	Angela D Sneeringer	1.06
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 18:32	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010 09:26	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:16	Choon Y Tian	20
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1



Analysis Report

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Sample Description: BH-10-20_1.3-1.8 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-20_1.3-1.8

LLI Sample # SW 6007717
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 14:45 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI20

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	3 J	0.6	6	1.01
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	1.01
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	1.01
10950	Ethylbenzene	100-41-4	N.D.	1	6	1.01
10950	Isopropylbenzene	98-82-8	N.D.	1	6	1.01
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	1.01
10950	Toluene	108-88-3	1 J	1	6	1.01
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	1.01
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	1.01
10950	Xylene (Total)	1330-20-7	N.D.	1	6	1.01

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	880	37	190	1
10724	Benzo(a)anthracene	56-55-3	1,800	37	190	1
10724	Benzo(a)pyrene	50-32-8	1,700	37	190	1
10724	Benzo(b)fluoranthene	205-99-2	2,300	37	190	1
10724	Benzo(g,h,i)perylene	191-24-2	1,400	37	190	1
10724	Chrysene	218-01-9	1,700	37	190	1
10724	Fluorene	86-73-7	320	37	190	1
10724	Naphthalene	91-20-3	1,200	37	190	1
10724	Phenanthrene	85-01-8	2,600	37	190	1
10724	Pyrene	129-00-0	2,800	37	190	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	179	0.0274	0.549	5

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	10.7	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-20_1.3-1.8 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-20_1.3-1.8

LLI Sample # SW 6007717
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/08/2010 14:45 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI20

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 5035	1	201016721436	06/08/2010 14:45	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/08/2010 14:45	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101691AA	06/18/2010 09:12	Angela D Sneeringer	1.01
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 18:57	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:19	Choon Y Tian	5
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1

Sample Description: BH-10-19_0.5-1.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-19_0.5-1.0

LLI Sample # SW 6007718
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:00 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI19

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	< 5	5	0.5	0.87
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.87
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.87
10950	Ethylbenzene	100-41-4	< 5	5	1	0.87
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.87
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.87
10950	Toluene	108-88-3	< 5	5	1	0.87
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.87
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.87
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.87
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	670	180	37	1
10724	Benzo(a)anthracene	56-55-3	2,100	180	37	1
10724	Benzo(a)pyrene	50-32-8	2,300	180	37	1
10724	Benzo(b)fluoranthene	205-99-2	3,100	180	37	1
10724	Benzo(g,h,i)perylene	191-24-2	2,500	180	37	1
10724	Chrysene	218-01-9	2,200	180	37	1
10724	Fluorene	86-73-7	190	180	37	1
10724	Naphthalene	91-20-3	< 180	180	37	1
10724	Phenanthrene	85-01-8	2,500	180	37	1
10724	Pyrene	129-00-0	3,500	180	37	1
Metals SW-846 6020						
06135	Lead	7439-92-1	365	1.07	0.0535	10
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	9.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 08:00	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-19_0.5-1.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-19_0.5-1.0

LLI Sample # SW 6007718
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:00 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI19

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 5035	1	201016721436	06/09/2010 08:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 08:00	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101731AA	06/22/2010 18:49	Kelly E Keller	0.87
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 19:22	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:48	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10168820006B	06/17/2010 18:33	Scott W Freisher	1

Sample Description: BH-10-18_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-18_1.5-2.0

LLI Sample # SW 6007719
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:30 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI18

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	0.8 J	0.7	7	1.1
10950	1,2-Dibromoethane	106-93-4	N.D.	1	7	1.1
10950	1,2-Dichloroethane	107-06-2	N.D.	1	7	1.1
10950	Ethylbenzene	100-41-4	N.D.	1	7	1.1
10950	Isopropylbenzene	98-82-8	N.D.	1	7	1.1
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.7	7	1.1
10950	Toluene	108-88-3	2 J	1	7	1.1
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	7	1.1
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	7	1.1
10950	Xylene (Total)	1330-20-7	N.D.	1	7	1.1

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. In addition, there was a surrogate standard percent recovery outside of QC limits in the initial analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,000	44	220	1
10724	Benzo(a)anthracene	56-55-3	1,400	44	220	1
10724	Benzo(a)pyrene	50-32-8	1,500	44	220	1
10724	Benzo(b)fluoranthene	205-99-2	1,700	44	220	1
10724	Benzo(g,h,i)perylene	191-24-2	1,200	44	220	1
10724	Chrysene	218-01-9	1,600	44	220	1
10724	Fluorene	86-73-7	530	44	220	1
10724	Naphthalene	91-20-3	3,100	44	220	1
10724	Phenanthrene	85-01-8	2,400	44	220	1
10724	Pyrene	129-00-0	2,400	44	220	1

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	478	0.0634	1.27	10

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	23.4	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Sample Description: BH-10-18_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-18_1.5-2.0

LLI Sample # SW 6007719
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI18

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010 08:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 08:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101722AA	06/22/2010 08:47	Holly Berry	1.1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 19:47	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:21	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



Analysis Report

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Sample Description: BH-10-17_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-17_1.5-2.0

LLI Sample # SW 6007720
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:50 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI17

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	460	29	290	52.52
10950	1,2-Dibromoethane	106-93-4	N.D.	57	290	52.52
10950	1,2-Dichloroethane	107-06-2	N.D.	57	290	52.52
10950	Ethylbenzene	100-41-4	800	57	290	52.52
10950	Isopropylbenzene	98-82-8	300	57	290	52.52
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	29	290	52.52
10950	Toluene	108-88-3	2,300	57	290	52.52
10950	1,2,4-Trimethylbenzene	95-63-6	4,400	57	290	52.52
10950	1,3,5-Trimethylbenzene	108-67-8	2,400	57	290	52.52
10950	Xylene (Total)	1330-20-7	7,500	57	290	52.52
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	570	36	180	1
10724	Benzo(a)anthracene	56-55-3	580	36	180	1
10724	Benzo(a)pyrene	50-32-8	510	36	180	1
10724	Benzo(b)fluoranthene	205-99-2	540	36	180	1
10724	Benzo(g,h,i)perylene	191-24-2	320	36	180	1
10724	Chrysene	218-01-9	930	36	180	1
10724	Fluorene	86-73-7	900	36	180	1
10724	Naphthalene	91-20-3	1,400	36	180	1
10724	Phenanthrene	85-01-8	2,300	36	180	1
10724	Pyrene	129-00-0	1,400	36	180	1
Metals SW-846 6020						
06135	Lead	7439-92-1	47.8	0.0109	0.218	2
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	8.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 08:50	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-17_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-17_1.5-2.0

LLI Sample # SW 6007720
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 08:50 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI17

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 5035	1	201016721436	06/09/2010 08:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 08:50	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 08:36	Holly Berry	52.52
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 20:12	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/27/2010 16:48	Parker D Lindstrom	2
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



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Sample Description: BH-10-06_1.2-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-06_1.2-1.7

LLI Sample # SW 6007721
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 09:15 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI06

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	0.7 J	0.6	6	0.98
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	0.98
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	0.98
10950	Ethylbenzene	100-41-4	N.D.	1	6	0.98
10950	Isopropylbenzene	98-82-8	N.D.	1	6	0.98
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	0.98
10950	Toluene	108-88-3	2 J	1	6	0.98
10950	1,2,4-Trimethylbenzene	95-63-6	2 J	1	6	0.98
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	0.98
10950	Xylene (Total)	1330-20-7	N.D.	1	6	0.98

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	870	42	210	1
10724	Benzo(a)anthracene	56-55-3	1,900	42	210	1
10724	Benzo(a)pyrene	50-32-8	1,900	42	210	1
10724	Benzo(b)fluoranthene	205-99-2	2,500	42	210	1
10724	Benzo(g,h,i)perylene	191-24-2	1,600	42	210	1
10724	Chrysene	218-01-9	2,000	42	210	1
10724	Fluorene	86-73-7	360	42	210	1
10724	Naphthalene	91-20-3	3,300	42	210	1
10724	Phenanthrene	85-01-8	2,300	42	210	1
10724	Pyrene	129-00-0	2,800	42	210	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	266	0.0604	1.21	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	20.4	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result



Analysis Report

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Sample Description: BH-10-06_1.2-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-06_1.2-1.7

LLI Sample # SW 6007721
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 09:15 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI06

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time		Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010	09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010	09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010	09:15	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101722AA	06/22/2010	09:10	Holly Berry	0.98
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010	20:38	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010	03:03	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010	21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010	17:14	Scott W Freisher	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Sample Description: BH-10-05_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-05_1.5-2.0

LLI Sample # SW 6007722
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 09:50 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI05

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	3 J	0.8	8	1.36
10950	1,2-Dibromoethane	106-93-4	N.D.	2	8	1.36
10950	1,2-Dichloroethane	107-06-2	N.D.	2	8	1.36
10950	Ethylbenzene	100-41-4	2 J	2	8	1.36
10950	Isopropylbenzene	98-82-8	4 J	2	8	1.36
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.8	8	1.36
10950	Toluene	108-88-3	5 J	2	8	1.36
10950	1,2,4-Trimethylbenzene	95-63-6	7 J	2	8	1.36
10950	1,3,5-Trimethylbenzene	108-67-8	6 J	2	8	1.36
10950	Xylene (Total)	1330-20-7	17	2	8	1.36

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	540	39	200	1
10724	Benzo(a)anthracene	56-55-3	1,100	39	200	1
10724	Benzo(a)pyrene	50-32-8	1,000	39	200	1
10724	Benzo(b)fluoranthene	205-99-2	1,300	39	200	1
10724	Benzo(g,h,i)perylene	191-24-2	960	39	200	1
10724	Chrysene	218-01-9	1,100	39	200	1
10724	Fluorene	86-73-7	340	39	200	1
10724	Naphthalene	91-20-3	1,000	39	200	1
10724	Phenanthrene	85-01-8	1,200	39	200	1
10724	Pyrene	129-00-0	1,700	39	200	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	411	0.0563	1.13	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	14.6	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-05_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-05_1.5-2.0

LLI Sample # SW 6007722
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 09:50 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI05

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 09:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010 09:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 09:50	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101722AA	06/22/2010 09:32	Holly Berry	1.36
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 21:02	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:25	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1

Sample Description: BH-10-13_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-13_1.5-2.0

LLI Sample # SW 6007723
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 10:30 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI13

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	2 J	0.6	6	1
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	1
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	1
10950	Ethylbenzene	100-41-4	N.D.	1	6	1
10950	Isopropylbenzene	98-82-8	N.D.	1	6	1
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	1
10950	Toluene	108-88-3	3 J	1	6	1
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	1
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	1
10950	Xylene (Total)	1330-20-7	N.D.	1	6	1

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. In addition, there was a surrogate standard percent recovery outside of QC limits in the initial analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,600	38	190	1
10724	Benzo(a)anthracene	56-55-3	5,000	380	1,900	10
10724	Benzo(a)pyrene	50-32-8	4,200	38	190	1
10724	Benzo(b)fluoranthene	205-99-2	5,700	380	1,900	10
10724	Benzo(g,h,i)perylene	191-24-2	2,900	38	190	1
10724	Chrysene	218-01-9	4,600	380	1,900	10
10724	Fluorene	86-73-7	530	38	190	1
10724	Naphthalene	91-20-3	1,000	38	190	1
10724	Phenanthrene	85-01-8	4,500	38	190	1
10724	Pyrene	129-00-0	7,300	380	1,900	10

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	320	0.0561	1.12	10

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	11.8	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Sample Description: BH-10-13_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-13_1.5-2.0

LLI Sample # SW 6007723
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 10:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI13

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 10:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010 10:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 10:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101722AA	06/22/2010 09:55	Holly Berry	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 21:28	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010 09:51	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:27	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1

Sample Description: BH-10-14_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-14_1.5-2.0

LLI Sample # SW 6007724
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 11:30 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI14

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	260 J	40	400	69.08
10950	1,2-Dibromoethane	106-93-4	N.D.	81	400	69.08
10950	1,2-Dichloroethane	107-06-2	N.D.	81	400	69.08
10950	Ethylbenzene	100-41-4	220 J	81	400	69.08
10950	Isopropylbenzene	98-82-8	N.D.	81	400	69.08
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	40	400	69.08
10950	Toluene	108-88-3	950	81	400	69.08
10950	1,2,4-Trimethylbenzene	95-63-6	290 J	81	400	69.08
10950	1,3,5-Trimethylbenzene	108-67-8	120 J	81	400	69.08
10950	Xylene (Total)	1330-20-7	1,100	81	400	69.08

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,000	39	190	1
10724	Benzo(a)anthracene	56-55-3	1,300	39	190	1
10724	Benzo(a)pyrene	50-32-8	1,200	39	190	1
10724	Benzo(b)fluoranthene	205-99-2	1,600	39	190	1
10724	Benzo(g,h,i)perylene	191-24-2	1,100	39	190	1
10724	Chrysene	218-01-9	1,400	39	190	1
10724	Fluorene	86-73-7	410	39	190	1
10724	Naphthalene	91-20-3	4,900	390	1,900	10
10724	Phenanthrene	85-01-8	2,600	39	190	1
10724	Pyrene	129-00-0	1,800	39	190	1

Metals		SW-846 6020	mg/kg	mg/kg	mg/kg	
06135	Lead	7439-92-1	531	0.142	2.83	25

Wet Chemistry		SM20 2540 G	%	%	%	
00111	Moisture	n.a.	14.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-14_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-14_1.5-2.0

LLI Sample # SW 6007724
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 11:30 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI14

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 11:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010 11:30	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 11:30	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 08:58	Holly Berry	69.08
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 21:53	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010 10:16	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	2	101676150002A	06/28/2010 08:17	Choon Y Tian	25
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	2	10172820002A	06/21/2010 17:54	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-15_1.4-1.9 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-15_1.4-1.9

LLI Sample # SW 6007725
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 11:50 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI15

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	4 J	0.6	6	1.03
10950	1,2-Dibromoethane	106-93-4	N.D.	1	6	1.03
10950	1,2-Dichloroethane	107-06-2	N.D.	1	6	1.03
10950	Ethylbenzene	100-41-4	N.D.	1	6	1.03
10950	Isopropylbenzene	98-82-8	N.D.	1	6	1.03
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.6	6	1.03
10950	Toluene	108-88-3	2 J	1	6	1.03
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	6	1.03
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	6	1.03
10950	Xylene (Total)	1330-20-7	N.D.	1	6	1.03

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	570	38	190	1
10724	Benzo(a)anthracene	56-55-3	1,700	38	190	1
10724	Benzo(a)pyrene	50-32-8	1,400	38	190	1
10724	Benzo(b)fluoranthene	205-99-2	2,000	38	190	1
10724	Benzo(g,h,i)perylene	191-24-2	970	38	190	1
10724	Chrysene	218-01-9	1,600	38	190	1
10724	Fluorene	86-73-7	230	38	190	1
10724	Naphthalene	91-20-3	310	38	190	1
10724	Phenanthrene	85-01-8	2,400	38	190	1
10724	Pyrene	129-00-0	2,700	38	190	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	280	0.0553	1.11	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	11.3	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-15_1.4-1.9 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-15_1.4-1.9

LLI Sample # SW 6007725
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 11:50 by DW

SUN: Aquaterra Tech.

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Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI15

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 11:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/09/2010 11:50	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010 11:50	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101722AA	06/22/2010 05:19	Holly Berry	1.03
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 22:18	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:30	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



Analysis Report

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Sample Description: BH-10-16_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-16_1.5-2.0

LLI Sample # SW 6007726
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 14:35 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI16

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	850 J	88	880	133.55
10950	1,2-Dibromoethane	106-93-4	N.D.	180	880	133.55
10950	1,2-Dichloroethane	107-06-2	N.D.	180	880	133.55
10950	Ethylbenzene	100-41-4	N.D.	180	880	133.55
10950	Isopropylbenzene	98-82-8	9,100	180	880	133.55
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	88	880	133.55
10950	Toluene	108-88-3	340 J	180	880	133.55
10950	1,2,4-Trimethylbenzene	95-63-6	240 J	180	880	133.55
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	180	880	133.55
10950	Xylene (Total)	1330-20-7	690 J	180	880	133.55
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	1,900 J	440	2,200	10
10724	Benzo(a)anthracene	56-55-3	3,500	440	2,200	10
10724	Benzo(a)pyrene	50-32-8	2,800	440	2,200	10
10724	Benzo(b)fluoranthene	205-99-2	3,500	440	2,200	10
10724	Benzo(g,h,i)perylene	191-24-2	2,200 J	440	2,200	10
10724	Chrysene	218-01-9	4,700	440	2,200	10
10724	Fluorene	86-73-7	N.D.	440	2,200	10
10724	Naphthalene	91-20-3	N.D.	440	2,200	10
10724	Phenanthrene	85-01-8	11,000	440	2,200	10
10724	Pyrene	129-00-0	8,000	440	2,200	10
Metals SW-846 6020						
06135	Lead	7439-92-1	616	0.131	2.63	20
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	23.9	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/09/2010 14:35	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-16_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-16_1.5-2.0

LLI Sample # SW 6007726
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/09/2010 14:35 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI16

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 5035	1	201016721436	06/09/2010	14:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/09/2010	14:35	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010	13:09	Holly Berry	133.55
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010	10:41	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010	02:32	Choon Y Tian	20
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010	21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010	17:14	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-12_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-12_1.5-2.0

LLI Sample # SW 6007727
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 07:55 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI12

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	4 J	0.7	7	1.12
10950	1,2-Dibromoethane	106-93-4	N.D.	1	7	1.12
10950	1,2-Dichloroethane	107-06-2	N.D.	1	7	1.12
10950	Ethylbenzene	100-41-4	N.D.	1	7	1.12
10950	Isopropylbenzene	98-82-8	N.D.	1	7	1.12
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.7	7	1.12
10950	Toluene	108-88-3	7 J	1	7	1.12
10950	1,2,4-Trimethylbenzene	95-63-6	6 J	1	7	1.12
10950	1,3,5-Trimethylbenzene	108-67-8	3 J	1	7	1.12
10950	Xylene (Total)	1330-20-7	7	1	7	1.12

The GC/MS volatile internal standard peak areas were outside the QC limits for both the initial analysis and the re-analysis. The values reported here are from the initial analysis of the sample.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,700	40	200	1
10724	Benzo(a)anthracene	56-55-3	2,400	40	200	1
10724	Benzo(a)pyrene	50-32-8	2,100	40	200	1
10724	Benzo(b)fluoranthene	205-99-2	2,700	40	200	1
10724	Benzo(g,h,i)perylene	191-24-2	1,500	40	200	1
10724	Chrysene	218-01-9	2,500	40	200	1
10724	Fluorene	86-73-7	1,300	40	200	1
10724	Naphthalene	91-20-3	3,800	40	200	1
10724	Phenanthrene	85-01-8	3,800	40	200	1
10724	Pyrene	129-00-0	4,500	40	200	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	414	0.0583	1.17	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	15.9	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-12_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-12_1.5-2.0

LLI Sample # SW 6007727
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 07:55 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI12

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 07:55	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010 07:55	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010 07:55	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101731AA	06/22/2010 21:07	Kelly E Keller	1.12
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 23:08	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:34	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



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Sample Description: BH-10-11_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-11_1.5-2.0

LLI Sample # SW 6007728
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 08:35 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI11

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	56 J	26	260	46.25
10950	1,2-Dibromoethane	106-93-4	N.D.	53	260	46.25
10950	1,2-Dichloroethane	107-06-2	N.D.	53	260	46.25
10950	Ethylbenzene	100-41-4	90 J	53	260	46.25
10950	Isopropylbenzene	98-82-8	N.D.	53	260	46.25
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	26	260	46.25
10950	Toluene	108-88-3	190 J	53	260	46.25
10950	1,2,4-Trimethylbenzene	95-63-6	430	53	260	46.25
10950	1,3,5-Trimethylbenzene	108-67-8	85 J	53	260	46.25
10950	Xylene (Total)	1330-20-7	300	53	260	46.25

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,300	38	190	1
10724	Benzo(a)anthracene	56-55-3	3,300	38	190	1
10724	Benzo(a)pyrene	50-32-8	2,700	38	190	1
10724	Benzo(b)fluoranthene	205-99-2	3,600	38	190	1
10724	Benzo(g,h,i)perylene	191-24-2	1,400	38	190	1
10724	Chrysene	218-01-9	3,400	38	190	1
10724	Fluorene	86-73-7	640	38	190	1
10724	Naphthalene	91-20-3	1,500	38	190	1
10724	Phenanthrene	85-01-8	2,900	38	190	1
10724	Pyrene	129-00-0	6,600	380	1,900	10

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	184	0.0278	0.555	5

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	12.6	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-11_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-11_1.5-2.0

LLI Sample # SW 6007728
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 08:35 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI11

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 08:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010 08:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010 08:35	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 09:44	Holly Berry	46.25
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 23:33	Barton C Conner	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010 11:06	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:39	Choon Y Tian	5
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



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Sample Description: BH-10-10_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-10_1.5-2.0

LLI Sample # SW 6007729
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 09:15 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI10

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	160 J	47	470	78.47
10950	1,2-Dibromoethane	106-93-4	N.D.	93	470	78.47
10950	1,2-Dichloroethane	107-06-2	N.D.	93	470	78.47
10950	Ethylbenzene	100-41-4	180 J	93	470	78.47
10950	Isopropylbenzene	98-82-8	180 J	93	470	78.47
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	47	470	78.47
10950	Toluene	108-88-3	700	93	470	78.47
10950	1,2,4-Trimethylbenzene	95-63-6	890	93	470	78.47
10950	1,3,5-Trimethylbenzene	108-67-8	99 J	93	470	78.47
10950	Xylene (Total)	1330-20-7	570	93	470	78.47

The GC/MS volatile analysis was performed according to the high level soil method due to the level of non-target compounds. Therefore, the reporting limits were raised.

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	1,200	40	200	1
10724	Benzo(a)anthracene	56-55-3	1,400	40	200	1
10724	Benzo(a)pyrene	50-32-8	1,400	40	200	1
10724	Benzo(b)fluoranthene	205-99-2	1,700	40	200	1
10724	Benzo(g,h,i)perylene	191-24-2	1,000	40	200	1
10724	Chrysene	218-01-9	1,800	40	200	1
10724	Fluorene	86-73-7	930	40	200	1
10724	Naphthalene	91-20-3	3,300	40	200	1
10724	Phenanthrene	85-01-8	2,000	40	200	1
10724	Pyrene	129-00-0	3,000	40	200	1

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	725	0.117	2.35	20

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	15.7	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-10_1.5-2.0 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-10_1.5-2.0

LLI Sample # SW 6007729
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 09:15 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI10

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010 09:15	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010 09:15	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101721AA	06/21/2010 09:21	Holly Berry	78.47
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/01/2010 23:58	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:41	Choon Y Tian	20
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1



Analysis Report

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REVISED

Sample Description: BH-10-08_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-08_1.5-2.0

LLI Sample # SW 6007730
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 09:55 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI08

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	370 J	46	460	66.74
10950	1,2-Dibromoethane	106-93-4	N.D.	92	460	66.74
10950	1,2-Dichloroethane	107-06-2	N.D.	92	460	66.74
10950	Ethylbenzene	100-41-4	150 J	92	460	66.74
10950	Isopropylbenzene	98-82-8	27,000	92	460	66.74
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	46	460	66.74
10950	Toluene	108-88-3	120 J	92	460	66.74
10950	1,2,4-Trimethylbenzene	95-63-6	210 J	92	460	66.74
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	92	460	66.74
10950	Xylene (Total)	1330-20-7	690	92	460	66.74
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	2,500	460	2,300	10
10724	Benzo(a)anthracene	56-55-3	2,600	460	2,300	10
10724	Benzo(a)pyrene	50-32-8	2,200 J	460	2,300	10
10724	Benzo(b)fluoranthene	205-99-2	2,100 J	460	2,300	10
10724	Benzo(g,h,i)perylene	191-24-2	1,600 J	460	2,300	10
10724	Chrysene	218-01-9	8,300	460	2,300	10
10724	Fluorene	86-73-7	35,000	460	2,300	10
10724	Naphthalene	91-20-3	N.D.	460	2,300	10
10724	Phenanthrene	85-01-8	20,000	460	2,300	10
10724	Pyrene	129-00-0	8,900	460	2,300	10
Metals SW-846 6020						
06135	Lead	7439-92-1	444	0.0688	1.38	10
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	27.3	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 09:55	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-08_1.5-2.0 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-08_1.5-2.0

LLI Sample # SW 6007730
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 09:55 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI08

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 5035	1	201016721436	06/10/2010	09:55	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010	09:55	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	R101732AA	06/23/2010	00:57	Lauren C Temple	66.74
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010	11:31	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010	02:43	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010	21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010	17:14	Scott W Freisher	1



Analysis Report

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Sample Description: BH-10-09_1.2-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-09_1.2-1.7

LLI Sample # SW 6007731
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 10:25 by DW

SUN: Aquaterra Tech.

Submitted: 06/15/2010 18:25

PO Box 744

Reported: 07/16/2010 09:42

West Chester PA 19381

Discard: 09/15/2010

AOI09

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10950	Benzene	71-43-2	2 J	0.7	7	1.05
10950	1,2-Dibromoethane	106-93-4	N.D.	1	7	1.05
10950	1,2-Dichloroethane	107-06-2	N.D.	1	7	1.05
10950	Ethylbenzene	100-41-4	N.D.	1	7	1.05
10950	Isopropylbenzene	98-82-8	N.D.	1	7	1.05
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.7	7	1.05
10950	Toluene	108-88-3	3 J	1	7	1.05
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.	1	7	1.05
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.	1	7	1.05
10950	Xylene (Total)	1330-20-7	2 J	1	7	1.05
GC/MS Semivolatiles SW-846 8270C						
10724	Anthracene	120-12-7	1,500	42	210	1
10724	Benzo(a)anthracene	56-55-3	2,600	42	210	1
10724	Benzo(a)pyrene	50-32-8	2,700	42	210	1
10724	Benzo(b)fluoranthene	205-99-2	3,400	42	210	1
10724	Benzo(g,h,i)perylene	191-24-2	1,900	42	210	1
10724	Chrysene	218-01-9	2,600	42	210	1
10724	Fluorene	86-73-7	570	42	210	1
10724	Naphthalene	91-20-3	4,600	42	210	1
10724	Phenanthrene	85-01-8	3,400	42	210	1
10724	Pyrene	129-00-0	3,200	42	210	1
Metals SW-846 6020						
06135	Lead	7439-92-1	1,230	0.158	3.16	25
Wet Chemistry SM20 2540 G						
00111	Moisture	n.a.	20.9	0.50	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.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 10:25	Client Supplied	1

*=This limit was used in the evaluation of the final result

Sample Description: BH-10-09_1.2-1.7 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-09_1.2-1.7

LLI Sample # SW 6007731
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 10:25 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI09

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 5035	1	201016721436	06/10/2010	10:25	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010	10:25	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101741AA	06/23/2010	07:50	Holly Berry	1.05
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010	00:47	Barton C Conner	1
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010	10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010	03:06	Choon Y Tian	25
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010	21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010	17:14	Scott W Freisher	1

Sample Description: BH-10-07_1.0-1.5 Grab Soil
Philadelphia Refinery AOI-7
COC: 239639 BH-10-07_1.0-1.5

LLI Sample # SW 6007732
LLI Group # 1198982
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 11:35 by DW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 06/15/2010 18:25

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI07

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Limit of Quantitation*	Dry Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/kg	ug/kg	ug/kg	
10950	Benzene	71-43-2	< 5	5	0.5	0.9
10950	1,2-Dibromoethane	106-93-4	< 5	5	1	0.9
10950	1,2-Dichloroethane	107-06-2	< 5	5	1	0.9
10950	Ethylbenzene	100-41-4	< 5	5	1	0.9
10950	Isopropylbenzene	98-82-8	< 5	5	1	0.9
10950	Methyl Tertiary Butyl Ether	1634-04-4	< 5	5	0.5	0.9
10950	Toluene	108-88-3	< 5	5	1	0.9
10950	1,2,4-Trimethylbenzene	95-63-6	< 5	5	1	0.9
10950	1,3,5-Trimethylbenzene	108-67-8	< 5	5	1	0.9
10950	Xylene (Total)	1330-20-7	< 5	5	1	0.9

GC/MS	Semivolatiles	SW-846 8270C	ug/kg	ug/kg	ug/kg	
10724	Anthracene	120-12-7	< 1,900	1,900	380	10
10724	Benzo(a)anthracene	56-55-3	< 1,900	1,900	380	10
10724	Benzo(a)pyrene	50-32-8	< 1,900	1,900	380	10
10724	Benzo(b)fluoranthene	205-99-2	< 1,900	1,900	380	10
10724	Benzo(g,h,i)perylene	191-24-2	< 1,900	1,900	380	10
10724	Chrysene	218-01-9	< 1,900	1,900	380	10
10724	Fluorene	86-73-7	< 1,900	1,900	380	10
10724	Naphthalene	91-20-3	< 1,900	1,900	380	10
10724	Phenanthrene	85-01-8	< 1,900	1,900	380	10
10724	Pyrene	129-00-0	< 1,900	1,900	380	10

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.

Metals	SW-846 6020	mg/kg	mg/kg	mg/kg	
06135 Lead	7439-92-1	305	1.12	0.0558	10

Wet Chemistry	SM20 2540 G	%	%	%	
00111 Moisture	n.a.	13.0	0.50	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.					

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

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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*=This limit was used in the evaluation of the final result

Sample Description: BH-10-07_1.0-1.5 Grab Soil
 Philadelphia Refinery AOI-7
 COC: 239639 BH-10-07_1.0-1.5

LLI Sample # SW 6007732
 LLI Group # 1198982
 Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 06/10/2010 11:35 by DW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 06/15/2010 18:25

West Chester PA 19381

Reported: 07/16/2010 09:42

Discard: 09/15/2010

AOI07

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-Field PreservedMeOH-NC	SW-846 5035	1	201016721436	06/10/2010 11:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201016721436	06/10/2010 11:35	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201016721436	06/10/2010 11:35	Client Supplied	1
10950	BTEX/MTBE/EDB/EDC/Cumene/TM Bs	SW-846 8260B	1	X101742AA	06/23/2010 23:51	Emily R Styer	0.9
10724	PAH 8270 (microwave)	SW-846 8270C	1	10167SLG026	07/02/2010 11:55	Brian K Graham	10
10814	BNA Soil Microwave PAH	SW-846 3546	1	10167SLG026	06/17/2010 10:30	Kerrie A Freeburn	1
06135	Lead	SW-846 6020	1	101676150002A	06/28/2010 02:46	Choon Y Tian	10
06150	ICP/MS SW-846 Solid Digest	SW-846 3050B	1	101676150002	06/16/2010 21:21	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	10169820005A	06/18/2010 17:14	Scott W Freisher	1

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X101742AA	Sample number(s): 6007732								
Benzene	< 5	5.	0.5	ug/kg	94	90	80-120	4	30
1,2-Dibromoethane	< 5	5.	1	ug/kg	84	84	80-120	0	30
1,2-Dichloroethane	< 5	5.	1	ug/kg	92	91	71-129	1	30
Ethylbenzene	< 5	5.	1	ug/kg	94	89	80-120	5	30
Isopropylbenzene	< 5	5.	1	ug/kg	94	89	76-120	6	30
Methyl Tertiary Butyl Ether	< 5	5.	0.5	ug/kg	98	98	74-121	0	30
Toluene	< 5	5.	1	ug/kg	91	88	80-120	4	30
1,2,4-Trimethylbenzene	< 5	5.	1	ug/kg	89	85	79-120	4	30
1,3,5-Trimethylbenzene	< 5	5.	1	ug/kg	89	85	78-120	4	30
Xylene (Total)	< 5	5.	1	ug/kg	94	91	80-120	4	30

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL**	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: Q101721AA	Sample number(s): 6007708								
1,2,4-Trimethylbenzene	N.D.	50.	250	ug/kg	101	98	79-120	3	30
Batch number: R101721AA	Sample number(s): 6007702, 6007704, 6007707-6007709, 6007714, 6007720, 6007724, 6007726, 6007728-6007729								
Benzene	N.D.	25.	250	ug/kg	99	100	80-120	1	30
1,2-Dibromoethane	N.D.	50.	250	ug/kg	105	104	80-120	1	30
1,2-Dichloroethane	N.D.	50.	250	ug/kg	101	104	71-129	3	30
Ethylbenzene	N.D.	50.	250	ug/kg	103	103	80-120	0	30
Isopropylbenzene	N.D.	50.	250	ug/kg	103	106	76-120	3	30
Methyl Tertiary Butyl Ether	N.D.	25.	250	ug/kg	99	109	74-121	10	30
Toluene	N.D.	50.	250	ug/kg	104	102	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	50.	250	ug/kg	106	105	79-120	0	30
1,3,5-Trimethylbenzene	N.D.	50.	250	ug/kg	106	105	78-120	1	30
Xylene (Total)	N.D.	50.	250	ug/kg	104	104	80-120	0	30
Batch number: R101732AA	Sample number(s): 6007730								
Benzene	N.D.	25.	250	ug/kg	94	88	80-120	6	30
1,2-Dibromoethane	N.D.	50.	250	ug/kg	102	104	80-120	2	30
1,2-Dichloroethane	N.D.	50.	250	ug/kg	101	96	71-129	6	30
Ethylbenzene	N.D.	50.	250	ug/kg	96	96	80-120	0	30
Isopropylbenzene	N.D.	50.	250	ug/kg	97	96	76-120	2	30
Methyl Tertiary Butyl Ether	N.D.	25.	250	ug/kg	98	93	74-121	5	30
Toluene	N.D.	50.	250	ug/kg	93	107	80-120	13	30
1,2,4-Trimethylbenzene	N.D.	50.	250	ug/kg	109	99	79-120	10	30
1,3,5-Trimethylbenzene	N.D.	50.	250	ug/kg	101	98	78-120	3	30
Xylene (Total)	N.D.	50.	250	ug/kg	98	97	80-120	0	30

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL**	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X101691AA	Sample number(s): 6007705-6007706,6007710-6007713,6007715-6007717								
Benzene	N.D.	0.5	5	ug/kg	92	90	80-120	2	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	90	86	80-120	4	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	96	93	71-129	4	30
Ethylbenzene	N.D.	1.	5	ug/kg	92	90	80-120	2	30
Isopropylbenzene	N.D.	1.	5	ug/kg	90	91	76-120	0	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	107	102	74-121	5	30
Toluene	N.D.	1.	5	ug/kg	90	87	80-120	4	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	88	87	79-120	1	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	88	86	78-120	2	30
Xylene (Total)	N.D.	1.	5	ug/kg	93	92	80-120	1	30
Batch number: X101722AA	Sample number(s): 6007719,6007721-6007723,6007725								
Benzene	N.D.	0.5	5	ug/kg	98	96	80-120	1	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	94	92	80-120	3	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	102	100	71-129	2	30
Ethylbenzene	N.D.	1.	5	ug/kg	94	94	80-120	0	30
Isopropylbenzene	N.D.	1.	5	ug/kg	94	93	76-120	0	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	112	112	74-121	0	30
Toluene	N.D.	1.	5	ug/kg	92	93	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	88	89	79-120	1	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	88	89	78-120	1	30
Xylene (Total)	N.D.	1.	5	ug/kg	94	95	80-120	1	30
Batch number: X101731AA	Sample number(s): 6007718,6007727								
Benzene	N.D.	0.5	5	ug/kg	91	87	80-120	4	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	91	88	80-120	3	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	94	90	71-129	4	30
Ethylbenzene	N.D.	1.	5	ug/kg	93	89	80-120	4	30
Isopropylbenzene	N.D.	1.	5	ug/kg	93	89	76-120	5	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	104	100	74-121	4	30
Toluene	N.D.	1.	5	ug/kg	89	87	80-120	3	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	87	86	79-120	2	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	87	86	78-120	1	30
Xylene (Total)	N.D.	1.	5	ug/kg	93	90	80-120	4	30
Batch number: X101741AA	Sample number(s): 6007731								
Benzene	N.D.	0.5	5	ug/kg	95	94	80-120	1	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	93	89	80-120	4	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	98	94	71-129	3	30
Ethylbenzene	N.D.	1.	5	ug/kg	96	93	80-120	3	30
Isopropylbenzene	N.D.	1.	5	ug/kg	95	92	76-120	4	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	106	104	74-121	2	30
Toluene	N.D.	1.	5	ug/kg	94	91	80-120	3	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	91	87	79-120	4	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	91	87	78-120	6	30
Xylene (Total)	N.D.	1.	5	ug/kg	96	92	80-120	4	30
Batch number: X101752AA	Sample number(s): 6007703								
Benzene	N.D.	0.5	5	ug/kg	90	90	80-120	1	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	88	85	80-120	3	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	91	89	71-129	2	30
Ethylbenzene	N.D.	1.	5	ug/kg	92	94	80-120	2	30
Isopropylbenzene	N.D.	1.	5	ug/kg	93	94	76-120	1	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	99	96	74-121	3	30

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

Laboratory Compliance Quality Control

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank MDL**</u>	<u>Blank LOQ</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Toluene	N.D.	1.	5	ug/kg	90	91	80-120	1	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	87	91	79-120	4	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	87	92	78-120	6	30
Xylene (Total)	N.D.	1.	5	ug/kg	93	94	80-120	2	30
Batch number: 10167SLF026	Sample number(s): 6007702-6007712								
Anthracene	N.D.	33.	170	ug/kg	94		89-109		
Benzo(a)anthracene	N.D.	33.	170	ug/kg	100		86-113		
Benzo(a)pyrene	N.D.	33.	170	ug/kg	92		63-138		
Benzo(b)fluoranthene	N.D.	33.	170	ug/kg	104		61-133		
Benzo(g,h,i)perylene	N.D.	33.	170	ug/kg	103		63-130		
Chrysene	N.D.	33.	170	ug/kg	96		84-117		
Fluorene	N.D.	33.	170	ug/kg	106		84-113		
Naphthalene	N.D.	33.	170	ug/kg	91		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	93		86-109		
Pyrene	N.D.	33.	170	ug/kg	101		86-122		
Batch number: 10167SLG026	Sample number(s): 6007713-6007732								
Anthracene	N.D.	33.	170	ug/kg	98		89-109		
Benzo(a)anthracene	N.D.	33.	170	ug/kg	91		86-113		
Benzo(a)pyrene	N.D.	33.	170	ug/kg	91		63-138		
Benzo(b)fluoranthene	N.D.	33.	170	ug/kg	87		61-133		
Benzo(g,h,i)perylene	N.D.	33.	170	ug/kg	103		63-130		
Chrysene	N.D.	33.	170	ug/kg	96		84-117		
Fluorene	N.D.	33.	170	ug/kg	97		84-113		
Naphthalene	N.D.	33.	170	ug/kg	95		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	98		86-109		
Pyrene	N.D.	33.	170	ug/kg	92		86-122		
Batch number: 101676150001A	Sample number(s): 6007702-6007712								
Lead	N.D.	0.0100	0.200	mg/kg	110		80-120		
Batch number: 101676150002A	Sample number(s): 6007713-6007732								
Lead	N.D.	0.0100	0.200	mg/kg	99		80-120		
Batch number: 10168820006A	Sample number(s): 6007702-6007708								
Moisture					100		99-101		
Batch number: 10168820006B	Sample number(s): 6007709-6007718								
Moisture					100		99-101		
Batch number: 10169820005A	Sample number(s): 6007719-6007723,6007725-6007732								
Moisture					100		99-101		
Batch number: 10172820002A	Sample number(s): 6007724								
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

MS	MSD	MS/MSD	RPD	BKG	DUP	DUP	Dup RPD
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*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

- (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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

<u>Analysis Name</u>	<u>%REC</u>	<u>%REC</u>	<u>Limits</u>	<u>RPD</u>	<u>MAX</u>	<u>Conc</u>	<u>Conc</u>	<u>RPD</u>	<u>Max</u>
Batch number: X101742AA	Sample number(s): 6007732 UNSPK: P010293								
Benzene	97		55-143						
1,2-Dibromoethane	95		54-129						
1,2-Dichloroethane	96		53-143						
Ethylbenzene	90		44-141						
Isopropylbenzene	82		38-144						
Methyl Tertiary Butyl Ether	113		55-129						
Toluene	97		50-146						
1,2,4-Trimethylbenzene	88		37-149						
1,3,5-Trimethylbenzene	90		38-150						
Xylene (Total)	88		44-136						
Batch number: X101691AA	Sample number(s): 6007705-6007706,6007710-6007713,6007715-6007717 UNSPK: P004640								
Benzene	78		55-143						
1,2-Dibromoethane	76		54-129						
1,2-Dichloroethane	86		53-143						
Ethylbenzene	83		44-141						
Isopropylbenzene	88		38-144						
Methyl Tertiary Butyl Ether	90		55-129						
Toluene	57		50-146						
1,2,4-Trimethylbenzene	70		37-149						
1,3,5-Trimethylbenzene	76		38-150						
Xylene (Total)	79		44-136						
Batch number: X101722AA	Sample number(s): 6007719,6007721-6007723,6007725 UNSPK: P006604								
Benzene	114		55-143						
1,2-Dibromoethane	101		54-129						
1,2-Dichloroethane	110		53-143						
Ethylbenzene	105		44-141						
Isopropylbenzene	103		38-144						
Methyl Tertiary Butyl Ether	138*		55-129						
Toluene	105		50-146						
1,2,4-Trimethylbenzene	98		37-149						
1,3,5-Trimethylbenzene	99		38-150						
Xylene (Total)	105		44-136						
Batch number: X101731AA	Sample number(s): 6007718,6007727 UNSPK: P007872								
Benzene	104		55-143						
1,2-Dibromoethane	102		54-129						
1,2-Dichloroethane	107		53-143						
Ethylbenzene	101		44-141						
Isopropylbenzene	101		38-144						
Methyl Tertiary Butyl Ether	120		55-129						
Toluene	100		50-146						
1,2,4-Trimethylbenzene	99		37-149						
1,3,5-Trimethylbenzene	100		38-150						
Xylene (Total)	102		44-136						
Batch number: X101741AA	Sample number(s): 6007731 UNSPK: P006610								
Benzene	107		55-143						
1,2-Dibromoethane	98		54-129						
1,2-Dichloroethane	105		53-143						
Ethylbenzene	102		44-141						
Isopropylbenzene	99		38-144						
Methyl Tertiary Butyl Ether	111		55-129						
Toluene	102		50-146						
1,2,4-Trimethylbenzene	92		37-149						
1,3,5-Trimethylbenzene	95		38-150						

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

- (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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

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
Xylene (Total)	101		44-136						
Batch number: X101752AA	Sample number(s): 6007703 UNSPK: P014560								
Benzene	107		55-143						
1,2-Dibromoethane	104		54-129						
1,2-Dichloroethane	107		53-143						
Ethylbenzene	108		44-141						
Isopropylbenzene	109		38-144						
Methyl Tertiary Butyl Ether	115		55-129						
Toluene	105		50-146						
1,2,4-Trimethylbenzene	103		37-149						
1,3,5-Trimethylbenzene	104		38-150						
Xylene (Total)	108		44-136						
Batch number: 10167SLF026	Sample number(s): 6007702-6007712 UNSPK: 6007702								
Anthracene	94	95	76-111	1	30				
Benzo(a)anthracene	88	86	78-111	2	30				
Benzo(a)pyrene	76	76	57-129	0	30				
Benzo(b)fluoranthene	79	81	53-131	2	30				
Benzo(g,h,i)perylene	93	80	60-123	13	30				
Chrysene	89	87	76-114	2	30				
Fluorene	98	96	75-111	1	30				
Naphthalene	57	36	33-140	16	30				
Phenanthrene	85	81	69-115	3	30				
Pyrene	93	89	76-124	3	30				
Batch number: 10167SLG026	Sample number(s): 6007713-6007732 UNSPK: 6007713								
Anthracene	99	92	76-111	7	30				
Benzo(a)anthracene	95	90	78-111	5	30				
Benzo(a)pyrene	90	80	57-129	11	30				
Benzo(b)fluoranthene	92	77	53-131	16	30				
Benzo(g,h,i)perylene	101	96	60-123	5	30				
Chrysene	90	87	76-114	3	30				
Fluorene	100	94	75-111	7	30				
Naphthalene	98	89	33-140	8	30				
Phenanthrene	98	91	69-115	6	30				
Pyrene	88	82	76-124	6	30				
Batch number: 101676150001A	Sample number(s): 6007702-6007712 UNSPK: P007928 BKG: P007928								
Lead	150 (2)	489 (2)	75-125	15	20	58.2	98.7	52*	20
Batch number: 101676150002A	Sample number(s): 6007713-6007732 UNSPK: 6007718 BKG: 6007718								
Lead	-3063 (2)	-3157 (2)	75-125	1	20	331	247	29*	20
Batch number: 10168820006A	Sample number(s): 6007702-6007708 BKG: 6007707								
Moisture						21.2	23.6	11	15
Batch number: 10168820006B	Sample number(s): 6007709-6007718 BKG: 6007714								
Moisture						30.6	31.5	3	15
Batch number: 10169820005A	Sample number(s): 6007719-6007723,6007725-6007732 BKG: 6007730								
Moisture						27.3	33.9	22*	15

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

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: 10172820002A									
Moisture						14.3	14.8	4	15

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: 8260 Master Scan (soil)

Batch number: Q101721AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
Blank	89	97	94	94
LCS	102	110*	108	103
LCSD	97	106	102	99
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)

Batch number: R101721AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007702	94	96	90	96
6007704	88	81	98	81
6007707	83	69*	90	74
6007708	94	101	94	103
6007709	69*	70	111	100
6007714	82	79	71	96
6007720	106	107	103	101
6007724	102	99	102	98
6007726	81	83	93	150*
6007728	86	85	78	84
6007729	97	92	89	83
Blank	92	93	94	98
LCS	97	96	100	101
LCSD	101	100	99	103
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)

Batch number: R101732AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007730	78	80	81	109
Blank	92	95	92	94
LCS	92	93	89	98
LCSD	90	88	105	97
Limits:	71-114	70-109	70-123	70-111

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

Surrogate Quality Control

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101691AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007705	102	103	98	100
6007706	100	104	95	91
6007710	100	101	96	87
6007711	100	100	94	91
6007712	101	105	93	96
6007713	101	102	100	82
6007715	105	98	126*	66*
6007716	103	101	100	87
6007717	100	107	95	89
Blank	100	97	94	93
LCS	102	102	99	95
LCSD	99	99	99	96
MS	102	111*	98	99
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101722AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007719	110	108	115	65*
6007721	108	104	109	68*
6007722	123*	127*	117	76
6007723	103	101	115	68*
6007725	103	108	108	77
Blank	101	102	93	92
LCS	102	98	97	96
LCSD	103	103	98	96
MS	103	99	99	94
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101731AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007718	100	107	101	84
6007727	109	110*	119	57*
Blank	101	93	91	91
LCS	103	97	99	96
LCSD	100	99	97	96
MS	101	102	98	94
Limits:	71-114	70-109	70-123	70-111

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X101741AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007731	99	99	100	84
Blank	102	96	92	89
LCS	101	95	99	95
LCSD	101	94	98	95

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

- (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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

Surrogate Quality Control

MS	101	102	100	94
Limits:	71-114	70-109	70-123	70-111
Analysis Name: TCL(4.3)by 8260(soil)				
Batch number: X101742AA				
	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007732	104	101	93	84
Blank	101	95	92	92
LCS	101	97	99	94
LCSD	101	92	98	95
MS	103	104	106	84
Limits:	71-114	70-109	70-123	70-111
Analysis Name: TCL(4.3)by 8260(soil)				
Batch number: X101752AA				
	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6007703	102	101	94	86
Blank	102	95	93	91
LCS	103	99	97	95
LCSD	100	96	99	94
MS	101	97	98	94
Limits:	71-114	70-109	70-123	70-111
Analysis Name: PAH 8270 (microwave)				
Batch number: 10167SLF026				
	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14	
6007702	82	93	75	
6007703	88	95	79	
6007704	86	98	72	
6007705	88	96	75	
6007706	85	94	71	
6007707	76	90	67	
6007708	81	103	90	
6007709	79	98	79	
6007710	85	96	73	
6007711	88	95	78	
6007712	84	92	77	
Blank	92	95	84	
LCS	92	95	87	
MS	86	96	89	
MSD	86	99	88	
Limits:	55-121	74-110	57-112	
Analysis Name: PAH 8270 (microwave)				
Batch number: 10167SLG026				
	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14	
6007713	89	99	76	
6007714	92	101	76	
6007715	88	95	75	
6007716	81	84	68	

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/16/10 at 09:42 AM

Group Number: 1198982

Surrogate Quality Control

6007717	92	97	76
6007718	90	97	76
6007719	90	91	72
6007720	117	96	78
6007721	91	96	75
6007722	81	83	67
6007723	93	101	81
6007724	87	93	73
6007725	79	89	71
6007726	100	65*	57
6007727	89	91	75
6007728	89	94	77
6007729	73	74	58
6007730	95	67*	58
6007731	86	96	77
6007732	80	83	75
Blank	99	112*	98
LCS	91	105	88
MS	97	104	82
MSD	94	101	80

Limits:	55-121	74-110	57-112
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*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

- (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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group# 1198982 Sample # 6007702-32 **COC # 239639** 1 OF 4

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

0.9-1.4°C

1 Client: <u>Sun-Aquaterra</u> Acct. #: _____ Project Name#: <u>Philly Ref. AOE-7</u> PWSID #: _____ Project Manager: <u>T. Doerr</u> P.O.#: _____ Sampler: <u>Dennis Webster</u> Quote #: _____ Name of state where samples were collected: <u>PA</u>				Matrix Check if Applicable <input type="checkbox"/> Potable <input type="checkbox"/> NPDES		4 Total # of Containers	5 Analyses Requested Preservation Codes												For Lab Use Only FSC: _____ SCR#: _____		
							Preservation Codes: H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other												6 Temperature of samples upon receipt (if requested)		
2 Sample Identification				3 Composite		Soil <input type="checkbox"/> Water <input type="checkbox"/> Other		Lead 1,2-Dichloroethane 1,2,4 and 1,3,5-Tri-methylbenzene Benzene, Cumene Ethylbenzene, mTBE Toluene, Xylene(s) (m) Ethylene Dibromide Anthracene Benzolanthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene, Fluoranthene Naphthalene Phenanthrene Pyrene													Remarks
Date Collected Time Collected BH-10-24-1.0-1.5 6/7/10 0845 BH-10-23-1.0-1.5 6/7/10 0945 BH-10-25-1.2-1.7 6/7/10 1100 BH-10-26-1.5-2.0 6/7/10 1135 BH-10-29-0.7-1.2 6/7/10 1325 BH-10-30-1.5-2.0 6/7/10 1400 BH-10-28-1.5-2.0 6/7/10 1430 BH-10-27-1.5-2.0 6/8/10 0810 BH-10-33-1.5-2.0 6/8/10 0850 BH-10-35-1.3-1.7' 6/8/10 0930																					
7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: _____ Rush results requested by (please circle): Phone Fax <u>E-mail</u> Phone #: _____ Fax #: _____ E-mail address: _____						Relinquished by: <u>[Signature]</u> Date: <u>6/10/10</u> Time: <u>250</u> Relinquished by: <u>[Signature]</u> Date: <u>6-15-10</u> Time: <u>1040</u> Relinquished by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1525</u> Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____						Received by: <u>Aquaterra Fridge</u> Date: <u>6/10/10</u> Time: <u>2:50</u> Received by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1000</u> Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____ Received by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1825</u>									
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes <u>No</u> Type IV (CLP SOW) Internal COC Required? Yes <u>No</u> Type VI (Raw Data Only)						SDG Complete? Yes <u>No</u>															

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only
 Acct. # 10132 Group# 1198982 Sample # 6007702-32 **COC # 240137** ^{2 of 4}

Please print. Instructions on reverse side correspond with circled numbers. 0.9-1.40C

1 Client: <u>Sun-Aquaterre</u> Acct. #: _____ Project Name#: <u>Philly Ref AUL-7</u> PWSID #: _____ Project Manager: <u>T. Querr</u> P.O.#: _____ Sampler: <u>Dennis Webster</u> Quote #: _____ Name of state where samples were collected: <u>PA</u>				Matrix Check if Potable <input type="checkbox"/> NPDES <input type="checkbox"/> Applicable <input type="checkbox"/> Soil <input type="checkbox"/> Water <input type="checkbox"/> Other <input type="checkbox"/>		5 Analyses Requested Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other												6 Temperature of samples upon receipt (if requested)		
						For Lab Use Only FSC: _____ SCR#: _____														
2 Sample Identification				3 Composite		4 Total # of Containers		1,2-Dichloroethane 1,2,4- and 1,3,5-TMB Benzene, Cumene Ethylbenzene, m-Xylene Toluene, Xylene (total) Anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene, Fluorene naphthalene Phenanthrene, Pyrene												Remarks X Analysis per attached list
Date Collected Time Collected Grab				Soil Water Other																
BH-10-34_1.0-1.5				6/8/10 0950		X		X												
BH-10-32_0.5-1.0 (inverted)				6/8/10 1030		X		X												
BH-10-31_1.5-2.0				6/8/10 1105		X		X												
BH-10-22_1.5-2.0				6/8/10 1320		X		X												
BH-10-21_1.0-1.5				6/8/10 1400		X		X												
BH-10-20_1.3-1.8				6/8/10 1445		X		X												
BH-10-19_0.5-1.0				6/9/10 0800		X		X												
BH-10-18_1.5-2.0				6/9/10 0830		X		X												
BH-10-17_1.5-2.0				6/9/10 0850		X		X												
BH-10-06_1.2-1.7				6/9/10 0915		X		X												
7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> 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: _____								Relinquished by: <u>[Signature]</u> Date <u>6/10/10</u> Time <u>2:50</u> Relinquished by: <u>[Signature]</u> Date <u>6-15-10</u> Time <u>10:00</u> Relinquished by: <u>[Signature]</u> Date <u>6/15/10</u> Time <u>1825</u> Relinquished by: <u>[Signature]</u> Date _____ Time _____ Relinquished by: _____ Date _____ Time _____				Received by: <u>Aquaterre Fridge</u> Date <u>6/10/10</u> Time <u>2:50</u> Received by: <u>[Signature]</u> Date <u>6/15/10</u> Time <u>10:00</u> Received by: <u>[Signature]</u> Date _____ Time _____ Received by: <u>[Signature]</u> Date _____ Time _____ Received by: <u>[Signature]</u> Date <u>6/15/10</u> Time <u>1825</u>								
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes <u>No</u> Type IV (CLP SOW) If yes, indicate QC sample and serial replicate vol./no. Type VI (Raw Data Only) Internal COC Required? Yes <u>No</u>								SDG Complete? <u>No</u>												



**Lancaster
Laboratories**

Acct. # 10132

Group#

Sample # 6007102-32

~~COC # 240138~~

Please print. Instructions on reverse side correspond with circled numbers

0.9-1.4°C)

For Lab Use Only

FSC:

SCR#:

Preservation Codes

$$H=HCl$$

T=Thiosulfate

$$\text{N}=\text{HNO}_2$$

B=NaOH

$$S=H_2SO$$

0=Other

6

Temperature of samples upon receipt (if requested)

1 Client: <u>Sun - Aquaterra</u> Acct. #: _____ Project Name/ID: <u>Philly AEC A01-7</u> PWSID #: _____ Project Manager: <u>T. Quern</u> P.O. #: _____ Sampler: <u>Dennis Webster</u> Quote #: _____ Name of state where samples were collected: _____		4 Matrix Check if Applicable Potable <input type="checkbox"/> NPDES <input type="checkbox"/>		5 Analyses Requested Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other												For Lab Use Only FSC: _____ SCR#: _____										
				6 Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other												Temperature of samples upon receipt (if requested)										
2 Sample Identification		Date Collected	Time Collected	3 Grab	Composite	Soil	Water	Other	Total # of Containers	Lead (ppm) 1,2-Dichloroethene 1,2,4 and 1,3,5-TMB Benzene, Cumene Ethylbenzene, m-Xylene Ethylene Dibromide Toluene, Xylene (total) Anthracene Benzene, p-xylene Benzene, o-xylene Benzene, m-xylene Chrysene, Fluoranthene Naphthalene Phenanthrene, Pyrene												Remarks				
BH-10-05_ 1.5-2.0		6/9/10	0950	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	* Analysis per attached 1.5-	
BH-10-13_ 1.5-2.0		6/9/10	1030	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
BH-10-14_ 1.5-2.0		6/9/10	1130	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
BH-10-15_ 1.4-1.9		6/9/10	1150	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
BH-10-16_ 1.5-2.0		6/9/10	1435	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
BH-10-12_ 1.5-2.0		6/10/10	0755	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
BH-10-11_ 1.5-2.0		6/10/10	0835	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
BH-10-10_ 1.5-2.0		6/10/10	0915	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
BH-10-08_ 1.5-2.0		6/10/10	0955	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
BH-10-09_ 1.2-1.7		6/10/10	1025	X		X			4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: _____ Rush results requested by (please circle): Phone Fax <u>E-mail</u> Phone #: _____ Fax #: _____ E-mail address: _____						Relinquished by: <u>[Signature]</u> Date: <u>6/10/10</u> Time: <u>2:50</u>		Received by: <u>Aquaterra FID</u> Date: <u>6/10/10</u> Time: <u>2:50</u>																		
Relinquished by: <u>[Signature]</u> Date: <u>6-15-10</u> Time: <u>10:00</u>						Received by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>10:00</u>																				
Relinquished by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1825</u>						Received by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1825</u>																				
Relinquished by: <u>[Signature]</u> Date: _____ Time: _____						Received by: _____ Date: _____ Time: _____																				
Relinquished by: <u>[Signature]</u> Date: _____ Time: _____						Received by: <u>[Signature]</u> Date: <u>6/15/10</u> Time: <u>1825</u>																				

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group # 1198982 Sample # 6007702-32 **COC # 240136** 40F4

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

0.9-1.4°C

1 Client: <u>Sun-Aquarona</u> Acct. #: _____ Project Name/ #: <u>Philly Ref-AVE-7</u> PWSID #: _____ Project Manager: <u>T. DUCIV</u> P.O. #: _____ Sampler: <u>D. LEBER</u> Quote #: _____ Name of state where samples were collected: _____				4 Matrix Check if Applicable Potable <input type="checkbox"/> NPDES <input type="checkbox"/> Water <input type="checkbox"/> Other <input type="checkbox"/>		5 Analyses Requested Preservation Codes <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Lead</td> <td style="width: 10%;">1,2-Dichloroethane</td> <td style="width: 10%;">1,2,4-Trichlorobenzene</td> <td style="width: 10%;">Benzene</td> <td style="width: 10%;">Ethylbenzene</td> <td style="width: 10%;">Toluene</td> <td style="width: 10%;">Xylenes</td> <td style="width: 10%;">Styrene</td> <td style="width: 10%;">Acrylonitrile</td> <td style="width: 10%;">Methanol</td> <td style="width: 10%;">Ethanol</td> <td style="width: 10%;">Isopropanol</td> <td style="width: 10%;">Naphthalene</td> <td style="width: 10%;">Phenanthrene</td> <td style="width: 10%;">Fluoranthene</td> <td style="width: 10%;">Pyrene</td> <td style="width: 10%;">Benzo(a)pyrene</td> <td style="width: 10%;">Benzo(a)fluoranthene</td> <td style="width: 10%;">Benzo(b)fluoranthene</td> <td style="width: 10%;">Benzo(k)fluoranthene</td> <td style="width: 10%;">Dibenz(a,h)anthracene</td> <td style="width: 10%;">Indeno(1,2,3-cd)pyrene</td> <td style="width: 10%;">Chrysene</td> <td style="width: 10%;">Fluorene</td> <td style="width: 10%;">Naphthalene</td> <td style="width: 10%;">Phenanthrene</td> <td style="width: 10%;">Fluoranthene</td> <td style="width: 10%;">Pyrene</td> <td style="width: 10%;">Benzo(a)pyrene</td> <td style="width: 10%;">Benzo(a)fluoranthene</td> <td style="width: 10%;">Benzo(b)fluoranthene</td> <td style="width: 10%;">Benzo(k)fluoranthene</td> <td style="width: 10%;">Dibenz(a,h)anthracene</td> <td style="width: 10%;">Indeno(1,2,3-cd)pyrene</td> </tr> </table>										Lead	1,2-Dichloroethane	1,2,4-Trichlorobenzene	Benzene	Ethylbenzene	Toluene	Xylenes	Styrene	Acrylonitrile	Methanol	Ethanol	Isopropanol	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Benzo(a)pyrene	Benzo(a)fluoranthene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Chrysene	Fluorene	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Benzo(a)pyrene	Benzo(a)fluoranthene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	For Lab Use Only FSC: _____ SCR#: <u>91651</u>		6 Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other		Temperature of samples upon receipt (if requested)	
Lead	1,2-Dichloroethane	1,2,4-Trichlorobenzene	Benzene	Ethylbenzene	Toluene	Xylenes	Styrene	Acrylonitrile	Methanol	Ethanol	Isopropanol	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Benzo(a)pyrene	Benzo(a)fluoranthene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Chrysene	Fluorene	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Benzo(a)pyrene	Benzo(a)fluoranthene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene																						
2 Sample Identification				Date Collected		Time Collected		3 Grab Composite		Soil		Water		Other		Total # of Containers		Remarks																																					
<u>9/10-07-10-15</u>				<u>6/10/10</u>		<u>1135</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>4</u>		<u>*Analysis per attached List.</u>																																					
7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: _____ Rush results requested by (please circle): Phone Fax <u>E-mail</u> Phone #: _____ Fax #: _____ E-mail address: _____				Relinquished by: <u>Bottle Storage</u> Date: _____ Time: _____ Relinquished by: <u>J. L. L.</u> Date: <u>6/10/10</u> Time: <u>9:50</u> Relinquished by: <u>J. L. L.</u> Date: <u>6/10/10</u> Time: <u>2:50</u> Relinquished by: <u>J. L. L.</u> Date: <u>6-15-10</u> Time: <u>10:00</u> Relinquished by: <u>J. L. L.</u> Date: <u>6/15/10</u> Time: <u>1835</u>		Received by: <u>J. L. L.</u> Date: <u>6/10/10</u> Time: <u>6:45</u> Received by: <u>J. L. L.</u> Date: <u>6/10/10</u> Time: <u>2:50</u> Received by: <u>J. L. L.</u> Date: <u>6/15/10</u> Time: <u>10:00</u> Received by: <u>J. L. L.</u> Date: <u>6/15/10</u> Time: <u>1825</u>		9 Date Time																																															
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes <u>No</u> Type IV (CLP SOW) Internal COC Required? Yes / No <u>No</u> Type VI (Raw Data Only)				SDG Complete? Yes No		Relinquished by: <u>J. L. L.</u> Date: <u>6/15/10</u> Time: <u>1835</u>		Received by: <u>J. L. L.</u> Date: <u>6/15/10</u> Time: <u>1825</u>		Date Time																																													

Table 1 (continued)
Constituents of Concern for Soil
AOIs 2 and 3 Work Plan for Site Characterization
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

METALS	CAS No.
Lead (total)	7439-92-1

VOLATILE ORGANIC COMPOUNDS	CAS No.
1,2-dichloroethane	107-06-2
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Ethylene dibromide	106-93-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

SEMI-VOLATILE ORGANIC COMPOUNDS	CAS No.
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo (g,h,i) perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

Notes:

1. Constituents are from Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E (pgs. 29-30) of PADEP Document, *Closure Requirements for Underground Storage Tank Systems*, effective April 1, 1998 and the March 18, 2008 revised PADEP Petroleum Short List.

[illegible][illegible]

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T

WARRANTY AND LIMITS OF LIABILITY - I, _____, hereby acknowledge that I have read and understand 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, _____, do not warrant that the information contained herein will be complete, true, accurate, reliable, or current. No representation or warranty is made by us regarding the accuracy, reliability, or completeness of the information contained herein. LANCASTER LABORATORIES, INC. does not warrant that the information contained herein will be complete, true, accurate, reliable, or current. S. _____ T. _____ C. _____ LANCASTER LABORATORIES, INC. does not warrant that the information contained herein will be complete, true, accurate, reliable, or current.

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 30, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/13/2010

Group Number: 1202808

PO Number: PHILADELPHIA REFINERY

State of Sample Origin: PA

Client Sample DescriptionC-129_071210 Grab Water
C-129D_071210 Grab Water
C-130_071210 Grab Water
C-50_071210 Grab WaterLancaster Labs (LLI) #6030838
6030839
6030840
6030841

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan
COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.
COPY TO

Attn: Megan Breen

ELECTRONIC SUN: Aquaterra Tech.
COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI
COPY TO

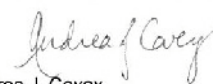
Attn: EDD Group

ELECTRONIC Langan
COPY TO

Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,


Andrea J. Covey
Senior Specialist

Sample Description: C-129_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-129_071210

LLI Sample # WW 6030838
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 10:45 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A7129

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0095	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	0.0025	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102014AA	07/21/2010 00:35	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102014AA	07/21/2010 00:35	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10195WAJ026	07/23/2010 12:32	Brian K Graham	1
07807	BNA Water Extraction	SW-846 3510C	1	10195WAJ026	07/15/2010 06:15	Timothy J Attenberger	1
07879	EDB in Wastewater	SW-846 8011	1	101950015A	07/17/2010 19:10	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101950015A	07/15/2010 09:00	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050002A	07/16/2010 12:32	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050002	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-129D_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-129D_071210

LLI Sample # WW 6030839
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 12:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A729D

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS	Semivolatiles	SW-846 8270C	ug/l	ug/l	ug/l	
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC	Miscellaneous	SW-846 8011	ug/l	ug/l	ug/l	
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals	Dissolved	SW-846 6020	mg/l	mg/l	mg/l	
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P101991AA	07/18/2010 21:44	Florida A Cimino	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P101991AA	07/18/2010 21:44	Florida A Cimino	1
07805	PAHs by 8270	SW-846 8270C	1	10195WAJ026	07/24/2010 03:33	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10195WAJ026	07/15/2010 06:15	Timothy J Attenberger	1
07879	EDB in Wastewater	SW-846 8011	1	101950015A	07/17/2010 19:40	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101950015A	07/15/2010 09:00	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050002A	07/16/2010 12:34	Choon Y Tian	1

*=This limit was used in the evaluation of the final result

Sample Description: C-129D_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-129D_071210

LLI Sample # WW 6030839
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 12:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A729D

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050002	07/15/2010 19:45	Mirit S Shenouda	1

Sample Description: C-130_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-130_071210

LLI Sample # WW 6030840
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 14:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A7130

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P101991AA	07/18/2010 22:13	Florida A Cimino	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P101991AA	07/18/2010 22:13	Florida A Cimino	1
07805	PAHs by 8270	SW-846 8270C	1	10195WAJ026	07/24/2010 04:19	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10195WAJ026	07/15/2010 06:15	Timothy J Attenberger	1
07879	EDB in Wastewater	SW-846 8011	1	101950015A	07/17/2010 20:10	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101950015A	07/15/2010 09:00	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050002A	07/16/2010 12:36	Choon Y Tian	1

*=This limit was used in the evaluation of the final result



Analysis Report

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

Page 2 of 2

Sample Description: C-130_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-130_071210

LLI Sample # WW 6030840
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 14:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A7130

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050002	07/15/2010 19:45	Mirit S Shenouda	1

Sample Description: C-50_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-50_071210

LLI Sample # WW 6030841
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 14:45 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A7-50

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0095	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102011AA	07/20/2010 20:21	Daniel H Heller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102011AA	07/20/2010 20:21	Daniel H Heller	1
07805	PAHs by 8270	SW-846 8270C	1	10195WAJ026	07/24/2010 05:05	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10195WAJ026	07/15/2010 06:15	Timothy J Attenberger	1
07879	EDB in Wastewater	SW-846 8011	1	101950015A	07/17/2010 20:39	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101950015A	07/15/2010 09:00	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050002A	07/16/2010 12:37	Choon Y Tian	1

*=This limit was used in the evaluation of the final result



Analysis Report

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

Page 2 of 2

Sample Description: C-50_071210 Grab Water
Philadelphia Refinery AOI-7
COC: 242742 C-50_071210

LLI Sample # WW 6030841
LLI Group # 1202808
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/12/2010 14:45 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/13/2010 15:10

West Chester PA 19381

Reported: 07/30/2010 17:42

Discard: 08/14/2010

A7-50

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050002	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/30/10 at 05:42 PM

Group Number: 1202808

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P101991AA Sample number(s): 6030839-6030840									
Benzene	< 1	1.	0.5	ug/l	109	110	79-120	1	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	87	89	70-130	1	30
Ethylbenzene	< 1	1.	0.5	ug/l	84	85	79-120	1	30
Isopropylbenzene	< 2	2.	0.5	ug/l	80	83	77-120	4	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	107	109	76-120	2	30
Toluene	< 1	1.	0.5	ug/l	91	94	79-120	3	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	81	84	74-120	3	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	82	86	75-120	4	30
Xylene (Total)	< 1	1.	0.5	ug/l	85	87	80-120	2	30
Batch number: P102011AA Sample number(s): 6030841									
Benzene	< 1	1.	0.5	ug/l	93	93	79-120	0	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	74	75	70-130	1	30
Ethylbenzene	< 1	1.	0.5	ug/l	88	89	79-120	1	30
Isopropylbenzene	< 2	2.	0.5	ug/l	84	86	77-120	2	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	90	92	76-120	2	30
Toluene	< 1	1.	0.5	ug/l	95	97	79-120	2	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	89	88	74-120	1	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	90	89	75-120	1	30
Xylene (Total)	< 1	1.	0.5	ug/l	89	90	80-120	2	30
Batch number: P102014AA Sample number(s): 6030838									
Benzene	< 1	1.	0.5	ug/l	98	100	79-120	2	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	80	81	70-130	1	30
Ethylbenzene	< 1	1.	0.5	ug/l	90	90	79-120	0	30
Isopropylbenzene	< 2	2.	0.5	ug/l	89	90	77-120	1	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	103	100	76-120	2	30
Toluene	< 1	1.	0.5	ug/l	93	94	79-120	1	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	87	87	74-120	0	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	87	87	75-120	0	30
Xylene (Total)	< 1	1.	0.5	ug/l	92	91	80-120	0	30
Batch number: 10195WAJ026 Sample number(s): 6030838-6030841									
Chrysene	< 5	5.	1	ug/l	98	99	82-112	2	30
Fluorene	< 5	5.	1	ug/l	108	106	82-113	2	30
Naphthalene	< 5	5.	1	ug/l	96	96	77-107	1	30
Phenanthrene	< 5	5.	1	ug/l	98	99	83-112	2	30
Pyrene	< 5	5.	1	ug/l	106	107	80-115	1	30
Batch number: 101950015A Sample number(s): 6030838-6030841									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	96	96	60-140	0	20
Batch number: 101966050002A Sample number(s): 6030838-6030841									
Lead	< 0.0010	0.0010	0.00005	mg/l	99		90-115		
			0						

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/30/10 at 05:42 PM

Group Number: 1202808

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

<u>Analysis Name</u>	<u>MS</u> <u>%REC</u>	<u>MSD</u> <u>%REC</u>	<u>MS/MSD</u> <u>Limits</u>	<u>RPD</u>	<u>RPD</u> <u>MAX</u>	<u>BKG</u> <u>Conc</u>	<u>DUP</u> <u>Conc</u>	<u>DUP</u> <u>RPD</u>	<u>Dup RPD</u> <u>Max</u>
Batch number: P101991AA	Sample number(s): 6030839-6030840 UNSPK: 6030840								
Benzene	114		80-126						
1,2-Dichloroethane	88		66-141						
Ethylbenzene	87		71-134						
Isopropylbenzene	84		75-128						
Methyl Tertiary Butyl Ether	109		72-126						
Toluene	96		80-125						
1,2,4-Trimethylbenzene	82		72-130						
1,3,5-Trimethylbenzene	84		72-131						
Xylene (Total)	88		79-125						
Batch number: P102011AA	Sample number(s): 6030841 UNSPK: P034448								
Benzene	101		80-126						
1,2-Dichloroethane	79		66-141						
Ethylbenzene	96		71-134						
Isopropylbenzene	94		75-128						
Methyl Tertiary Butyl Ether	95		72-126						
Toluene	105		80-125						
1,2,4-Trimethylbenzene	97		72-130						
1,3,5-Trimethylbenzene	100		72-131						
Xylene (Total)	97		79-125						
Batch number: P102014AA	Sample number(s): 6030838 UNSPK: 6030838								
Benzene	108		80-126						
1,2-Dichloroethane	85		66-141						
Ethylbenzene	100		71-134						
Isopropylbenzene	98		75-128						
Methyl Tertiary Butyl Ether	107		72-126						
Toluene	104		80-125						
1,2,4-Trimethylbenzene	95		72-130						
1,3,5-Trimethylbenzene	95		72-131						
Xylene (Total)	100		79-125						
Batch number: 101950015A	Sample number(s): 6030838-6030841 UNSPK: P030835 BKG: P030836								
Ethylene dibromide	83		65-135			< 0.028	< 0.028	0 (1)	30
Batch number: 101966050002A	Sample number(s): 6030838-6030841 UNSPK: P032079 BKG: P032079								
Lead	115	108	75-125	7	20	< 0.0010	< 0.0010	3 (1)	20

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: UST BTEX, MTBE in Water

Batch number: P101991AA

Dibromofluoromethane

1,2-Dichloroethane-d4

Toluene-d8

4-Bromofluorobenzene

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/30/10 at 05:42 PM

Group Number: 1202808

Surrogate Quality Control

6030839	98	103	94	93
6030840	99	104	94	93
Blank	98	105	94	92
LCS	98	106	94	93
LCSD	97	106	95	93
MS	97	108	93	92

Limits: 80-116 77-113 80-113 78-113

Analysis Name: UST BTEX, MTBE in Water

Batch number: P102011AA

Dibromofluoromethane 1,2-Dichloroethane-d4 Toluene-d8 4-Bromofluorobenzene

6030841	91	104	102	91
Blank	92	104	104	89
LCS	91	102	103	90
LCSD	91	103	104	92
MS	92	104	104	91

Limits: 80-116 77-113 80-113 78-113

Analysis Name: UST BTEX, MTBE in Water

Batch number: P102014AA

Dibromofluoromethane 1,2-Dichloroethane-d4 Toluene-d8 4-Bromofluorobenzene

6030838	94	99	98	94
Blank	94	103	99	94
LCS	93	104	100	95
LCSD	95	106	98	93
MS	95	105	99	96

Limits: 80-116 77-113 80-113 78-113

Analysis Name: PAHs by 8270

Batch number: 10195WAJ026

Nitrobenzene-d5 2-Fluorobiphenyl Terphenyl-d14

6030838	86	92	89
6030839	88	90	84
6030840	86	89	76
6030841	86	92	88
Blank	90	92	84
LCS	92	95	82
LCSD	90	93	83

Limits: 64-121 63-114 47-114

Analysis Name: EDB in Wastewater

Batch number: 101950015A

1,1,2,2-Tetrachloroethane

6030838	92
6030839	28*
6030840	93
6030841	97
Blank	115

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/30/10 at 05:42 PM

Group Number: 1202808

Surrogate Quality Control

DUP	107
LCS	110
LCSD	104
MS	130

Limits: 46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

- (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.



**Lancaster
Laboratories**

Acct. # 10132 Group# 1202808 Sample # 6030838-41

COC # 242742

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

(1) Client: SUN - AQUATERRA Acct. #: _____ Project Name/#: PHILAREF A01-7 PWSID #: _____ Project Manager: TIFFANY ODELL P.O.#: _____ Sampler: ETHAN MAIZE Quote #: _____ Name of state where samples were collected: _____				Matrix <input type="checkbox"/> Potable <input checked="" type="checkbox"/> Check if NPDES Applicable		(5) Analyses Requested										For Lab Use Only FSC: SCR#: 9268C							
						Preservation Codes										Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other							
(2) Sample Identification			Date Collected	Time Collected	(3) Grab Composite	Soil	Water	Other	Total # of Containers											Remarks	Temperature of samples upon receipt (if requested)		
C-129-071210	7/12/10	10:45	X			X			8	X	X	X	X	X	X	X							O.9-2.6 C
C-129D-071210	7/12/10	12:30	X			X			8														
C-130-071210	7/12/10	14:30	X			X			8														
C-50-071210	7/12/10	14:45	X			X			8														
(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: _____						Relinquished by: Bottle Storage		Date	Time	Received by: J. Lacey		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
(8) Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 SDG Complete? Yes No Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes No Type IV (CLP SOW) Type VI (Raw Data Only) Internal COC Required? Yes / No						Relinquished by: [Signature] LAQT		Date	Time	Received by: Fridge		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										
						Relinquished by: [Signature]		Date	Time	Received by: [Signature]		Date	Time										

Note: All yes indicate QC sample and submit trip rate volume.

Lancaster Laboratories, Inc., 2425 New Holland Pike, Lancaster, PA 17601 (717) 656-2300 Fax: (717) 656-6766
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

Issued by Dept. 6042 Management
2102.05

2102 05

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Material or Blank Material Limit
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Nuclei Too Numerous To Count	CP Units	Colony-Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - T indicates that the concentration of the sample is less than the <u>method detection limit</u> of the analytical method used.		
>	Greater than		
J	Concentration of T is greater than or equal to the Method Detection Limit (MDL) of the L. method (LOD)		
ppm	Parts per million - O indicates that the concentration of the sample is greater than or equal to the Method Detection Limit (MDL) of the L. method (LOD) of the analytical method used. F indicates that the concentration of the sample is greater than or equal to the Method Detection Limit (MDL) of the L. method (LOD) of the analytical method used.		
ppb	Parts per billion		
Dry weight basis	Reported concentration is based on the dry weight of the sample. T indicates that the concentration is based on the total weight of the sample. A indicates that the concentration is based on the ash-free weight of the sample.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a qualitative method for identifying compounds	B	Volatile (CRDL) ≥ IDL
B	Analysis is a qualitative method for identifying compounds	E	Elemental analysis is a qualitative method for identifying compounds
C	Peak is a qualitative method for identifying compounds	M	Detection limit is a qualitative method for identifying compounds
D	Concentration is a qualitative method for identifying compounds	N	Sample is a qualitative method for identifying compounds
E	Concentration is a qualitative method for identifying compounds	S	Method is a qualitative method for identifying compounds (MSA) is a qualitative method for identifying compounds
N	Peak is a qualitative method for identifying compounds (TIC is a qualitative method for identifying compounds)	U	Concentration is a qualitative method for identifying compounds
P	Concentration is a qualitative method for identifying compounds (TIC is a qualitative method for identifying compounds)	W	Peak is a qualitative method for identifying compounds
U	Concentration is a qualitative method for identifying compounds	*	Detection limit is a qualitative method for identifying compounds
X,Y,Z	Detection limit is a qualitative method for identifying compounds	+	Concentration is a qualitative method for identifying compounds (MSA) ≥ 0.995

Analysis is a qualitative method for identifying compounds. NELAC is a qualitative method for identifying compounds.

Method is a qualitative method for identifying compounds. MSA is a qualitative method for identifying compounds.

TIC is a qualitative method for identifying compounds. C is a qualitative method for identifying compounds. U is a qualitative method for identifying compounds. W is a qualitative method for identifying compounds. T is a qualitative method for identifying compounds. A is a qualitative method for identifying compounds. S is a qualitative method for identifying compounds. M is a qualitative method for identifying compounds. E is a qualitative method for identifying compounds. B is a qualitative method for identifying compounds. N is a qualitative method for identifying compounds. D is a qualitative method for identifying compounds. P is a qualitative method for identifying compounds. X, Y, Z is a qualitative method for identifying compounds.

WARRANTY AND LIMITS OF LIABILITY - I, the undersigned, hereby warrant that the foregoing analysis was performed in accordance with the methods and procedures of the Lancaster Laboratories. 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. W is a qualitative method for identifying compounds. L is a qualitative method for identifying compounds. S is a qualitative method for identifying compounds. T is a qualitative method for identifying compounds. C is a qualitative method for identifying compounds. X, Y, Z is a qualitative method for identifying compounds.

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 30, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/14/2010

Group Number: 1203026

PO Number: PHILADELPHIA REFINERY

State of Sample Origin: PA

Client Sample DescriptionC-96_071310 Water
C-50D_071310 Water
C-95_071310 Water
C-113_071310 Water
C-49_071310 Water
C-109_071310 WaterLancaster Labs (LLI) #6031959
6031960
6031961
6031962
6031963
6031964

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Megan Breen

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Max E. Snavelly
Senior Specialist

Sample Description: C-96_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-96_071310

LLI Sample # WW 6031959
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 10:05 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/14/2010 17:07

West Chester PA 19381

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C--96

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102002AA	07/19/2010 20:13	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102002AA	07/19/2010 20:13	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/28/2010 23:08	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 07:05	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:15	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-50D_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-50D_071310

LLI Sample # WW 6031960
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 11:05 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/14/2010 17:07

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C-50D

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102002AA	07/19/2010 20:41	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102002AA	07/19/2010 20:41	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/28/2010 23:34	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 07:35	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:17	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-95_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-95_071310

LLI Sample # WW 6031961
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 12:15 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/14/2010 17:07

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C--95

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	19	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	2	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102002AA	07/19/2010 21:09	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102002AA	07/19/2010 21:09	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/28/2010 23:59	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 08:05	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:19	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-113_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-113_071310

LLI Sample # WW 6031962
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 13:25 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/14/2010 17:07

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C-113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102002AA	07/19/2010 21:37	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102002AA	07/19/2010 21:37	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/29/2010 00:25	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 08:35	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:21	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-49_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-49_071310

LLI Sample # WW 6031963
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 13:55 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/14/2010 17:07

West Chester PA 19381

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C--49

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
Preservation requirements were not met. The vial submitted for volatile analysis did not have a pH < 2 at the time of analysis. Due to the volatile nature of the analytes, it is not appropriate for the laboratory to adjust the pH at the time of sample receipt. The pH of this sample was pH = 3.						
GC/MS	Semivolatiles	SW-846 8270C	ug/l	ug/l	ug/l	
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC	Miscellaneous	SW-846 8011	ug/l	ug/l	ug/l	
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals	Dissolved	SW-846 6020	mg/l	mg/l	mg/l	
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102002AA	07/19/2010 22:06	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102002AA	07/19/2010 22:06	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/29/2010 01:17	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 10:04	James H Place	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 2 of 2

Sample Description: C-49_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-49_071310

LLI Sample # WW 6031963
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 13:55 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/14/2010 17:07

West Chester PA 19381

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C--49

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:22	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-109_071310 Water
Philadelphia Refinery AOI-7
COC: 242744 C-109_071310

LLI Sample # WW 6031964
LLI Group # 1203026
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/13/2010 14:50 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/14/2010 17:07

Reported: 07/30/2010 09:02

Discard: 08/14/2010

C-109

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102022AA	07/21/2010 21:31	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102022AA	07/21/2010 21:31	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10196WAD026	07/29/2010 01:42	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10196WAD026	07/16/2010 01:25	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	101960019A	07/18/2010 10:34	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101960019A	07/16/2010 08:45	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	101966050003A	07/20/2010 10:24	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	101966050003	07/15/2010 19:45	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/30/10 at 09:02 AM

Group Number: 1203026

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

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank LOQ**</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: P102002AA Sample number(s): 6031959-6031963									
Benzene	< 1	1.	0.5	ug/l	103	95	79-120	8	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	82	80	70-130	3	30
Ethylbenzene	< 1	1.	0.5	ug/l	95	89	79-120	6	30
Isopropylbenzene	< 2	2.	0.5	ug/l	93	88	77-120	6	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	104	99	76-120	5	30
Toluene	< 1	1.	0.5	ug/l	100	94	79-120	6	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	92	88	74-120	5	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	93	88	75-120	6	30
Xylene (Total)	< 1	1.	0.5	ug/l	96	91	80-120	5	30
Batch number: P102022AA Sample number(s): 6031964									
Benzene	< 1	1.	0.5	ug/l	105		79-120		
1,2-Dichloroethane	< 1	1.	0.5	ug/l	83		70-130		
Ethylbenzene	< 1	1.	0.5	ug/l	94		79-120		
Isopropylbenzene	< 2	2.	0.5	ug/l	91		77-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	106		76-120		
Toluene	< 1	1.	0.5	ug/l	96		79-120		
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	94		74-120		
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	94		75-120		
Xylene (Total)	< 1	1.	0.5	ug/l	95		80-120		
Batch number: 10196WAD026 Sample number(s): 6031959-6031964									
Chrysene	< 5	5.	1	ug/l	93	94	82-112	1	30
Fluorene	< 5	5.	1	ug/l	97	94	82-113	2	30
Naphthalene	< 5	5.	1	ug/l	94	94	77-107	0	30
Phenanthrene	< 5	5.	1	ug/l	96	95	83-112	1	30
Pyrene	< 5	5.	1	ug/l	102	96	80-115	6	30
Batch number: 101960019A Sample number(s): 6031959-6031964									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	117	108	60-140	7	20
Batch number: 101966050003A Sample number(s): 6031959-6031964									
Lead	< 0.0010	0.0010	0.00005	mg/l	101		90-115		

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

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
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*- Outside of specification

** This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/30/10 at 09:02 AM

Group Number: 1203026

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	BKG MAX	DUP Conc	DUP RPD	Dup RPD Max
Batch number: P102002AA	Sample number(s): 6031959-6031963 UNSPK: P031921							
Benzene	103		80-126	1				
1,2-Dichloroethane	80		66-141					
Ethylbenzene	95		71-134					
Isopropylbenzene	95		75-128					
Methyl Tertiary Butyl Ether	98		72-126					
Toluene	100		80-125					
1,2,4-Trimethylbenzene	92		72-130					
1,3,5-Trimethylbenzene	92		72-131					
Xylene (Total)	96		79-125					
Batch number: P102022AA	Sample number(s): 6031964 UNSPK: P034994							
Benzene	107	107	80-126	1	30			
1,2-Dichloroethane	83	86	66-141	3	30			
Ethylbenzene	97	98	71-134	2	30			
Isopropylbenzene	97	98	75-128	1	30			
Methyl Tertiary Butyl Ether	105	105	72-126	0	30			
Toluene	101	103	80-125	1	30			
1,2,4-Trimethylbenzene	94	94	72-130	0	30			
1,3,5-Trimethylbenzene	95	94	72-131	1	30			
Xylene (Total)	98	98	79-125	1	30			
Batch number: 101960019A	Sample number(s): 6031959-6031964 UNSPK: P031713							
Ethylene dibromide	91	96	65-135	5	20			
Batch number: 101966050003A	Sample number(s): 6031959-6031964 UNSPK: P031956 BKG: P031956							
Lead	105	101	75-125	4	20	< 0.0010	< 0.0010	200* (1) 20

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: UST BTEX, MTBE in Water
Batch number: P102002AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6031959	93	103	99	93
6031960	94	100	99	94
6031961	92	98	98	97
6031962	94	102	99	93
6031963	94	102	99	93
Blank	93	101	100	93
LCS	93	103	99	93
LCS	94	104	100	93
MS	93	105	99	92
Limits:	80-116	77-113	80-113	78-113

Analysis Name: UST BTEX, MTBE in Water

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/30/10 at 09:02 AM

Group Number: 1203026

Surrogate Quality Control

Batch number: P102022AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6031964	97	103	95	94
Blank	95	102	98	94
LCS	95	104	96	92
MS	94	105	97	94
MSD	95	105	97	95
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270

Batch number: 10196WAD026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6031959	101	100	99
6031960	101	100	95
6031961	99	92	81
6031962	109	93	104
6031963	101	95	94
6031964	105	99	89
Blank	106	107	94
LCS	102	99	91
LCSD	99	99	87
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater

Batch number: 101960019A

	1,1,2,2-Tetrachloroethane
6031959	91
6031960	92
6031961	98
6031962	97
6031963	91
6031964	94
Blank	99
LCS	108
LCSD	104
MS	81
MSD	90
Limits:	46-136

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

(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.



**Lancaster
Laboratories**

For Lancaster Laboratories use only

Acct. # 10132 Group# 1203026 Sample # 6031959-64

COC # 242744

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate

$$\mathbf{N} = \text{HNO}_3 \quad \mathbf{B} = \text{NaOH}$$

S=H₂SO₄ **O**=Other

6 Temperature of samples upon receipt (if requested)

[illegible]

Explanation of Symbols and Abbreviations

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

RL	Rounded Lead	BMQL	Bottom Material
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Tolerances are indicated by the symbol < (e.g., < 0.001) indicating that the tolerance is less than the value indicated.		
>	Greater than		
J	Joint - Tolerances are indicated by the symbol ≥ (e.g., ≥ 0.001) indicating that the tolerance is greater than or equal to the value indicated (LOL).		
ppm	Parts per million - Ozone is measured in parts per million (ppm) and is defined as the mass of ozone in a given volume of air divided by the mass of the air (e.g., 1 ppm = 1 mg/m ³).		
ppb	Parts per billion		
Dry weight basis	Residue is reported on a dry weight basis. Tolerances are indicated by the symbol < (e.g., < 0.001) indicating that the tolerance is less than the value indicated.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a qualitative measure of organic compounds	B	Volatile (CRDL) ≥ IDL
B	Aromatic or non-aromatic	E	Elemental
C	Pesticide or herbicide	M	Dissolved
D	Chlorinated	N	Soluble
E	Chlorinated or brominated	S	Metals (MSA) (MSA)
N	Pesticide or herbicide	U	Chlorinated or brominated
P	Chlorinated or brominated	W	Pesticide or herbicide
U	Chlorinated or brominated	*	Dissolved
X,Y,Z	Dissolved or suspended	+	Chlorinated or brominated

Aromatic or non-aromatic is a qualitative measure of organic compounds.

Metals (MSA) (MSA) is a qualitative measure of metals.

TIC is a qualitative measure of organic compounds. C is a qualitative measure of chlorinated or brominated compounds. U is a qualitative measure of dissolved or suspended compounds. W is a qualitative measure of pesticides or herbicides. T is a qualitative measure of toxic compounds.

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ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

July 26, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/15/2010
Group Number: 1203256
PO Number: PHILADELPHIA REFINERY
State of Sample Origin: PAClient Sample DescriptionC-112_071410 Grab Water
C-114_071410 Grab Water
C-57_071410 Grab Water
C-58_071410 Grab Water
C-51_071410 Grab WaterLancaster Labs (LLI) #6033025
6033026
6033027
6033028
6033029

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Megan Breen

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Robin C. Runkle
Senior Specialist

Sample Description: C-112_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-112_071410

LLI Sample # WW 6033025
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 08:55 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C-112

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	13	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	19	5	1	1
07805	Pyrene	129-00-0	9	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102011AA	07/20/2010 11:50	Daniel H Heller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102011AA	07/20/2010 11:50	Daniel H Heller	1
07805	PAHs by 8270	SW-846 8270C	1	10198WAC026	07/22/2010 16:38	Brian K Graham	1
07807	BNA Water Extraction	SW-846 3510C	1	10198WAC026	07/19/2010 09:45	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 12:19	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102006050001A	07/21/2010 07:40	Deborah A Krady	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 2 of 2

Sample Description: C-112_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-112_071410

LLI Sample # WW 6033025
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 08:55 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C-112

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102006050001	07/20/2010 09:42	Denise K Connors	1

Sample Description: C-114_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-114_071410

LLI Sample # WW 6033026
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 10:25 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C-114

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	16	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102001AA	07/19/2010 16:41	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102001AA	07/19/2010 16:41	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10198WAC026	07/23/2010 13:49	Brian K Graham	1
07807	BNA Water Extraction	SW-846 3510C	1	10198WAC026	07/19/2010 09:45	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 13:49	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102006050001A	07/21/2010 07:41	Deborah A Krady	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 2 of 2

Sample Description: C-114_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-114_071410

LLI Sample # WW 6033026
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 10:25 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C-114

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102006050001	07/20/2010 09:42	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-57_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-57_071410

LLI Sample # WW 6033027
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 11:20 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/15/2010 17:10

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C--57

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
Preservation requirements were not met. The vial submitted for volatile analysis did not have a pH < 2 at the time of analysis. Due to the volatile nature of the analytes, it is not appropriate for the laboratory to adjust the pH at the time of sample receipt. The pH of this sample was pH = 6.						
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	6	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	8	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102001AA	07/19/2010 17:10	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102001AA	07/19/2010 17:10	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10198WAC026	07/23/2010 14:15	Brian K Graham	1
07807	BNA Water Extraction	SW-846 3510C	1	10198WAC026	07/19/2010 09:45	Kerrie A Freeburn	1

*=This limit was used in the evaluation of the final result

Sample Description: C-57_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-57_071410

LLI Sample # WW 6033027
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 11:20 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C--57

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 14:19	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102006050001A	07/21/2010 07:47	Deborah A Krady	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102006050001	07/20/2010 09:42	Denise K Conners	1

Sample Description: C-58_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-58_071410

LLI Sample # WW 6033028
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 12:40 by EM

SUN: Aquaterra Tech.

Submitted: 07/15/2010 17:10

PO Box 744

Reported: 07/26/2010 14:18

West Chester PA 19381

Discard: 08/10/2010

C--58

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102001AA	07/19/2010 17:38	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102001AA	07/19/2010 17:38	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10198WAC026	07/24/2010 00:24	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10198WAC026	07/19/2010 09:45	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 14:48	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102006050001A	07/21/2010 07:49	Deborah A Krady	1

*=This limit was used in the evaluation of the final result

Sample Description: C-58_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-58_071410

LLI Sample # WW 6033028
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 12:40 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C--58

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102006050001	07/20/2010 09:42	Denise K Connors	1

Sample Description: C-51_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-51_071410

LLI Sample # WW 6033029
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 13:35 by EM

SUN: Aquaterra Tech.

Submitted: 07/15/2010 17:10

PO Box 744

Reported: 07/26/2010 14:18

West Chester PA 19381

Discard: 08/10/2010

C--51

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102001AA	07/19/2010 18:06	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102001AA	07/19/2010 18:06	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10198WAC026	07/24/2010 00:50	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10198WAC026	07/19/2010 09:45	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 15:19	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102006050001A	07/21/2010 07:50	Deborah A Krady	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 2 of 2

Sample Description: C-51_071410 Grab Water
Philadelphia Refinery AOI-7
COC: 232897 C-51_071410

LLI Sample # WW 6033029
LLI Group # 1203256
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/14/2010 13:35 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/15/2010 17:10

West Chester PA 19381

Reported: 07/26/2010 14:18

Discard: 08/10/2010

C--51

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102006050001	07/20/2010 09:42	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 07/26/10 at 02:18 PM

Group Number: 1203256

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P102001AA Sample number(s): 6033026-6033029									
Benzene	< 1	1.	0.5	ug/l	92	95	79-120	3	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	75	75	70-130	0	30
Ethylbenzene	< 1	1.	0.5	ug/l	89	91	79-120	2	30
Isopropylbenzene	< 2	2.	0.5	ug/l	85	88	77-120	4	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	93	93	76-120	0	30
Toluene	< 1	1.	0.5	ug/l	96	100	79-120	4	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	91	93	74-120	2	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	91	94	75-120	4	30
Xylene (Total)	< 1	1.	0.5	ug/l	90	93	80-120	3	30
Batch number: P102011AA Sample number(s): 6033025									
Benzene	< 1	1.	0.5	ug/l	93	93	79-120	0	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	74	75	70-130	1	30
Ethylbenzene	< 1	1.	0.5	ug/l	88	89	79-120	1	30
Isopropylbenzene	< 2	2.	0.5	ug/l	84	86	77-120	2	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	90	92	76-120	2	30
Toluene	< 1	1.	0.5	ug/l	95	97	79-120	2	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	89	88	74-120	1	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	90	89	75-120	1	30
Xylene (Total)	< 1	1.	0.5	ug/l	89	90	80-120	2	30
Batch number: 10198WAC026 Sample number(s): 6033025-6033029									
Chrysene	< 5	5.	1	ug/l	90	89	82-112	1	30
Fluorene	< 5	5.	1	ug/l	99	97	82-113	2	30
Naphthalene	< 5	5.	1	ug/l	93	92	77-107	1	30
Phenanthrene	< 5	5.	1	ug/l	93	94	83-112	0	30
Pyrene	< 5	5.	1	ug/l	93	92	80-115	1	30
Batch number: 101980008A Sample number(s): 6033025-6033029									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	104	104	60-140	0	20
Batch number: 102006050001A Sample number(s): 6033025-6033029									
Lead	< 0.0010	0.0010	0.00005	mg/l	101		90-115		

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
---------------	---------	----------	---------------	-----	---------	----------	----------	---------	-------------

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/26/10 at 02:18 PM

Group Number: 1203256

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	BKG MAX	DUP Conc	DUP RPD	Dup RPD Max
Batch number: P102001AA	Sample number(s): 6033026-6033029 UNSPK: P032950							
Benzene	97		80-126					
1,2-Dichloroethane	78		66-141					
Ethylbenzene	91		71-134					
Isopropylbenzene	89		75-128					
Methyl Tertiary Butyl Ether	99		72-126					
Toluene	99		80-125					
1,2,4-Trimethylbenzene	91		72-130					
1,3,5-Trimethylbenzene	92		72-131					
Xylene (Total)	91		79-125					
Batch number: P102011AA	Sample number(s): 6033025 UNSPK: P034448							
Benzene	101		80-126					
1,2-Dichloroethane	79		66-141					
Ethylbenzene	96		71-134					
Isopropylbenzene	94		75-128					
Methyl Tertiary Butyl Ether	95		72-126					
Toluene	105		80-125					
1,2,4-Trimethylbenzene	97		72-130					
1,3,5-Trimethylbenzene	100		72-131					
Xylene (Total)	97		79-125					
Batch number: 101980008A	Sample number(s): 6033025-6033029 UNSPK: 6033025 BKG: 6033026							
Ethylene dibromide	96		65-135		< 0.029	< 0.030	0 (1)	30
Batch number: 102006050001A	Sample number(s): 6033025-6033029 UNSPK: P033985 BKG: P033985							
Lead	100	102	75-125	1	20	< 0.0010	< 0.0010	200* (1) 20

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: UST BTEX, MTBE in Water

Batch number: P102001AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6033026	91	102	103	91
6033027	91	102	102	90
6033028	91	101	104	91
6033029	92	102	104	90
Blank	91	101	102	89
LCS	91	104	103	90
LCSD	90	102	103	90
MS	93	105	104	90
Limits:	80-116	77-113	80-113	78-113

Analysis Name: UST BTEX, MTBE in Water

Batch number: P102011AA

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 07/26/10 at 02:18 PM

Group Number: 1203256

Surrogate Quality Control

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6033025	92	100	103	92
Blank	92	104	104	89
LCS	91	102	103	90
LCSD	91	103	104	92
MS	92	104	104	91
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270

Batch number: 10198WAC026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6033025	88	94	85
6033026	91	97	85
6033027	90	89	76
6033028	90	94	88
6033029	97	95	88
Blank	94	98	82
LCS	95	97	85
LCSD	93	94	84
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater

Batch number: 101980008A

1,1,2,2-Tetrachloroethane

6033025	84
6033026	85
6033027	87
6033028	96
6033029	93
Blank	100
DUP	88
LCS	104
LCSD	98
MS	82

Limits: 46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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.



Lancaster
Laboratories

Acct. # 10132 Group# 1203256 Sample # 6033025-29

COC # 232897

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

s. Cooler Temp 0.9-2.6°C

For Lab Use Only

FSC:

SCR#:

Preservation Codes

$$\text{H}=\text{HC}\text{I}$$

T=Thiosulfate

$$\text{N}=\text{HNO}_3$$

B=NaOH

$$\mathbf{S}=\mathbf{H}_2\mathbf{SO}_4$$

0=Other

6

Temperature of samples
upon receipt (if requested)

[illegible]

Lancaster Laboratories, Inc., 2425 New Holland Pike, Lancaster, PA 17601 (717) 656-2300 Fax: (717) 656-6766
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Material or Blank Material Limit
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Counts Exceeded	CP Units	Count Per Unit
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - T indicates that the concentration of the sample is less than the <u>method detection limit</u> of the method used to analyze the sample.		
>	Greater than		
J	Joint Factories and Chemicals Association (JFCA) Method Detection Limit (MDL) or the Laboratory's Limit of Observation (LOO)		
ppm	Parts per million - O indicates that the concentration of the sample is less than the method detection limit (g/g) or the laboratory's limit of observation (g/g). F indicates that the concentration of the sample is greater than the method detection limit (g/g) or the laboratory's limit of observation (g/g).		
ppb	Parts per billion		
Dry weight basis	Reported concentration is based on the dry weight of the sample. T indicates that the concentration is based on the total weight of the sample. A indicates that the concentration is based on the ash weight of the sample.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a Total Ion Chromatogram	B	Volatile (CRDL) ≥ IDL
B	Acetone is a solvent	E	Elemental
C	Peak is a chromatogram	M	Detection Method
D	Concentration is a chromatogram	N	Sample
E	Concentration is a chromatogram	S	Method (MSA) is a chromatogram
N	Peak is a chromatogram	U	Concentration is a chromatogram
P	Concentration is a chromatogram	W	Peak is a chromatogram
U	Concentration is a chromatogram	*	Detection Method
X,Y,Z	Detection Method	+	Concentration is a chromatogram

A concentration of a sample is reported as NELAC (National Environmental Laboratory Accreditation Council) method.

M indicates that the concentration is based on the dry weight of the sample.

T indicates that the concentration is based on the total weight of the sample. C indicates that the concentration is based on the concentration of the sample. U indicates that the concentration is based on the concentration of the sample. W indicates that the concentration is based on the concentration of the sample. T indicates that the concentration is based on the concentration of the sample.

WARRANTY AND LIMITS OF LIABILITY - I understand and agree that 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. W indicates that the concentration is based on the concentration of the sample. L indicates that the concentration is based on the concentration of the sample. S indicates that the concentration is based on the concentration of the sample. T indicates that the concentration is based on the concentration of the sample. C indicates that the concentration is based on the concentration of the sample.

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

August 03, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/16/2010
Group Number: 1203491
PO Number: PHILA REF AOI-7
State of Sample Origin: PAClient Sample DescriptionC-127_071510 Grab Water
C-52_071510 Grab Water
C-131_071510 Grab Water
C-132_071510 Grab Water
C-133_071510 Grab Water
C-137_071510 Grab Water
C-54_071510 Grab WaterLancaster Labs (LLI) #6034558
6034559
6034560
6034561
6034562
6034563
6034564

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

Attn: Dennis Webster

COPY TO

ELECTRONIC SUN: Aquaterra Tech.

Attn: Megan Breen

COPY TO

ELECTRONIC SUN: Aquaterra Tech.

Attn: Tiffani Doerr

COPY TO

ELECTRONIC LLI

Attn: EDD Group

COPY TO

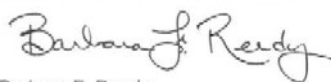
ELECTRONIC Langan

Attn: Kristen Ward

COPY TO

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Barbara F. Reedy
Senior Specialist

Sample Description: C-127_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-127_071510

LLI Sample # WW 6034558
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 08:50 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/16/2010 17:20

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-127

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	7	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	6	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 17:03	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 17:03	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WAJ026	07/30/2010 20:19	Ryan P Byrne	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WAJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 20:18	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:46	David K Beck	1

*=This limit was used in the evaluation of the final result



Analysis Report

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Page 2 of 2

Sample Description: C-127_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-127_071510

LLI Sample # WW 6034558
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 08:50 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-127

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

Sample Description: C-52_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-52_071510

LLI Sample # WW 6034559
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 09:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-52-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 17:25	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 17:25	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WJ026	07/30/2010 20:43	Ryan P Byrne	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 20:48	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:47	David K Beck	1

*=This limit was used in the evaluation of the final result



Analysis Report

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

Page 2 of 2

Sample Description: C-52_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-52_071510

LLI Sample # WW 6034559
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 09:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-52-

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-131_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-131_071510

LLI Sample # WW 6034560
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 10:40 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/16/2010 17:20

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C131-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	7	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1

Preservation requirements were not met. The vial submitted for volatile analysis did not have a pH < 2 at the time of analysis. Due to the volatile nature of the analytes, it is not appropriate for the laboratory to adjust the pH at the time of sample receipt. The pH of this sample was pH = 5.

GC/MS	Semivolatiles	SW-846 8270C	ug/l	ug/l	ug/l	
07805	Chrysene	218-01-9	< 50	50	10	1
07805	Fluorene	86-73-7	< 50	50	10	1
07805	Naphthalene	91-20-3	< 50	50	10	1
07805	Phenanthrene	85-01-8	100	50	10	1
07805	Pyrene	129-00-0	78	50	10	1

Due to the nature of the sample matrix, a reduced aliquot was used for analysis. The reporting limits were raised accordingly.

GC	Miscellaneous	SW-846 8011	ug/l	ug/l	ug/l	
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals	Dissolved	SW-846 6020	mg/l	mg/l	mg/l	
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 17:47	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 17:47	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WAJ026	07/31/2010 07:09	Florida A Cimino	1

*=This limit was used in the evaluation of the final result

Sample Description: C-131_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-131_071510

LLI Sample # WW 6034560
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 10:40 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C131-

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07807	BNA Water Extraction	SW-846 3510C	1	10200WAJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980008A	07/20/2010 21:18	Michele D Hamilton	1
07786	EDB Extraction	SW-846 8011	1	101980008A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:53	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Conners	1

Sample Description: C-132_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-132_071510

LLI Sample # WW 6034561
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 11:45 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-132

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	28	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 18:10	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 18:10	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WAJ026	07/31/2010 07:32	Florida A Cimino	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WAJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980012A	07/20/2010 22:47	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101980012A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:55	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-133_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-133_071510

LLI Sample # WW 6034562
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 12:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-133

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	8	5	1	1
07805	Fluorene	86-73-7	8	5	1	1
07805	Naphthalene	91-20-3	8	5	1	1
07805	Phenanthrene	85-01-8	17	5	1	1
07805	Pyrene	129-00-0	17	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 18:33	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 18:33	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WJ026	07/31/2010 07:57	Florida A Cimino	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980012A	07/20/2010 23:46	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101980012A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:56	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-137_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-137_071510

LLI Sample # WW 6034563
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 13:35 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C137-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	4	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 18:55	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 18:55	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WAJ026	07/31/2010 08:21	Florida A Cimino	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WAJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980012A	07/21/2010 00:46	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101980012A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 11:58	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-54_071510 Grab Water
Philadelphia Refinery AOI-7
COC: 232898 C-54_071510

LLI Sample # WW 6034564
LLI Group # 1203491
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/15/2010 14:35 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/16/2010 17:20

West Chester PA 19381

Reported: 08/03/2010 13:28

Discard: 08/18/2010

C-54-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D102031AA	07/22/2010 21:54	Ginelle L Feister	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	D102031AA	07/22/2010 21:54	Ginelle L Feister	1
07805	PAHs by 8270	SW-846 8270C	1	10200WAJ026	07/31/2010 08:45	Florida A Cimino	1
07807	BNA Water Extraction	SW-846 3510C	1	10200WAJ026	07/20/2010 09:30	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	101980012A	07/21/2010 01:16	James H Place	1
07786	EDB Extraction	SW-846 8011	1	101980012A	07/19/2010 08:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 12:00	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 08/03/10 at 01:28 PM

Group Number: 1203491

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D102031AA Sample number(s): 6034558-6034564									
Benzene	< 1	1.	0.5	ug/l	83		79-120		
1,2-Dichloroethane	< 1	1.	0.5	ug/l	94		70-130		
Ethylbenzene	< 1	1.	0.5	ug/l	96		79-120		
Isopropylbenzene	< 2	2.	0.5	ug/l	99		77-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	96		76-120		
Toluene	< 1	1.	0.5	ug/l	94		79-120		
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	104		74-120		
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	101		75-120		
Xylene (Total)	< 1	1.	0.5	ug/l	100		80-120		
Batch number: 10200WJ026 Sample number(s): 6034558-6034564									
Chrysene	< 5	5.	1	ug/l	96	96	82-112	0	30
Fluorene	< 5	5.	1	ug/l	99	100	82-113	2	30
Naphthalene	< 5	5.	1	ug/l	87	86	77-107	1	30
Phenanthrene	< 5	5.	1	ug/l	94	96	83-112	2	30
Pyrene	< 5	5.	1	ug/l	97	95	80-115	2	30
Batch number: 101980008A Sample number(s): 6034558-6034560									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	104	104	60-140	0	20
Batch number: 101980012A Sample number(s): 6034561-6034564									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	121	121	60-140	0	20
Batch number: 102016050003A Sample number(s): 6034558-6034564									
Lead	< 0.0010	0.0010	0.00005	mg/l	102		90-115		

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: D102031AA Sample number(s): 6034558-6034564 UNSPK: P033697									
Benzene	89	89	80-126	1	30				
1,2-Dichloroethane	94	94	66-141	1	30				
Ethylbenzene	96	90	71-134	6	30				
Isopropylbenzene	91	99	75-128	9	30				
Methyl Tertiary Butyl Ether	96	96	72-126	1	30				
Toluene	101	97	80-125	4	30				
1,2,4-Trimethylbenzene	94	106	72-130	12	30				

*- Outside of specification

** This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/03/10 at 01:28 PM

Group Number: 1203491

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	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
1,3,5-Trimethylbenzene	89	101	72-131	13	30				
Xylene (Total)	103	98	79-125	5	30				
Batch number: 101980008A	Sample number(s): 6034558-6034560 UNSPK: P033025 BKG: P033026								
Ethylene dibromide	96		65-135			< 0.029	< 0.030	0 (1)	30
Batch number: 101980012A	Sample number(s): 6034561-6034564 UNSPK: 6034561 BKG: 6034562								
Ethylene dibromide	104		65-135			< 0.029	< 0.029	0 (1)	30
Batch number: 102016050003A	Sample number(s): 6034558-6034564 UNSPK: P033036 BKG: P033036								
Lead	103	104	75-125	1	20	< 0.0010	< 0.0010	41* (1)	20

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: UST BTEX, MTBE in Water
Batch number: D102031AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6034558	93	93	106	94
6034559	95	97	105	101
6034560	97	100	110	91
6034561	91	94	111	102
6034562	95	99	108	101
6034563	96	95	102	100
6034564	95	96	107	87
Blank	96	98	106	95
LCS	93	101	105	98
MS	92	94	105	94
MSD	93	102	109	96
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270
Batch number: 10200WAJ026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6034558	92	91	92
6034559	88	89	85
6034560	89	90	76
6034561	90	91	78
6034562	86	76	56
6034563	91	82	80
6034564	88	91	79
Blank	91	93	89
LCS	89	88	89
LCSD	86	88	86

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/03/10 at 01:28 PM

Group Number: 1203491

Surrogate Quality Control

Limits: 64-121 63-114 47-114

Analysis Name: EDB in Wastewater
Batch number: 101980008A
1,1,2,2-
Tetrachloroethane

6034558	101
6034559	100
6034560	97
Blank	100
DUP	88
LCS	104
LCSD	98
MS	82

Limits: 46-136

Analysis Name: EDB in Wastewater
Batch number: 101980012A
1,1,2,2-
Tetrachloroethane

6034561	72
6034562	90
6034563	87
6034564	93
Blank	94
DUP	77
LCS	99
LCSD	98
MS	62

Limits: 46-136

*- Outside of specification

** This limit was used in the evaluation of the final result for the blank

(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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group# 1203491 Sample # 6034558-64

COC # 232898

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

1 Client: <u>SUNOCO - PHILA REF A01-7</u> Acct. #: _____ Project Name/ #: _____ PWSID #: _____ Project Manager: <u>TIFFANY ODER</u> P.O. #: _____ Sampler: <u>ETHAN MAGEE</u> Quote #: _____ Name of state where samples were collected: <u>PENNSYLVANIA</u>				4 Matrix <input type="checkbox"/> Potable <input type="checkbox"/> Check if <input type="checkbox"/> WPDEN <input type="checkbox"/> Applicable <input type="checkbox"/> Other		5 Analyses Requested Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other										6 Temperature of samples upon receipt (if requested)																																																																					
						LEAD 1,2-DICHLOROETHANE 1,2,4-TRIMETHYLBENZENE 1,3,5-TRIMETHYLBENZENE BENZENE, CUMENE ETHYLBENZENE ETHYLENE DIBROMIDE MTBE, TOLUENE XYLENES (TOTAL) CHLORIDE, FLUORIDE NITRATE, NITRITE PHOSPHORUS PYRENE																																																																															
2 <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample Identification</th> <th>Date Collected</th> <th>Time Collected</th> <th>Grab</th> <th>Composite</th> <th>Soil</th> <th>Water</th> <th>Other</th> <th>Total # of Containers</th> </tr> </thead> <tbody> <tr> <td>C-127-071510</td> <td>7/15/10</td> <td>8:50</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-52-071510</td> <td>7/15/10</td> <td>9:30</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-131-071510</td> <td>7/15/10</td> <td>10:40</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-132-071510</td> <td>7/15/10</td> <td>11:45</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-133-071510</td> <td>7/15/10</td> <td>12:30</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-137-071510</td> <td>7/15/10</td> <td>13:35</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> <tr> <td>C-54-071510</td> <td>7/15/10</td> <td>14:35</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> </tr> </tbody> </table>				Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	C-127-071510	7/15/10	8:50	X			X		8	C-52-071510	7/15/10	9:30	X			X		8	C-131-071510	7/15/10	10:40	X			X		8	C-132-071510	7/15/10	11:45	X			X		8	C-133-071510	7/15/10	12:30	X			X		8	C-137-071510	7/15/10	13:35	X			X		8	C-54-071510	7/15/10	14:35	X			X		8	Remarks <u>Temp 0.7-1.2°C</u>									
Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers																																																																													
C-127-071510	7/15/10	8:50	X			X		8																																																																													
C-52-071510	7/15/10	9:30	X			X		8																																																																													
C-131-071510	7/15/10	10:40	X			X		8																																																																													
C-132-071510	7/15/10	11:45	X			X		8																																																																													
C-133-071510	7/15/10	12:30	X			X		8																																																																													
C-137-071510	7/15/10	13:35	X			X		8																																																																													
C-54-071510	7/15/10	14:35	X			X		8																																																																													
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: _____				Relinquished by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>15:00</u>		Received by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>15:00</u>		9																																																																													
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes No Type IV (CLP SOW) (If yes, indicate QC sample and submit triplicate volume.) Type VI (Raw Data Only) Internal COC Required? Yes / No				Relinquished by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>16:30</u>		Received by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>15:00</u>																																																																															
				Relinquished by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>12:15</u>		Received by: <u>[Signature]</u> Date: <u>7/15/10</u> Time: <u>12:15</u>																																																																															
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Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Monitoring Level
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony-Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - T indicates that the concentration of the sample is less than the <u>method detection limit</u> of the analytical method used.		
>	Greater than		
J	The sample concentration is \geq the Method Detection Limit (MDL) or the Limit of Quantification (LOQ).		
ppm	Parts per million - O indicates that the concentration is in $\mu\text{g/g}$ or $\mu\text{g/l}$. F indicates that the concentration is in mg/g or mg/l .		
ppb	Parts per billion		
Dry weight basis	Reported concentration is based on the dry weight of the sample. T indicates that the concentration is based on the total weight of the sample. A indicates that the concentration is based on the ash-free weight of the sample.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a Total Ion Chromatogram	B	Volatile is \geq CRDL
B	Acetone is a solvent	E	Elemental is a gas
C	Pesticide is a pesticide	M	Dissolved is a dissolved
D	Chlorine is a chlorine	N	Sulfate is a sulfate
E	Chlorine is a chlorine	S	Metal is a metal (MSA) is a metal
N	Pesticide is a pesticide	U	Chlorine is a chlorine
P	Chlorine is a chlorine	W	Pesticide is a pesticide
U	Chlorine is a chlorine	*	Dissolved is a dissolved
X,Y,Z	Dissolved is a dissolved	+	Chlorine is a chlorine

A Lancaster Laboratories is a member of the NELAC International network.

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T Lancaster Laboratories is a member of the NELAC International network. C Lancaster Laboratories is a member of the NELAC International network. U Lancaster Laboratories is a member of the NELAC International network. W Lancaster Laboratories is a member of the NELAC International network. T Lancaster Laboratories is a member of the NELAC International network.

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ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

August 03, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/19/2010
Group Number: 1203664
PO Number: PHILA REFINERY AOI-7
State of Sample Origin: PAClient Sample DescriptionC-55_071610 Grab Water
C-138_071610 Grab Water
C-60_071610 Grab Water
C-98_071610 Grab Water
C-63_071610 Grab Water
C-108_071610 Grab Water
C-53A_071610 Grab WaterLancaster Labs (LLI) #6035583
6035584
6035585
6035586
6035587
6035588
6035589

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

Attn: Dennis Webster

COPY TO

ELECTRONIC SUN: Aquaterra Tech.

Attn: Megan Breen

COPY TO

ELECTRONIC SUN: Aquaterra Tech.

Attn: Tiffani Doerr

COPY TO

ELECTRONIC LLI

Attn: EDD Group

COPY TO


ELECTRONIC Langan

Attn: Kristen Ward

COPY TO

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,


Robert Strocko Jr.
Manager

Sample Description: C-55_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-55_071610

LLI Sample # WW 6035583
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 09:00 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-55-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102032AA	07/22/2010 11:19	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102032AA	07/22/2010 11:19	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 00:48	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 04:00	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 12:20	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-138_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-138_071610

LLI Sample # WW 6035584
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 10:25 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-138

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102032AA	07/22/2010 11:47	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102032AA	07/22/2010 11:47	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 01:12	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 04:59	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 12:22	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-60_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-60_071610

LLI Sample # WW 6035585
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 11:05 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-60-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	3	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102032AA	07/22/2010 12:15	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102032AA	07/22/2010 12:15	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 01:36	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 05:59	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 12:24	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-98_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-98_071610

LLI Sample # WW 6035586
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 11:55 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-98-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102031AA	07/22/2010 08:43	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102031AA	07/22/2010 08:43	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 01:59	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 06:29	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102016050003A	07/22/2010 12:26	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102016050003	07/21/2010 08:55	Denise K Connors	1

*=This limit was used in the evaluation of the final result

Sample Description: C-63_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-63_071610

LLI Sample # WW 6035587
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 12:55 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-63-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102031AA	07/22/2010 09:40	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102031AA	07/22/2010 09:40	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 02:23	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 07:59	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102026050005A	07/27/2010 10:42	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102026050005	07/21/2010 20:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-108_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-108_071610

LLI Sample # WW 6035588
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 13:40 by EW

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/19/2010 16:25

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-108

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102031AA	07/22/2010 10:08	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102031AA	07/22/2010 10:08	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 02:47	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 08:29	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102026050005A	07/27/2010 10:44	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102026050005	07/21/2010 20:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-53A_071610 Grab Water
Philadelphia Refinery AOI-7
COC: 232899 C-53A_071610

LLI Sample # WW 6035589
LLI Group # 1203664
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/16/2010 14:30 by EW

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/19/2010 16:25

West Chester PA 19381

Reported: 08/03/2010 13:50

Discard: 08/18/2010

C-53A

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P102031AA	07/22/2010 10:36	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	P102031AA	07/22/2010 10:36	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10201WAN026	08/01/2010 03:10	Linda M Hartenstine	1
07807	BNA Water Extraction	SW-846 3510C	1	10201WAN026	07/21/2010 10:00	Kerrie A Freeburn	1
07879	EDB in Wastewater	SW-846 8011	1	102010009A	07/24/2010 08:59	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102010009A	07/20/2010 19:55	JoElla L Rice	1
06035	Lead	SW-846 6020	1	102026050005A	07/27/2010 10:50	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102026050005	07/21/2010 20:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 08/03/10 at 01:50 PM

Group Number: 1203664

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P102031AA	Sample number(s): 6035586-6035589								
Benzene	< 1	1.	0.5	ug/l	92	91	79-120	2	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	74	73	70-130	2	30
Ethylbenzene	< 1	1.	0.5	ug/l	88	85	79-120	3	30
Isopropylbenzene	< 2	2.	0.5	ug/l	85	83	77-120	2	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	90	89	76-120	1	30
Toluene	< 1	1.	0.5	ug/l	94	93	79-120	1	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	87	87	74-120	1	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	89	87	75-120	2	30
Xylene (Total)	< 1	1.	0.5	ug/l	88	86	80-120	2	30
Batch number: P102032AA	Sample number(s): 6035583-6035585								
Benzene	< 1	1.	0.5	ug/l	92		79-120		
1,2-Dichloroethane	< 1	1.	0.5	ug/l	75		70-130		
Ethylbenzene	< 1	1.	0.5	ug/l	91		79-120		
Isopropylbenzene	< 2	2.	0.5	ug/l	91		77-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	93		76-120		
Toluene	< 1	1.	0.5	ug/l	96		79-120		
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	89		74-120		
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	89		75-120		
Xylene (Total)	< 1	1.	0.5	ug/l	93		80-120		
Batch number: 10201WAN026	Sample number(s): 6035583-6035589								
Chrysene	< 5	5.	1	ug/l	94	96	82-112	2	30
Fluorene	< 5	5.	1	ug/l	98	98	82-113	0	30
Naphthalene	< 5	5.	1	ug/l	95	95	77-107	0	30
Phenanthrene	< 5	5.	1	ug/l	97	97	83-112	0	30
Pyrene	< 5	5.	1	ug/l	99	100	80-115	2	30
Batch number: 102010009A	Sample number(s): 6035583-6035589								
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	88	88	60-140	0	20
Batch number: 102016050003A	Sample number(s): 6035583-6035586								
Lead	< 0.0010	0.0010	0.00005	mg/l	102		90-115		
			0						
Batch number: 102026050005A	Sample number(s): 6035587-6035589								
Lead	< 0.0010	0.0010	0.00005	mg/l	102		90-115		
			0						

Sample Matrix Quality Control

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.

Group Number: 1203664

Reported: 08/03/10 at 01:50 PM

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: P102031AA Sample number(s): 6035586-6035589 UNSPK: 6035586									
Benzene	97		80-126						
1,2-Dichloroethane	77		66-141						
Ethylbenzene	92		71-134						
Isopropylbenzene	90		75-128						
Methyl Tertiary Butyl Ether	95		72-126						
Toluene	101		80-125						
1,2,4-Trimethylbenzene	92		72-130						
1,3,5-Trimethylbenzene	92		72-131						
Xylene (Total)	93		79-125						
Batch number: P102032AA Sample number(s): 6035583-6035585 UNSPK: P035266									
Benzene	104	101	80-126	3	30				
1,2-Dichloroethane	82	80	66-141	3	30				
Ethylbenzene	99	98	71-134	2	30				
Isopropylbenzene	99	96	75-128	3	30				
Methyl Tertiary Butyl Ether	102	100	72-126	2	30				
Toluene	104	102	80-125	1	30				
1,2,4-Trimethylbenzene	96	93	72-130	3	30				
1,3,5-Trimethylbenzene	97	95	72-131	2	30				
Xylene (Total)	100	98	79-125	2	30				
Batch number: 102010009A Sample number(s): 6035583-6035589 UNSPK: 6035583 BKG: 6035584									
Ethylene dibromide	96		65-135			< 0.029	< 0.029	0 (1)	30
Batch number: 102016050003A Sample number(s): 6035583-6035586 UNSPK: P033036 BKG: P033036									
Lead	103	104	75-125	1	20	< 0.0010	< 0.0010	41* (1)	20
Batch number: 102026050005A Sample number(s): 6035587-6035589 UNSPK: P035639 BKG: P035639									
Lead	102	107	75-125	3	20	0.0101	0.0100	0	20

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: UST BTEX, MTBE in Water

Batch number: P102031AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6035586	92	102	102	91
6035587	92	104	104	92
6035588	93	101	103	91
6035589	92	101	102	91
Blank	92	102	103	91
LCS	92	104	103	92
LCSD	91	105	103	91
MS	92	107	103	92
Limits:	80-116	77-113	80-113	78-113

*- Outside of specification

**-This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/03/10 at 01:50 PM

Group Number: 1203664

Surrogate Quality Control

Analysis Name: UST BTEX, MTBE in Water
Batch number: P102032AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6035583	93	101	101	94
6035584	93	101	101	93
6035585	92	99	101	94
Blank	91	100	102	94
LCS	92	101	102	95
MS	94	101	102	94
MSD	92	104	101	94
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270
Batch number: 10201WAN026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6035583	98	95	89
6035584	97	95	92
6035585	97	95	87
6035586	95	92	87
6035587	94	92	87
6035588	96	93	86
6035589	97	93	84
Blank	97	94	93
LCS	100	98	93
LCSD	99	97	94
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater
Batch number: 102010009A

	1,1,2,2-Tetrachloroethane
6035583	87
6035584	74
6035585	120
6035586	71
6035587	94
6035588	83
6035589	94
Blank	99
DUP	104
LCS	83
LCSD	82
MS	91
Limits:	46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132 Group# 1263664 Sample # 6035583-89

COC # 232899

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

1 Client: <u>SUN- PHILA. REF A01-7</u> Acct. #: _____ Project Name/ #: <u>PH REF A01-7</u> PWSID #: _____ Project Manager: <u>TIFFANY DOERR</u> P.O. #: _____ Sampler: <u>ELIAN WAGNER</u> Quote #: _____ Name of state where samples were collected: <u>PENNSYLVANIA</u>				4 Matrix <input type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Soil <input type="checkbox"/> Water <input type="checkbox"/> Other		5 Analyses Requested Preservation Codes H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other										6 Temperature of samples upon receipt (if requested)																																																																																																																																																																														
						1,2-DICHLOROETHANE 1,2,4-TRIMETHYLBENZENE 1,3,5-TRIMETHYLBENZENE BENZENE, CUMENE ETHYLBENZENE ETHYLACETATE M-XYLENE TOLUENE XYLENES (TOTAL) CHLOROBENZENE NAPHTHALENE PHENANTHRENE PYRENE																																																																																																																																																																																								
2 <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample Identification</th> <th>Date Collected</th> <th>Time Collected</th> <th>Grab</th> <th>Composite</th> <th>Soil</th> <th>Water</th> <th>Other</th> <th>Total # of Containers</th> <th>LEAD</th> <th>1,2-DICHLOROETHANE</th> <th>1,2,4-TRIMETHYLBENZENE</th> <th>1,3,5-TRIMETHYLBENZENE</th> <th>BENZENE, CUMENE</th> <th>ETHYLBENZENE</th> <th>ETHYLACETATE</th> <th>M-XYLENE</th> <th>TOLUENE</th> <th>XYLENES (TOTAL)</th> <th>CHLOROBENZENE</th> <th>NAPHTHALENE</th> <th>PHENANTHRENE</th> <th>PYRENE</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>C-55-071610</td> <td>7/16/10</td> <td>9:00</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td rowspan="6">temp 0.8-2.3C</td> </tr> <tr> <td>C-138-071610</td> <td>7/16/10</td> <td>10:25</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>C-60-071610</td> <td>7/16/10</td> <td>11:05</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>C-98-071610</td> <td>7/16/10</td> <td>11:55</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>C-63-071610</td> <td>7/16/10</td> <td>12:55</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>C-108-071610</td> <td>7/16/10</td> <td>13:40</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr> <td>C-53A-071610</td> <td>7/16/10</td> <td>14:30</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td></td> </tr> </tbody> </table>				Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	LEAD	1,2-DICHLOROETHANE	1,2,4-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	BENZENE, CUMENE	ETHYLBENZENE	ETHYLACETATE	M-XYLENE	TOLUENE	XYLENES (TOTAL)	CHLOROBENZENE	NAPHTHALENE	PHENANTHRENE	PYRENE	Remarks	C-55-071610	7/16/10	9:00	X					8	X	X	X	X	X	X	X	X	X	X	X	X	X		temp 0.8-2.3C	C-138-071610	7/16/10	10:25	X					8	X	X	X	X	X	X	X	X	X	X	X	X		C-60-071610	7/16/10	11:05	X					8	X	X	X	X	X	X	X	X	X	X	X	X		C-98-071610	7/16/10	11:55	X					8	X	X	X	X	X	X	X	X	X	X	X	X		C-63-071610	7/16/10	12:55	X					8	X	X	X	X	X	X	X	X	X	X	X	X		C-108-071610	7/16/10	13:40	X					8	X	X	X	X	X	X	X	X	X	X	X	X		C-53A-071610	7/16/10	14:30	X					8	X	X	X	X	X	X	X	X	X	X	X	X			7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: _____ Rush results requested by (please circle): Phone Fax <u>E-mail</u> Phone #: _____ Fax #: _____ E-mail address: _____		Relinquished by: _____ Date: <u>7/16</u> Time: <u>15:00</u> Relinquished by: _____ Date: <u>7/16</u> Time: <u>15:00</u> Relinquished by: _____ Date: <u>7/16</u> Time: <u>09:30</u> Relinquished by: _____ Date: <u>7/16/10</u> Time: <u>16:25</u> Relinquished by: _____ Date: _____ Time: _____		Received by: _____ Date: <u>7/16</u> Time: <u>15:00</u> Received by: _____ Date: <u>7/16</u> Time: <u>15:00</u> Received by: _____ Date: <u>7/16/10</u> Time: <u>09:30</u> Received by: _____ Date: <u>7/16/10</u> Time: <u>16:25</u> Received by: _____ Date: <u>7/16/10</u> Time: <u>16:25</u>	
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8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes <u>No</u> Type IV (CLP SOW) Internal COC Required? Yes <u>No</u> Type VI (Raw Data Only)				SDG Complete? <u>Yes</u> No (If yes, indicate QC sample and submit duplicate volume.)																																																																																																																																																																																										



Unit	Definition	Unit	Definition
RL	Rounded to the nearest L (lb)	BMQL	Basis Moisture Maximum (lb)
N.D.	Not Determined	MPN	Most Probable Number (per 100 g)
TNTC	Total Number of Test Counts	CP Units	Chemical Process Units
IU	International Units	NTU	Nephelometric Turbidity Units
umhos/cm	micromhos per centimeter	ng	nanograms
C	Centigrade	F	Fahrenheit
meq	milliequivalents	lb.	pounds
g	grams	kg	kilograms
ug	micrograms	mg	milligrams
ml	milliliters	l	liters
m3	cubic meters	ul	microliters
<	Less than - T (Total) is less than the value of the <u>MDL</u> (Method Detection Limit) for the substance being analyzed.		
>	Greater than		
J	Joint - T (Total) is greater than or equal to the MDL (Method Detection Limit) for the substance being analyzed (LOQ) (Limit of Quantitation)		
ppm	Parts per million - O (Organic) is the concentration of the substance in the sample (g / L) divided by the concentration of the substance in the sample (g / L) multiplied by 1,000,000.		
ppb	Parts per billion		
Dry weight basis	Rounded to the nearest whole number of the dry weight basis. T (Total) is the concentration of the substance in the sample (g / L) divided by the concentration of the substance in the sample (g / L) multiplied by 100.		

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[illegible]

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

August 04, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/22/2010
Group Number: 1204282
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionC-62 Grab Water
C-134D Grab Water
C-140 Grab Water
C-142 Grab WaterLancaster Labs (LLI) #6039473
6039474
6039475
6039476

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Megan Breen

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Sarah M. Snyder
Senior Specialist

Sample Description: C-62 Grab Water
Philadelphia Refinery AOI-7
COC: 242400 C-62

LLI Sample # WW 6039473
LLI Group # 1204282
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/20/2010 12:30 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/22/2010 15:25

Reported: 08/04/2010 13:46

Discard: 08/19/2010

C-62-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 21:37	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 21:37	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/03/2010 21:09	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 06:36	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 08:50	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-134D Grab Water
Philadelphia Refinery AOI-7
COC: 242400 C-134D

LLI Sample # WW 6039474
LLI Group # 1204282
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/20/2010 11:30 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/22/2010 15:25

West Chester PA 19381

Reported: 08/04/2010 13:46

Discard: 08/19/2010

C134D

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 21:58	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 21:58	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 16:01	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 07:05	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:01	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-140 Grab Water
Philadelphia Refinery AOI-7
COC: 242400 C-140

LLI Sample # WW 6039475
LLI Group # 1204282
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/20/2010 11:50 by EM

SUN: Aquaterra Tech.

PO Box 744

West Chester PA 19381

Submitted: 07/22/2010 15:25

Reported: 08/04/2010 13:46

Discard: 08/19/2010

C-140

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	1	1	0.5	1
10943	Isopropylbenzene	98-82-8	2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	3	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	2	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	6	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11

This sample was filtered in the lab for dissolved metals.

Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 22:20	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 22:20	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 16:24	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 08:34	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:03	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-142 Grab Water
Philadelphia Refinery AOI-7
COC: 242400 C-142

LLI Sample # WW 6039476
LLI Group # 1204282
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/20/2010 13:25 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/22/2010 15:25

West Chester PA 19381

Reported: 08/04/2010 13:46

Discard: 08/19/2010

C-142

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS	Volatiles	SW-846 8260B	ug/l	ug/l	ug/l	
10943	Benzene	71-43-2	< 10	10	5	10
10943	1,2-Dichloroethane	107-06-2	< 10	10	5	10
10943	Ethylbenzene	100-41-4	< 10	10	5	10
10943	Isopropylbenzene	98-82-8	78	20	5	10
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 10	10	5	10
10943	Toluene	108-88-3	< 10	10	5	10
10943	1,2,4-Trimethylbenzene	95-63-6	< 20	20	5	10
10943	1,3,5-Trimethylbenzene	108-67-8	< 20	20	5	10
10943	Xylene (Total)	1330-20-7	< 10	10	5	10

Preservation requirements were not met. The vial submitted for volatile analysis did not have a pH < 2 at the time of analysis. Due to the volatile nature of the analytes, it is not appropriate for the laboratory to adjust the pH at the time of sample receipt. The pH of this sample was pH = 3.

The reporting limits for the GC/MS volatile compounds were raised due to sample foaming.

GC/MS	Semivolatiles	SW-846 8270C	ug/l	ug/l	ug/l	
07805	Chrysene	218-01-9	64	52	10	10
07805	Fluorene	86-73-7	< 52	52	10	10
07805	Naphthalene	91-20-3	< 52	52	10	10
07805	Phenanthrene	85-01-8	140	52	10	10
07805	Pyrene	129-00-0	110	52	10	10

GC	Miscellaneous	SW-846 8011	ug/l	ug/l	ug/l	
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1

Metals	Dissolved	SW-846 6020	mg/l	mg/l	mg/l	
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102073AA	07/27/2010 00:58	Kelly E Keller	10
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102073AA	07/27/2010 00:58	Kelly E Keller	10

*=This limit was used in the evaluation of the final result

Sample Description: C-142 Grab Water
Philadelphia Refinery AOI-7
COC: 242400 C-142

LLI Sample # WW 6039476
LLI Group # 1204282
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/20/2010 13:25 by EM

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/22/2010 15:25

West Chester PA 19381

Reported: 08/04/2010 13:46

Discard: 08/19/2010

C-142

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time		Analyst	Dilution Factor
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/03/2010	05:26	Brian K Graham	10
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010	09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010	09:04	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010	13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010	09:09	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010	18:00	Mirit S Shenouda	1

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:46 PM

Group Number: 1204282

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: F102044AA Sample number(s): 6039473-6039475									
Benzene	< 1	1.	0.5	ug/l	85		79-120		
1,2-Dichloroethane	< 1	1.	0.5	ug/l	89		70-130		
Ethylbenzene	< 1	1.	0.5	ug/l	92		79-120		
Isopropylbenzene	< 2	2.	0.5	ug/l	92		77-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	85		76-120		
Toluene	< 1	1.	0.5	ug/l	90		79-120		
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	93		74-120		
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	91		75-120		
Xylene (Total)	< 1	1.	0.5	ug/l	91		80-120		
Batch number: F102073AA Sample number(s): 6039476									
Benzene	< 1	1.	0.5	ug/l	82	85	79-120	4	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	84	88	70-130	4	30
Ethylbenzene	< 1	1.	0.5	ug/l	86	89	79-120	4	30
Isopropylbenzene	< 2	2.	0.5	ug/l	85	89	77-120	5	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	78	83	76-120	5	30
Toluene	< 1	1.	0.5	ug/l	86	89	79-120	4	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	84	87	74-120	3	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	83	86	75-120	4	30
Xylene (Total)	< 1	1.	0.5	ug/l	85	89	80-120	4	30
Batch number: 10204WAA026 Sample number(s): 6039473-6039476									
Chrysene	< 5	5.	1	ug/l	96	96	82-112	0	30
Fluorene	< 5	5.	1	ug/l	99	99	82-113	1	30
Naphthalene	< 5	5.	1	ug/l	97	96	77-107	1	30
Phenanthrene	< 5	5.	1	ug/l	100	97	83-112	3	30
Pyrene	< 5	5.	1	ug/l	98	97	80-115	1	30
Batch number: 102050032A Sample number(s): 6039473-6039476									
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	104	100	60-140	4	20
Batch number: 102046050004A Sample number(s): 6039473-6039476									
Lead	< 0.0010	0.0010	0.00005	mg/l	101		90-115		

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
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*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:46 PM

Group Number: 1204282

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	BKG MAX Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F102044AA	Sample number(s): 6039473-6039475 UNSPK: P039067							
Benzene	90	94	80-126	4	30			
1,2-Dichloroethane	93	94	66-141	1	30			
Ethylbenzene	97	99	71-134	2	30			
Isopropylbenzene	98	99	75-128	1	30			
Methyl Tertiary Butyl Ether	87	88	72-126	1	30			
Toluene	95	97	80-125	2	30			
1,2,4-Trimethylbenzene	96	97	72-130	1	30			
1,3,5-Trimethylbenzene	94	97	72-131	3	30			
Xylene (Total)	96	98	79-125	2	30			
Batch number: F102073AA	Sample number(s): 6039476 UNSPK: P041111							
Benzene	86		80-126					
1,2-Dichloroethane	87		66-141					
Ethylbenzene	90		71-134					
Isopropylbenzene	89		75-128					
Methyl Tertiary Butyl Ether	81		72-126					
Toluene	90		80-125					
1,2,4-Trimethylbenzene	86		72-130					
1,3,5-Trimethylbenzene	84		72-131					
Xylene (Total)	90		79-125					
Batch number: 102050032A	Sample number(s): 6039473-6039476 UNSPK: P039477 BKG: P039482							
Ethylene dibromide	96		65-135		< 0.029	< 0.029	0 (1)	30
Batch number: 102046050004A	Sample number(s): 6039473-6039476 UNSPK: 6039473 BKG: 6039473							
Lead	102	103	75-125	1	20	< 0.0010	< 0.0010	1 (1) 20

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: UST BTEX, MTBE in Water

Batch number: F102044AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6039473	97	100	101	96
6039474	96	97	103	96
6039475	95	98	102	94
Blank	96	97	102	95
LCS	96	99	103	99
MS	96	101	103	98
MSD	96	100	103	98
Limits:	80-116	77-113	80-113	78-113

Analysis Name: UST BTEX, MTBE in Water

Batch number: F102073AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
--	----------------------	-----------------------	------------	----------------------

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:46 PM

Group Number: 1204282

Surrogate Quality Control

6039476	95	98	102	95
Blank	96	99	103	94
LCS	93	99	102	96
LCSD	93	101	104	99
MS	94	100	102	96
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270

Batch number: 10204WAA026

Nitrobenzene-d5		2-Fluorobiphenyl	Terphenyl-d14
6039473	95	98	84
6039474	92	100	96
6039475	91	98	84
6039476	91	92	83
Blank	89	97	93
LCS	96	102	96
LCSD	94	100	93
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater

Batch number: 102050032A

1,1,2,2-Tetrachloroethane	
6039473	89
6039474	91
6039475	88
6039476	87
Blank	103
DUP	71
LCS	109
LCSD	105
MS	91
Limits:	46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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.



**Lancaster
Laboratories**

Acct. # 10132 Group# 1204282 Sample # 6039473-76

COC # 242400

For Lab Use Only

FSC: _____

SCR#: _____

Preservation Codes

H=HCl T=Thiosulfate

N=HNO₃ B=NaOH

S=H₂SO₄ **O**=Other

6

Temperature of samples
upon receipt (if requested)

1 Client: <u>Sun-Aguaterra</u> Acct. #: _____ Project Name/#: <u>Philly Ref AUI-7</u> PWSID #: _____ Project Manager: <u>Tiffany Duer</u> P.O.#: _____ Sampler: <u>Ethan Magel</u> Quote #: _____ Name of state where samples were collected: _____						Matrix <input type="checkbox"/> Potable <input checked="" type="checkbox"/> Check if NPDES Applicable <input type="checkbox"/> Water <input type="checkbox"/> Other		5		Analyses Requested		For Lab Use Only FSC: _____ SCR#: _____																																																																																																																						
								4		Preservation Codes																																																																																																																								
2 <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample Identification</th> <th>Date Collected</th> <th>Time Collected</th> <th>Grab</th> <th>Composite</th> <th>Soil</th> <th>Water</th> <th>Other</th> <th>Total # of Containers</th> <th>Lead (tested)</th> <th>1,2-Dichlorobenzene</th> <th>1,2,4-Trinitrobenzene</th> <th>1,3,5-Trinitrobenzene</th> <th>Benzene</th> <th>Chlorobenzene</th> <th>Bromobenzene</th> <th>Isopropyl alcohol</th> <th>Toluene</th> <th>Xylene</th> <th>Chrysene</th> <th>Fluorene</th> <th>Naphthalene</th> <th>Phenanthrene</th> <th>Pyrene</th> </tr> </thead> <tbody> <tr> <td>C-62</td> <td>7/20/10</td> <td>12:30</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>C-1340</td> <td>7/20/10</td> <td>11:30</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>C-140</td> <td>7/20/10</td> <td>11:50</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>C-142</td> <td>7/20/10</td> <td>13:25</td> <td>X</td> <td></td> <td></td> <td>X</td> <td></td> <td>8</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> </tbody> </table>						Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	Lead (tested)	1,2-Dichlorobenzene	1,2,4-Trinitrobenzene	1,3,5-Trinitrobenzene	Benzene	Chlorobenzene	Bromobenzene	Isopropyl alcohol	Toluene	Xylene	Chrysene	Fluorene	Naphthalene	Phenanthrene	Pyrene	C-62	7/20/10	12:30	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C-1340	7/20/10	11:30	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C-140	7/20/10	11:50	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C-142	7/20/10	13:25	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	3 Preservation Codes: H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other		6 Remarks: <u>temp 1.0 - 2.6°C</u>		Temperature of samples upon receipt (if requested)
						Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	Total # of Containers	Lead (tested)	1,2-Dichlorobenzene	1,2,4-Trinitrobenzene	1,3,5-Trinitrobenzene	Benzene	Chlorobenzene	Bromobenzene	Isopropyl alcohol	Toluene	Xylene	Chrysene	Fluorene	Naphthalene	Phenanthrene	Pyrene																																																																																																					
C-62	7/20/10	12:30	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																																																																																											
C-1340	7/20/10	11:30	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																																																																																											
C-140	7/20/10	11:50	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																																																																																											
C-142	7/20/10	13:25	X			X		8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																																																																																											
7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: <u>8/2/10</u> Rush results requested by (please circle): Phone Fax E-mail Phone #: _____ Fax #: _____ E-mail address: _____						Relinquished by: <u>[Signature]</u> Date: <u>7/22/10</u> Time: <u>9:19</u> Received by: <u>J. Keady</u> Date: <u>7/22/10</u> Time: <u>9:19</u>																																																																																																																												
8 Data Package Options (please circle if required) Type I (validation/NJ Reg) TX TRRP-13 Yes No Type II (Tier II) MA MCP CT RCP Type III (Reduced NJ) Site-specific QC (MS/MSD/Dup)? Yes No Type IV (CLP SOW) Internal COC Required? Yes / No Type VI (Raw Data Only)						Relinquished by: <u>A. Keady</u> Date: <u>7/22/10</u> Time: <u>1525</u> Received by: _____ Date: _____ Time: _____																																																																																																																												
Relinquished by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____						Relinquished by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____																																																																																																																												
Relinquished by: _____ Date: _____ Time: _____ Received by: <u>32</u> Date: <u>7/22/10</u> Time: <u>1525</u>						Relinquished by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____																																																																																																																												

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Material or Blank Material Limit
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony-Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Test results are reported as less than the <u>MDL</u> (Method Detection Limit) or the LOQ (Limit of Quantitation) when the concentration of the analyte is below the detection limit.		
>	Greater than		
J	Joint Factories and Chemicals Association (JFCA) Method Detection Limit (MDL) or the LOQ (Limit of Quantitation)		
ppm	Parts per million - One part in one million (1/1,000,000) or one millionth (1/1,000,000) of the total weight of the sample. For example, 1 ppm of a substance in a 1,000,000 g sample would be 1 g of the substance.		
ppb	Parts per billion		
Dry weight basis	Reported as the weight of the sample after all moisture has been removed. The weight of the sample is reported as a percentage of the dry weight. For example, if a sample contains 10% moisture, the dry weight is 90% of the total weight.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC (Total Ion Chromatogram) or GC/MS (Gas Chromatography/Mass Spectrometry)	B	Vapor (V) or CRDL (Controlled Release Detection Limit)
B	Analysis of the sample is not possible	E	Elemental analysis of the sample is not possible
C	Peak (P) or GC/MS (Gas Chromatography/Mass Spectrometry)	M	Detection limit (DL) or MSA (Method Specific Analysis)
D	Concentration of the sample is not possible	N	Sample (S) or MSA (Method Specific Analysis)
E	Concentration of the sample is not possible	S	Method (M) or MSA (Method Specific Analysis)
N	Peak (P) or GC/MS (Gas Chromatography/Mass Spectrometry)	U	Concentration of the sample is not possible
P	Concentration of the sample is not possible	W	Peak (P) or GC/MS (Gas Chromatography/Mass Spectrometry)
U	Concentration of the sample is not possible	*	Detection limit (DL) or MSA (Method Specific Analysis)
X,Y,Z	Detection limit (DL) or MSA (Method Specific Analysis)	+	Concentration of the sample is not possible

Analysis of the sample is not possible. NELAC (National Environmental Laboratories Accreditation Council) is a recognized accreditation body.

Method (M) or MSA (Method Specific Analysis) is a recognized accreditation body.

Test results are reported as less than the MDL (Method Detection Limit) or the LOQ (Limit of Quantitation) when the concentration of the analyte is below the detection limit. The test results are reported as greater than the MDL or the LOQ when the concentration of the analyte is above the detection limit. The test results are reported as the concentration of the analyte when the concentration of the analyte is above the detection limit.

WARRANTY AND LIMITS OF LIABILITY - Lancaster Laboratories warrants that the analysis was performed in accordance with the applicable standards and methods. 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 warrant that the analysis was performed in accordance with the applicable standards and methods. 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.

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

August 05, 2010

Project: SUN: Philadelphia Refinery AOI-7

Submittal Date: 07/22/2010
Group Number: 1204283
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionC-61_071910 Water
C-44_071910 Water
C-104_071910 Water
C-105_071910 Water
C-144D_071910 WaterLancaster Labs (LLI) #6039477
6039478
6039479
6039480
6039481

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC Langan

COPY TO

Attn: Dennis Webster

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Megan Breen

ELECTRONIC SUN: Aquaterra Tech.

COPY TO

Attn: Tiffani Doerr

ELECTRONIC LLI

COPY TO

Attn: EDD Group

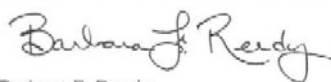
ELECTRONIC Langan

COPY TO

Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Barbara F. Reedy
Senior Specialist

Sample Description: C-61_071910 Water
Philadelphia Refinery AOI-7
COC: C-61_071910

LLI Sample # WW 6039477
LLI Group # 1204283
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/19/2010 14:20

SUN: Aquaterra Tech.

Submitted: 07/22/2010 15:25

PO Box 744

Reported: 08/05/2010 14:04

West Chester PA 19381

Discard: 08/20/2010

C-61-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 23:00	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 23:00	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 17:11	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 09:34	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:10	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-44_071910 Water
Philadelphia Refinery AOI-7
COC: C-44_071910

LLI Sample # WW 6039478
LLI Group # 1204283
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/19/2010 11:55

SUN: Aquaterra Tech.

Submitted: 07/22/2010 15:25

PO Box 744

Reported: 08/05/2010 14:04

West Chester PA 19381

Discard: 08/20/2010

C-44-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	3	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	3	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 23:22	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 23:22	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 17:35	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 10:33	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:12	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-104_071910 Water
Philadelphia Refinery AOI-7
COC: C-104_071910

LLI Sample # WW 6039479
LLI Group # 1204283
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/19/2010 12:55

SUN: Aquaterra Tech.

Submitted: 07/22/2010 15:25

PO Box 744

Reported: 08/05/2010 14:04

West Chester PA 19381

Discard: 08/20/2010

C-104

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	9	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/23/2010 23:43	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/23/2010 23:43	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 17:58	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 11:03	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:14	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-105_071910 Water
Philadelphia Refinery AOI-7
COC: C-105_071910

LLI Sample # WW 6039480
LLI Group # 1204283
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/19/2010 13:35

SUN: Aquaterra Tech.

Submitted: 07/22/2010 15:25

PO Box 744

Reported: 08/05/2010 14:04

West Chester PA 19381

Discard: 08/20/2010

C-105

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/24/2010 00:04	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/24/2010 00:04	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 18:21	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 11:33	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:16	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-144D_071910 Water
Philadelphia Refinery AOI-7
COC: C-144D_071910

LLI Sample # WW 6039481
LLI Group # 1204283
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/19/2010 11:30

SUN: Aquaterra Tech.

Submitted: 07/22/2010 15:25

PO Box 744

Reported: 08/05/2010 14:04

West Chester PA 19381

Discard: 08/20/2010

C144D

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102044AA	07/24/2010 00:25	Kelly E Keller	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102044AA	07/24/2010 00:25	Kelly E Keller	1
07805	PAHs by 8270	SW-846 8270C	1	10204WAA026	08/02/2010 18:45	Matthew S Woods	1
07807	BNA Water Extraction	SW-846 3510C	1	10204WAA026	07/23/2010 09:45	Roman Kuropatkin	1
07879	EDB in Wastewater	SW-846 8011	1	102050032A	07/27/2010 12:02	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102050032A	07/25/2010 13:35	Edwin Ortiz	1
06035	Lead	SW-846 6020	1	102046050004A	07/30/2010 09:18	Choon Y Tian	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102046050004	07/23/2010 18:00	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 08/05/10 at 02:04 PM

Group Number: 1204283

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

<u>Analysis Name</u>	<u>Blank Result</u>	<u>Blank LOQ**</u>	<u>Blank MDL</u>	<u>Report Units</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>LCS/LCSD Limits</u>	<u>RPD</u>	<u>RPD Max</u>
Batch number: F102044AA	Sample number(s): 6039477-6039481								
Benzene	< 1	1.	0.5	ug/l	85		79-120		
1,2-Dichloroethane	< 1	1.	0.5	ug/l	89		70-130		
Ethylbenzene	< 1	1.	0.5	ug/l	92		79-120		
Isopropylbenzene	< 2	2.	0.5	ug/l	92		77-120		
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	85		76-120		
Toluene	< 1	1.	0.5	ug/l	90		79-120		
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	93		74-120		
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	91		75-120		
Xylene (Total)	< 1	1.	0.5	ug/l	91		80-120		
Batch number: 10204WAA026	Sample number(s): 6039477-6039481								
Chrysene	< 5	5.	1	ug/l	96	96	82-112	0	30
Fluorene	< 5	5.	1	ug/l	99	99	82-113	1	30
Naphthalene	< 5	5.	1	ug/l	97	96	77-107	1	30
Phenanthrene	< 5	5.	1	ug/l	100	97	83-112	3	30
Pyrene	< 5	5.	1	ug/l	98	97	80-115	1	30
Batch number: 102050032A	Sample number(s): 6039477-6039481								
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	104	100	60-140	4	20
Batch number: 102046050004A	Sample number(s): 6039477-6039481								
Lead	< 0.0010	0.0010	0.00005	mg/l	101		90-115		
			0						

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

<u>Analysis Name</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>MS/MSD Limits</u>	<u>RPD</u>	<u>RPD MAX</u>	<u>BKG Conc</u>	<u>DUP Conc</u>	<u>DUP RPD</u>	<u>Dup RPD Max</u>
Batch number: F102044AA	Sample number(s): 6039477-6039481 UNSPK: P039067								
Benzene	90	94	80-126	4	30				
1,2-Dichloroethane	93	94	66-141	1	30				
Ethylbenzene	97	99	71-134	2	30				
Isopropylbenzene	98	99	75-128	1	30				
Methyl Tertiary Butyl Ether	87	88	72-126	1	30				
Toluene	95	97	80-125	2	30				
1,2,4-Trimethylbenzene	96	97	72-130	1	30				
1,3,5-Trimethylbenzene	94	97	72-131	3	30				
Xylene (Total)	96	98	79-125	2	30				

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/05/10 at 02:04 PM

Group Number: 1204283

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	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 102050032A Ethylene dibromide	96		65-135			6039477 < 0.029	BKG: P039482 < 0.029	0 (1)	30
Batch number: 102046050004A Lead	102	103	75-125	1	20	6039477-6039481 < 0.0010	UNSPK: P039473 < 0.0010	BKG: P039473 1 (1)	20

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: UST BTEX, MTBE in Water
Batch number: F102044AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6039477	97	99	103	96
6039478	96	98	102	96
6039479	97	100	102	97
6039480	95	98	103	96
6039481	95	99	100	94
Blank	96	97	102	95
LCS	96	99	103	99
MS	96	101	103	98
MSD	96	100	103	98
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270
Batch number: 10204WAA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6039477	87	98	85
6039478	89	100	91
6039479	91	99	88
6039480	89	101	89
6039481	89	99	91
Blank	89	97	93
LCS	96	102	96
LCSD	94	100	93
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater

Batch number: 102050032A
1,1,2,2-Tetrachloroethane

6039477	101
6039478	90
6039479	79

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/05/10 at 02:04 PM

Group Number: 1204283

Surrogate Quality Control

6039480	89
6039481	73
Blank	103
DUP	71
LCS	109
LCSD	105
MS	91

Limits: 46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

- (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.

Analysis Request/ Environmental Services Chain of Custody



For Lancaster Laboratories use only

Acct. # 10132

Group# 1042

7-23-10
1204283

Sample # 6039477-81

COC # 243067

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

1 Client: <u>Sun & Aquaterra</u> Acct. #: _____ Project Name/Ref: <u>SUN Philly Ref A01-7</u> PWSID #: _____ Project Manager: <u>T. Doerr</u> P.O. #: _____ Sampler: <u>Ethan Magee</u> Quote #: _____ Name of state where samples were collected: <u>PA</u>				4 Matrix <input type="checkbox"/> Potable <input type="checkbox"/> Check if Applicable <input type="checkbox"/> NPDES		5 Analyses Requested Preservation Codes								6 Temperature of samples upon receipt (if requested)													
						Preservation Codes: H=HCl T=Thiosulfate N=HNO ₃ B=NaOH S=H ₂ SO ₄ O=Other COC Received on <u>7/23/10</u> <u>75 7-23-10</u>																					
2 Sample Identification				3 Composite		Soil		Water		Other		Total # of Containers		Diss. Lead BTEX, MTBE, Cume EDC, TMB's EDS Chrysenes, Fluorene Daylight, Heavy Metals Phenanthrene								Remarks					
Date Collected				Time Collected		Grab		Composite		Soil		Water		Other		Total # of Containers		Diss. Lead BTEX, MTBE, Cume EDC, TMB's EDS Chrysenes, Fluorene Daylight, Heavy Metals Phenanthrene								Remarks	
<u>G144D_071910</u>				<u>7/19/10</u>		<u>1130</u>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>8</u>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>								<u>Lab filter lead</u>	
<u>C-44_071910</u>				<u>7/19/10</u>		<u>1155</u>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>8</u>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>									
<u>C-104_071910</u>				<u>7/19/10</u>		<u>1255</u>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>8</u>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>									
<u>C-105_071910</u>				<u>7/19/10</u>		<u>1335</u>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>8</u>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>									
<u>C-61_071910</u>				<u>7/19/10</u>		<u>1420</u>		<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<u>8</u>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>									

7 Turnaround Time Requested (TAT) (please circle): <u>Normal</u> Rush (Rush TAT is subject to Lancaster Laboratories approval and surcharge.) Date results are needed: _____ Rush results requested by (please circle): Phone Fax <u>E-mail</u> Phone #: _____ Fax #: _____ E-mail address: _____				Relinquished by: <u>[Signature]</u> * Date _____ Time _____ Relinquished by: <u>COC filled out & submitted on 7/23/10</u> Date _____ Time _____ Relinquished by: _____ Date _____ Time _____ Relinquished by: _____ Date _____ Time _____ Relinquished by: _____ Date _____ Time _____				Received by: _____ Date _____ Time _____ Received by: _____ Date _____ Time _____ Received by: _____ Date _____ Time _____ Received by: _____ Date _____ Time _____ Received by: _____ Date _____ Time _____			
---	--	--	--	--	--	--	--	--	--	--	--

8 Data Package Options (please circle if required)				SDG Complete? <u>Yes</u> No			
Type I (validation/NJ Reg)		TX TRRP-13		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Type II (Tier II)		MA MCP CT RCP		<input type="checkbox"/> Yes <input type="checkbox"/> No			
Type III (Reduced NJ)		Site-specific QC (MS/MSD/Dup)? Yes <u>No</u>		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Type IV (CLP SOW)		(If yes, indicate QC sample and submit triplicate volume)		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Type VI (Raw Data Only)		Internal COC Required? Yes <u>No</u>		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Material or Blank Material Limit
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Counts Too Close	CP Units	Counting Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - Ties are reported as less than or equal to (\leq)		
>	Greater than		
J	Joint Factories and Chemical Manufacturers Association (JFCA) Method Detection Limit (MDL) or Laboratory Limit of Quantitation (LOQ)		
ppm	Parts per million - Ozone gas is reported as milligrams per cubic meter (mg/m ³)		
ppb	Parts per billion		
Dry weight basis	Reported as dry weight basis unless otherwise specified. Ties are reported as less than or equal to (\leq)		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a Total Ion Chromatogram	B	Volatile (V) CRDL \geq IDL
B	Acetone is a solvent	E	Elemental
C	Pesticide is a pesticide	M	Dissolved
D	Chloride is a chloride	N	Soluble
E	Chloride is a chloride	S	Mass Spectrometry (MSA) is a mass spectrometry
N	Pesticide is a pesticide	U	Chloride is a chloride
P	Chloride is a chloride	W	Pesticide is a pesticide
U	Chloride is a chloride	*	Dissolved
X,Y,Z	Dissolved is a dissolved	+	Chloride is a chloride

Acetone is a solvent

Chloride is a chloride

Total Ion Chromatogram (TIC) is a Total Ion Chromatogram. C is a Concentration. U is a Unit. W is a Weight. T is a Temperature. S is a Soluble. M is a Mass Spectrometry. N is a Nitrogen. D is a Dissolved. B is a Background. A is a Acetone. P is a Pesticide. E is a Elemental. V is a Volatile. CRDL is a Critical Response Detection Limit. IDL is a Identification Limit.

WARRANTY AND LIMITS OF LIABILITY - Lancaster Laboratories warrants that the foregoing analysis was performed in accordance with the applicable regulatory requirements. 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 warrant that the analysis was performed in accordance with the applicable regulatory requirements. N is a Nitrogen. D is a Dissolved. B is a Background. A is a Acetone. P is a Pesticide. E is a Elemental. V is a Volatile. CRDL is a Critical Response Detection Limit. IDL is a Identification Limit.

ANALYTICAL RESULTS

Prepared by:

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

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

August 04, 2010

Project: SUN: Philadelphia Refinery AOI-7

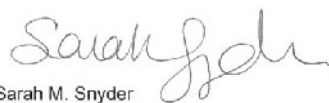
Submittal Date: 07/28/2010
Group Number: 1205094
PO Number: PHILADELPHIA
State of Sample Origin: PAClient Sample DescriptionC-110_072710 Water
C-111_072710 Water
C-56_072710 WaterLancaster Labs (LLI) #6044724
6044725
6044726

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Langan	Attn: Dennis Webster
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Megan Breen
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Tiffani Doerr
ELECTRONIC COPY TO	LLI	Attn: EDD Group
ELECTRONIC COPY TO	Langan	Attn: Kristen Ward

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,



Sarah M. Snyder
Senior Specialist

Sample Description: C-110_072710 Water
Philadelphia Refinery AOI-7
COC: 242403 C-110_072710

LLI Sample # WW 6044724
LLI Group # 1205094
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/27/2010 10:00 by SS

SUN: Aquaterra Tech.

PO Box 744

Submitted: 07/28/2010 18:45

West Chester PA 19381

Reported: 08/04/2010 13:45

Discard: 08/19/2010

110A7

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	< 1	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	< 1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	< 2	2	0.5	1
10943	Xylene (Total)	1330-20-7	< 1	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	< 5	5	1	1
07805	Naphthalene	91-20-3	< 5	5	1	1
07805	Phenanthrene	85-01-8	< 5	5	1	1
07805	Pyrene	129-00-0	< 5	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0096	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	< 0.0010	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102151AA	08/03/2010 13:07	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102151AA	08/03/2010 13:07	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10210WAE026	08/01/2010 15:08	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10210WAE026	07/29/2010 21:00	Karen L Beyer	1
07879	EDB in Wastewater	SW-846 8011	1	102110004A	08/03/2010 06:17	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102110004A	07/30/2010 11:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102106050002A	08/02/2010 18:01	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102106050002	07/29/2010 20:30	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-111_072710 Water
Philadelphia Refinery AOI-7
COC: 242403 C-111_072710

LLI Sample # WW 6044725
LLI Group # 1205094
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/27/2010 11:00 by SS

SUN: Aquaterra Tech.

Submitted: 07/28/2010 18:45

PO Box 744

Reported: 08/04/2010 13:45

West Chester PA 19381

Discard: 08/19/2010

111A7

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	89	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	1	1	0.5	1
10943	Isopropylbenzene	98-82-8	130	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	15	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	< 2	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	3	2	0.5	1
10943	Xylene (Total)	1330-20-7	12	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	0.9	1
07805	Fluorene	86-73-7	< 5	5	0.9	1
07805	Naphthalene	91-20-3	< 5	5	0.9	1
07805	Phenanthrene	85-01-8	7	5	0.9	1
07805	Pyrene	129-00-0	7	5	0.9	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0097	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	0.0013	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102151AA	08/03/2010 13:28	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102151AA	08/03/2010 13:28	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10210WAE026	08/01/2010 15:34	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10210WAE026	07/29/2010 21:00	Karen L Beyer	1
07879	EDB in Wastewater	SW-846 8011	1	102110004A	08/03/2010 06:46	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102110004A	07/30/2010 11:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102106050002A	08/02/2010 18:03	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102106050002	07/29/2010 20:30	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Sample Description: C-56_072710 Water
Philadelphia Refinery AOI-7
COC: 242403 C-56_072710

LLI Sample # WW 6044726
LLI Group # 1205094
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-7

Collected: 07/27/2010 12:00 by SS

SUN: Aquaterra Tech.

Submitted: 07/28/2010 18:45

PO Box 744

Reported: 08/04/2010 13:45

West Chester PA 19381

Discard: 08/19/2010

056A7

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles SW-846 8260B						
10943	Benzene	71-43-2	< 1	1	0.5	1
10943	1,2-Dichloroethane	107-06-2	< 1	1	0.5	1
10943	Ethylbenzene	100-41-4	2	1	0.5	1
10943	Isopropylbenzene	98-82-8	< 2	2	0.5	1
10943	Methyl Tertiary Butyl Ether	1634-04-4	< 1	1	0.5	1
10943	Toluene	108-88-3	1	1	0.5	1
10943	1,2,4-Trimethylbenzene	95-63-6	29	2	0.5	1
10943	1,3,5-Trimethylbenzene	108-67-8	13	2	0.5	1
10943	Xylene (Total)	1330-20-7	23	1	0.5	1
GC/MS Semivolatiles SW-846 8270C						
07805	Chrysene	218-01-9	< 5	5	1	1
07805	Fluorene	86-73-7	29	5	1	1
07805	Naphthalene	91-20-3	15	5	1	1
07805	Phenanthrene	85-01-8	72	5	1	1
07805	Pyrene	129-00-0	8	5	1	1
GC Miscellaneous SW-846 8011						
07879	Ethylene dibromide	106-93-4	< 0.029	0.029	0.0098	1
Metals Dissolved SW-846 6020						
06035	Lead	7439-92-1	0.0158	0.0010	0.000050	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/11
This sample was filtered in the lab for dissolved metals.
Trip blank vials were not received by the laboratory for this sample group.

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
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F102151AA	08/03/2010 13:50	Anita M Dale	1
10943	BTEX/MTBE/Cumene/EDC/TMBs	SW-846 8260B	1	F102151AA	08/03/2010 13:50	Anita M Dale	1
07805	PAHs by 8270	SW-846 8270C	1	10210WAE026	08/01/2010 15:59	Barton C Conner	1
07807	BNA Water Extraction	SW-846 3510C	1	10210WAE026	07/29/2010 21:00	Karen L Beyer	1
07879	EDB in Wastewater	SW-846 8011	1	102110004A	08/03/2010 07:16	James H Place	1
07786	EDB Extraction	SW-846 8011	1	102110004A	07/30/2010 11:45	Deborah M Zimmerman	1
06035	Lead	SW-846 6020	1	102106050002A	08/02/2010 18:04	David K Beck	1
06050	ICP/MS SW-846 Water Digest	SW-846 3010A modified	1	102106050002	07/29/2010 20:30	Mirit S Shenouda	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:45 PM

Group Number: 1205094

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 LOQ**	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: F102151AA	Sample number(s): 6044724-6044726								
Benzene	< 1	1.	0.5	ug/l	88	83	79-120	5	30
1,2-Dichloroethane	< 1	1.	0.5	ug/l	90	87	70-130	4	30
Ethylbenzene	< 1	1.	0.5	ug/l	93	88	79-120	5	30
Isopropylbenzene	< 2	2.	0.5	ug/l	92	88	77-120	5	30
Methyl Tertiary Butyl Ether	< 1	1.	0.5	ug/l	91	88	76-120	4	30
Toluene	< 1	1.	0.5	ug/l	93	88	79-120	6	30
1,2,4-Trimethylbenzene	< 2	2.	0.5	ug/l	94	90	74-120	5	30
1,3,5-Trimethylbenzene	< 2	2.	0.5	ug/l	96	89	75-120	7	30
Xylene (Total)	< 1	1.	0.5	ug/l	92	89	80-120	4	30
Batch number: 10210WAE026	Sample number(s): 6044724-6044726								
Chrysene	< 5	5.	1	ug/l	91	88	82-112	3	30
Fluorene	< 5	5.	1	ug/l	90	93	82-113	4	30
Naphthalene	< 5	5.	1	ug/l	81	90	77-107	11	30
Phenanthrene	< 5	5.	1	ug/l	92	96	83-112	5	30
Pyrene	< 5	5.	1	ug/l	95	93	80-115	2	30
Batch number: 102110004A	Sample number(s): 6044724-6044726								
Ethylene dibromide	< 0.030	0.030	0.010	ug/l	96	92	60-140	4	20
Batch number: 102106050002A	Sample number(s): 6044724-6044726								
Lead	< 0.0010	0.0010	0.00005	mg/l	99		90-115		

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: F102151AA	Sample number(s): 6044724-6044726 UNSPK: P044752								
Benzene	88		80-126						
Ethylbenzene	110		71-134						
Isopropylbenzene	99		75-128						
Methyl Tertiary Butyl Ether	90		72-126						
Toluene	97		80-125						
1,2,4-Trimethylbenzene	96		72-130						
1,3,5-Trimethylbenzene	90		72-131						
Xylene (Total)	97		79-125						
Batch number: 102110004A	Sample number(s): 6044724-6044726 UNSPK: P044524 BKG: P044525								

*- Outside of specification

**This limit was used in the evaluation of the final result for the blank

- (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: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:45 PM

Group Number: 1205094

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
Ethylene dibromide	100		65-135			< 0.030	< 0.030	0 (1)	30
Batch number: 102106050002A	Sample number(s): 6044724-6044726 UNSPK: P042439 BKG: P042439								
Lead	102	100	75-125	3	20	< 0.0010	< 0.0010	0 (1)	20

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: UST BTEX, MTBE in Water
Batch number: F102151AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6044724	96	98	102	99
6044725	94	96	101	99
6044726	96	97	100	99
Blank	96	99	101	97
LCS	96	98	101	99
LCSD	95	100	101	99
MS	95	99	101	99
Limits:	80-116	77-113	80-113	78-113

Analysis Name: PAHs by 8270
Batch number: 10210WAE026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6044724	98	95	82
6044725	95	98	94
6044726	99	87	68
Blank	111	104	89
LCS	100	91	85
LCSD	105	101	87
Limits:	64-121	63-114	47-114

Analysis Name: EDB in Wastewater

Batch number: 102110004A
1,1,2,2-Tetrachloroethane

6044724	81
6044725	92
6044726	83
Blank	90
DUP	100
LCS	96
LCSD	93
MS	98

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

(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: SUN: Aquaterra Tech.
Reported: 08/04/10 at 01:45 PM

Group Number: 1205094

Surrogate Quality Control

Limits: 46-136

*- Outside of specification

** - This limit was used in the evaluation of the final result for the blank

- (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.



**Lancaster
Laboratories**

Acct. # 10132 Group# 1205094 Sample # 6044724-26 **COC # 242403**

100

6

[illegible]

Explanation of Symbols and Abbreviations

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

RL	Reported Limit	BMQL	Background Monitoring Level
N.D.	Not Detected	MPN	Most Probable Number
TNTC	Total Number of Test Cells	CP Units	Colony-Forming Units
IU	International Unit	NTU	Nephelometric Turbidity Unit
umhos/cm	micromhos per centimeter	ng	nanogram (g)
C	Concentration	F	Factor
meq	milliequivalent	lb.	pound (lb)
g	gram (g)	kg	kilogram (kg)
ug	microgram (g)	mg	milligram (g)
ml	milliliter (l)	l	liter (l)
m3	cubic meter (m ³)	ul	microliter (l)
<	Less than - T indicates that the concentration of the sample is less than the <u>method detection limit</u> of the analytical method used.		
>	Greater than		
J	Joint Fact Sheet (JFS) T value \geq the Method Detection Limit (MDL) or the Limit of Quantitation (LOQ)		
ppm	Parts per million - O indicates that the concentration is in units of (g/l) or (mg/l) and F indicates that the concentration is in units of (g/g) or (mg/g)		
ppb	Parts per billion		
Dry weight basis	Reported concentration is based on the dry weight of the sample. T indicates that the concentration is based on the total weight of the sample. A indicates that the concentration is based on the ash-free weight of the sample.		

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a Total Ion Chromatogram	B	Volatile CRDL \geq IDL
B	Acetone is a solvent	E	Elemental
C	Pesticide is a pesticide	M	Dissolved
D	Chloride is a chloride	N	Soluble
E	Chloride is a chloride	S	Mass Spectrometry (MSA)
N	Pesticide is a pesticide	U	Chloride is a chloride
P	Chloride is a chloride	W	Pesticide is a pesticide
U	Chloride is a chloride	*	Dissolved
X,Y,Z	Dissolved is a chloride	+	Chloride is a chloride

A Lancaster Laboratories report is a NELAC report and is a report of the results of the analysis.

M Lancaster Laboratories report is a report of the results of the analysis.

T Lancaster Laboratories report is a report of the results of the analysis. C Lancaster Laboratories report is a report of the results of the analysis. U Lancaster Laboratories report is a report of the results of the analysis. W Lancaster Laboratories report is a report of the results of the analysis. T Lancaster Laboratories report is a report of the results of the analysis.

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APPENDIX E

July 2010 Groundwater Sampling Field Summary Report

Appendix E
July 2010 Groundwater Sampling Field Summary
AOI 7
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

WELL INFO					FIELD READINGS (pre-purge)						FIELD READINGS (post-purge)								FIELD READINGS (sampling)	
Location ID	Depth to Bottom (ft bgs)	Depth to Water (ft btic) ⁽¹⁾	Depth to Product (ft btic)	Product Thickness (ft)	Purge Start	Temp. (°C)	DO (mg/L)	ORP (mv)	pH	Conductivity (mS/cm)	Purge Complete	Approx. Purge Rate (gpm) ⁽²⁾	Volume Purged (gal)	Temp. (°C)	DO (mg/L)	ORP (mv)	pH	Conductivity (mS/cm)	Date Sampled	Sample Time
C-104	17.76	6.16	NP	NP	12:20	16.80	8.27	-67.8	5.99	1.325	12:55	2.00	22.70	17.68	8.34	-47.9	6.06	1.316	7/19/2010	12:55
C-105	17.40	3.65	NP	NP	13:20	17.50	9.10	-44.6	6.10	0.959	13:35	2.00	26.90	18.99	13.85	-37.8	6.39	0.960	7/19/2010	13:35
C-106	NM	product	8.85	1.25	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P
C-107	NM	product	8.30	2.19	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P
C-108	17.18	4.13	NP	NP	13:15	19.19	12.07	4.30	5.84	1.134	13:40	2.00	25.50	22.11	9.55	-15.5	6.01	1.121	7/16/2010	13:40
C-109	17.84	6.75	NP	NP	14:20	16.92	3.23	-46.6	6.41	2.840	14:55	2.00	18.70	18.86	1.77	-31.5	6.23	2.855	7/13/2010	14:55
C-110	17.48	5.13	NP	NP	9:40	18.46	8.99	14.99	7.23	0.936	10:00	1.50	24.00	17.86	2.32	16.20	7.09	0.001	7/27/2010	10:00
C-111	16.96	4.46	NP	NP	10:40	18.34	6.72	12.20	7.21	0.912	11:00	1.50	24.50	17.77	1.90	17.30	7.11	0.001	7/27/2010	8:55
C-112	16.78	3.64	NP	NP	8:30	16.11	5.48	-51.5	6.28	1.996	8:55	2.00	22.20	17.53	2.15	-51.9	6.22	1.855	7/14/2010	8:55
C-114	18.84	3.32	NP	NP	10:00	16.91	4.35	-55.0	6.59	1.102	10:25	2.00	30.40	19.22	3.70	-25.1	6.19	1.046	7/14/2010	10:25
C-127	16.78	7.61	NP	NP	8:20	22.29	5.05	-31.05	6.64	1.258	8:50	2.00	17.90	21.28	6.09	-38.2	6.56	0.720	7/15/2010	8:50
C-50	18.85	7.75	NP	NP	14:25	18.41	2.45	-71.8	6.43	0.714	14:50	2.00	21.80	20.21	1.20	-94.3	6.87	0.635	7/12/2010	14:45
C-50D	28.73	11.25	NP	NP	10:55	18.51	1.89	-29.2	6.55	0.693	11:05	2.00	14.80	19.31	2.76	-15.6	6.40	1.374	7/13/2010	11:05
C-51	13.28	3.36	NP	NP	13:00	18.58	3.93	-22.1	6.19	0.628	13:35	2.00	19.40	21.43	6.73	-8.8	6.37	0.531	7/14/2010	13:35
C-52	14.15	4.86	NP	NP	9:10	21.79	3.78	-37.3	6.52	0.735	9:30	2.00	15.70	35.01	4.03	-39.2	6.54	0.717	7/15/2010	9:30
C-53A	16.80	3.68	NP	NP	14:00	17.45	8.64	-22.3	5.75	1.599	14:30	2.00	22.10	19.53	8.84	-22.5	6.13	1.585	7/16/2010	14:30
C-54	12.32	<1	NP	NP	14:00	21.16	13.54	-21.2	6.21	1.426	14:35	2.00	22.10	26.32	17.06	71.20	6.28	0.965	7/15/2010	12:35
C-55	16.87	4.45	NP	NP	8:40	18.16	10.98	24.00	6.72	0.511	9:00	2.00	24.30	21.30	10.65	55.10	6.50	0.554	7/16/2010	9:00
C-56	13.85	2.23	NP	NP	11:40	19.65	5.45	11.10	6.97	0.873	12:00	1.50	23.00	18.23	2.12	12.40	6.93	0.001	7/27/2010	12:00
C-57	13.25	1.93	NP	NP	11:00	20.28	3.19	-33.0	5.99	1.572	11:20	2.00	22.20	24.12	2.19	-47.3	6.23	1.612	7/14/2010	11:20
C-58	11.97	1.01	NP	NP	12:15	28.07	2.96	-50.5	6.49	0.755	12:40	2.00	21.10	28.97	5.44	-34.0	6.41	0.637	7/14/2010	12:40
C-60	13.98	3.58	NP	NP	10:40	19.79	7.04	80.40	5.48	4.231	11:05	2.00	20.30	23.49	9.73	26.10	6.09	1.634	7/16/2010	11:05
C-61	12.85	2.95	NP	NP	14:00	19.45	12.12	-21.8	5.91	0.979	14:20	2.00	19.40	23.73	13.59	-39.5	6.41	0.957	7/19/2010	14:20
C-62	15.47	4.19	NP	NP	12:00	18.61	5.42	-0.4	6.94	1.621	12:30	2.00	22.10	19.88	10.47	-40.2	6.97	1.541	7/20/2010	12:30
C-63	16.11	5.46	NP	NP	12:25	23.43	13.96	-16.3	6.36	0.708	12:55	2.00	20.80	23.37	13.83	-17.7	6.43	0.729	7/16/2010	12:55
C-64	11.37	6.17	NP	NP	11:40	19.82	7.10	-64.2	6.34	0.629	11:55	2.00	10.20	20.54	7.26	-51.6	6.25	0.828	7/19/2010	11:55
C-65	7.15	product	4.90	0.46	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P
C-65D	NM	Damaged	NP	NP	NS-blockage in well		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C-95	32.16	5.19	NP	NP	11:45	15.70	2.54	-71.4	6.08	1.629	12:10	2.00	33.30	NM	NM	NM	NM	NM	7/13/2010	12:15
C-96	19.30	4.80	NP	NP	9:40	16.78	1.95	-78.5	6.48	1.528	10:10	2.00	29.20	16.34	1.93	-93.2	6.73	1.641	7/13/2010	10:05
C-97	NM	product	10.70	0.25	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P
C-98	19.68	4.86	NP	NP	11:15	18.61	8.89	-50.3	6.09	1.731	11:55	2.00	28.30	18.15	9.20	-54.4	6.04	1.456	7/16/2010	11:55
C-49	19.09	4.64	NP	NP	8:24	15.51	4.19	-55.5	6.03	2.063	09:00	2.00	28.30	NM	NM	NM	NM	NM	7/13/2010	13:55
C-113	17.53	3.54	NP	NP	13:00	17.45	1.36	-58.7	17.47	0.744	13:20	2.00	27.40	NM	NM	NM	NM	NM	7/13/2010	13:25
C-129	12.00	5.07	NP	NP	10:20	22.47	3.59	27.00	7.56	0.814	10:45	2.00	13.60	23.70	3.39	157.10	7.44	0.752	7/12/2010	10:45
C-129D	66.00	10.41	NP	NP	11:20	18.52	3.47	-18.8	11.58	2.073	12:30	2.00	108.40	19.82	1.33	-123.3	7.26	1.044	7/12/2010	12:30
C-130	15.00	7.02	NP	NP	14:20	20.81	1.99	-39.0	5.97	1.211	14:30	2.00	15.64	18.92	2.71	-30.4	6.02	1.744	7/12/2010	14:30
C-131	14.00	5.17	NP	NP	10:10	20.37	6.16	-65.8	6.47	2.952	10:40	2.00	21.20	19.37	282.00	-35.5	6.28	2.392	7/15/2010	10:40
C-132	14.00	2.60	NP	NP	11:25	20.17	4.95	-48.0	6.84	0.624	11:45	2.00	22.30	24.43	5.09	-20.8	6.98	0.505	7/15/2010	11:45
C-133	14.00	1.25	NP	NP	12:05	20.11	6.13	73.20	6.31	3.634	12:30	2.00	24.90	21.81	7.90	63.40	6.24	4.391	7/15/2010	12:30
C-134D	72.00	10.26	NP	NP	10:00	18.96	4.13	-440.6	11.48	4.567	11:30	2.00	121.00	19.46	6.94	-236.8	9.53	0.860	7/20/2010	11:30
C-136	14.00	5.05	NP	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C-137	14.00	1.95	NP	NP	13:15	24.83	11.73	-19.2	6.43	1.272	13:35	2.00	23.60	27.00	12.15	-28.0	6.35	1.357	7/18/2010	13:35
C-138	12.00	3.47	NP	NP	10:00	21.34	12.20	-43.4	7.06	0.572	10:25	2.00	16.70	26.17	13.57	-22.4	7.64	0.625	7/16/2010	10:25
C-139	12.00	3.00	NP	NP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C-140	12.00	1.10	NP	NP	11:40	25.32	8.07	-174.2	8.91	1.147	11:50	2.00	21.40	23.92	10.54	-110.6	8.13	1.236	7/20/2010	11:50
C-142	14.00	5.20	NP	NP	13:00	23.24	8.56	-72.4	6.99	1.926	13:25	2.00	17.20	17.51	9.57	-50.6	6.89	1.676	7/20/2010	13:25
C-143	14.00	9.20	8.22	0.80	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P	NS-P
C-144D	80.11	11.35	NP	NP	10:10	22.37	5.31	-87.1	6.42	0.000	11:30	2.00	116.20	18.29	3.86	-57.1	6.10	0.844	7/19/2010	11:10

Notes:

(1) - Measured prior to purging

(2) - Wells purged with whale pump unless otherwise noted

Groundwater quality readings collected using a YSI

Blocked - Well was blocked and unable to lower pump

A minimum of 3 well volumes were purged at each well location, unless well went dry during purging

All wells were sampled using poly bailers

Hand - Well purged using bailer

ft btic - Feet below top of inner casing

ft bgs - Feet below ground surface

mg/L - Milligrams per Liter

°C - Degrees celsius

mV - Milli volts

mS/cm - Milli siemens per cm

NM - Not measured

NP - No measurable (>0.01 ft) product

NS-P - Not sampled due to measurable (>0.01 ft) product

NS-Dry - Not sampled well was dry

gpm - Gallons per minute

NM - Total depth of well not measured due to the presence of light non aqueous phase liquid (LNAPL)

APPENDIX F

Fate and Transport Analysis

APPENDIX F
FATE AND TRANSPORT MODELING PROCEDURES
AOI 7: SUNOCO PHILADELPHIA REFINERY
PHILADELPHIA, PENNSYLVANIA

QUICK DOMENICO MODELING

F.1 INTRODUCTION

Fate and transport calculations were completed for groundwater in Area of Interest (AOI) 7 to evaluate potential migration pathways/potential impacts to receptors. Four wells (C-111, C-133, C-142 and C-56) in AOI 7 exhibited concentrations of groundwater compounds of concern (COCs) above their respective MSCs. The COCs that were above the MSCs in these wells were modeled using the analytical results from the July 2010 groundwater sampling event, and the Quick Domenico Version 2 (QD) spreadsheet model developed by Pennsylvania Department of Environmental Protection (PADEP). Site-specific data was used to complete the fate and transport calculations, when available.

F.2 MODEL OVERVIEW

The QD Model is a Microsoft Excel spreadsheet application based on the analytical contaminant transport equation developed by P.A. Domenico in *"An Analytical Model For Multidimensional Transport of a Decaying Contaminant Species,"* Journal of Hydrology, 91 (1987), pp. 49-58. The QD model calculates contaminant concentrations at any down-gradient location after a specified interval of time. The model incorporates the processes of advection, first order decay, retardation, and dispersion to describe fate and transport of compounds. In addition, the QD model displays the results as a two dimensional chart to facilitate interpretation of the results.

F.3 MODEL LIMITATIONS

Limitations of the QD model include:

- Groundwater flow is assumed to be steady state, and one-dimensional;
- Aquifer properties are assumed to be reasonably uniform;
- Applicable only to unconsolidated aquifers;
- Intended for use primarily with dissolved organic compounds;

- Does not account for the transformation of parent compounds into daughter products as the result of biodegradation;
- Compounds are considered individually, and are assumed to not react with each other; and
- The contaminant source is limited to a single and continuous source concentration.

F.4 MODEL INPUT PARAMETERS

In preparation of this report, input values for the QD model were compiled from available site-specific data. When no site-specific data was available, estimated input values from the PADEP spreadsheet "Number Please!," which is based on PA Code, Chapter 250, Appendix A, Table 5, or other acceptable literature sources, were utilized. The input parameters are discussed in detail in the following sections and are summarized in the input/output tables F.1 through F.4 in this appendix. An Excel spreadsheet interface was used to construct the QD simulations. This interface allowed the simulation of all relevant compounds at each well location to be constructed and saved in a single electronic file.

F.4.1 Source Concentration

Results of the July 2010 groundwater sampling indicated that two organic compounds (benzene and chrysene) and one metal (lead) were detected above their respective groundwater MSCs in shallow/intermediate wells (C-111, C-142, C-56, and C-133). The potential for these compounds to migrate offsite was evaluated through the use of the QD model. Based on groundwater flow direction the chrysene concentration in C-142 was evaluated in relation to AOI 7's western boundary (Schuylkill River), concentration of chrysene in C-133 was evaluated in relation to AOI 7's southern boundary (AOI 6), and the concentration of benzene in C-111 was evaluated in relation to the eastern AOI 7 boundary (AOI 3). The lead concentration in C-56 was evaluated in relation to the north and west (Schuylkill River) AOI 7 boundary, and south (AOI 6) boundary.

F.4.2 Distance to Location of Concern (x)

Distance to the Location of Concern (distance) for the current simulations is the distance required for each COCs concentration to fall below its respective MSC under steady-state plume conditions. The distance is iteratively entered in the QD model until the

location where the COC concentration reaches the MSC is identified. This step is performed using a large simulation time of 1×10^{99} days to ensure that the plume has reached steady-state.

F.4.3 Dispersivity

Dispersivity is the tendency of a dissolved plume to “spread out” as it moves down-gradient.

- Longitudinal dispersivity (A_x) occurs in the direction parallel to groundwater flow;
- Transverse dispersivity (A_y) occurs in the same plane as longitudinal dispersivity but perpendicular to the direction of groundwater flow; and
- Vertical dispersivity (A_z) occurs in the upward direction, normal to the plane in which longitudinal and transverse dispersivity occur (Vertical dispersivity is usually negligible and is typically omitted from most QD analyses).

Dispersivity estimates are difficult to quantify and are commonly estimated from the following relationships:

1. $A_x = X/10$ (where, X is the distance a contaminant has traveled by advective transport)
2. $A_y = A_x/10$
3. $A_z = A_x/20$ to $A_x/100$ (generally, it is recommended that A_z be a very small number (0.001) unless vertical monitoring can reliably justify a larger number. Additionally, a value of 0.0001 is suggested for uncalibrated or conceptual applications).

As stated above the value for A_y was estimated to be 10 percent of A_x . A value of 0.001 was used as a value for A_z .

F.4.4 Lambda

Lambda is the first order decay constant. It is determined by dividing 0.693 by the half-life of the compound. The value can typically be estimated for shrinking plumes by evaluating at concentrations versus time or distance. Lambda can also sometimes be estimated for stable plumes by evaluating concentration versus time using the

methodology outlined in Buscheck and Alcantar (1995). Important considerations to estimating Lambda from site data include:

1. Are the measured concentrations along the centerline of the plume?
2. Are the measured concentrations the result of the single source area?
3. Are there no remedial systems and/or activities that effected the migration of the plume during the time interval of evaluation?

If the answer is yes to these questions, then the methodologies outlined in Buscheck and Alcantar may be utilized to estimate a site-specific lambda from site data.

Based on review of the available site data, the criteria necessary to calculate a site-specific lambda could not be met; therefore, a default value for lambda (when appropriate and available) was obtained from the PADEP spreadsheet "Number Please!" which is based on PA Code, Chapter 250, Appendix A, Table 5.

F.4.5 Source Dimensions

Source width is the maximum width of the area measured perpendicular to the direction of groundwater flow. Source thickness is the thickness of the contaminated soils below the water table that contribute contamination to groundwater. In addition to the saturated zone, fluctuation in groundwater elevation may create a smear zone in the unsaturated portion of an aquifer. As an estimate of the thickness of the smear zone, average fluctuation can be used. Since no plumes have been delineated, a source width of 100 ft was used. The source thicknesses used was 15 feet (ft), which is the average thickness of the upper unconfined aquifer.

F.4.6 Hydraulic Conductivity (k)

The hydraulic conductivity of a geologic material is a measure of its ability to transmit water. A hydraulic conductivity of 4.64 ft/d was used in the AOI 7 QD simulations. This value was the average hydraulic conductivity of the fill/alluvium at the site, obtained from the CCR.

F.4.7 Hydraulic Gradient

Hydraulic gradient is the change in hydraulic head relative to the distance between head measurement locations. The hydraulic gradient is measured parallel to the direction of ground water flow assuming horizontal flow and a uniform gradient. Using the groundwater elevations collected in July 2010, the hydraulic gradient value was estimated between the well with exceedance and the downgradient wells within the same aquifer. The average value of the hydraulic gradient in the fill/alluvium/Trenton Gravel ranged from 0.0043 to 0.0081 with an average of 0.0061. The highest values of the hydraulic gradient are in the southern area near C-56.

F.4.8 Porosity (n)

Porosity is measured as the ratio of the volume of void space in a geologic material to the total volume of material. Porosity values used in the fate and transport modeling for AOI 2 were based on historical geotechnical analysis.

F.4.9 Soil Bulk Density (ρ_b)

Soil bulk density is the dry weight of a sample divided by the total volume of the sample in an undisturbed state. Soil bulk density can either be determined by a laboratory or by the equation

$$\rho_b = 2.65 * (1 - n).$$

Soil bulk density values used in the fate and transport modeling were based on historical geotechnical analysis.

F.4.10 Organic Carbon Partition Coefficient (KOC)

The organic carbon partition coefficient is chemical specific and is provided in the PADEP EP spreadsheet "Number Please!" which is based on PA Code, Chapter 250, Appendix A, Table 5. These values were used in the fate and transport modeling.

F.4.11 Fraction Organic Carbon (foc)

The fraction of organic carbon is the organic carbon content of a soil. A laboratory using ASTM methods can determine this value. Samples for organic carbon are taken from the same soil horizon in which the contaminant occurs, but outside of the impacted area. Since no site specific fraction of organic carbon data was available for the site, the fate and transport modeling used the model-recommended default concentration of 0.005, which is a conservative value based on the description of site soils.

F.4.12 Plume Coordinates ('y' and 'z')

The plume coordinates, 'y' and 'z,' define the horizontal and vertical extent of the impacted area, respectfully. For a solution on the centerline of the plume down gradient from the source, 'y' was set equal to zero. Additionally, to yield the highest concentration, which is located at the water table, 'z' was also set equal to zero.

F.4.13 Time (t)

'Time zero' is the point at which contamination was introduced into the aquifer. Time since 'time zero' is measured in days. The final simulation time of 1×10^{99} days was used to ensure that a steady-state plume was simulated.

F.4.14 Grid Dimensions

The grid dimensions form the window through which the plume is viewed and the locations where concentrations are calculated. The grid is determined by user specified length and width measurements from the source of the plume.

F.5 OUTPUT DATA AND RESULTS

A spreadsheet for each well, for which a QD simulation was performed, is included at the end of this appendix. The QD simulations prepared for the shallow/intermediate (fill/alluvium and Trenton Gravel) are summarized in Tables F.1 through F.4. The results of the QD screening can be found in Table F.5. A comparison between the model-predicted downgradient transport distance and the distance to the nearest property boundary and/or surface water receptor is also included in these tables. The following summarizes the results of the QD simulations:

The QD modeling results indicated the following:

- Concentrations above the groundwater MSCs in monitoring wells C-133 and C-142 are not predicted to migrate beyond the AOI 7 boundary;
- One monitoring well (C-111) contains a concentration of benzene that has the potential to reach the AOI-7 eastern boundary, and migrate into AOI 3. Based on the QD simulations, benzene concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary; and
- One monitoring well (C-56) contains a concentration of lead that has the potential to reach AOI-7 southern boundary, and migrate into AOI 6. Based on QD simulations, lead concentrations in exceedance of the groundwater MSC will not reach the Refinery boundary.

Table F.1
Quick Domenico
Fate and Transport Model Input and Output
AOI-7 Shallow Groundwater
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Project
Prepared by
Date Prepared

2574601 - Sunoco Philadelphia Refinery
Terrance Stanley
8/24/2010

Generic Input Parameters				Data Source
Source Identification (or Well ID)			C-111	
Sample Date			7/27/2010	
Source Width		ft	100	Delineated LNAPL (100' default if no plume is present)
Source Thickness		ft	15	URS, 2002 (average thickness of the UUA)
Perpendicular Distance to Location of Concern	y	ft	0	Set equal to zero to focus on centerline of simulated plume
Vertical Axis Perpendicular to x and y	z	ft	0	Set equal to zero to focus on centerline of simulated plume
Longitudinal Dispersivity	A _x	ft	50	Estimate based on knowledge of site geology and contaminants present
Transverse Dispersivity	A _y	ft	5.0	Quick Domenico User's Manual
Vertical Dispersivity	A _z	ft	0.0001	Quick Domenico User's Manual
Hydraulic Conductivity	k	ft/day	4.64	Secor (2002b) (average based on site-wide slug testing)
Hydraulic Gradient	i	ft/ft	0.0062	C-111/C-109 July 2010
Porosity	n	decimal fraction	0.35	Site soil analyses
Soil Bulk Density	p _b	g/cm ³	1.7225	ACT 2 TGM Default
Fraction of Organic Carbon	f _{oc}	decimal fraction	0.005	ACT 2 TGM Default
Time		days	1.00E+99	Steady-State Conditions

Chemical Specific Input Parameters				Data Source
Sim 1				
Contaminant			Benzene	
Source Concentration (mg/L)		mg/L	0.0890	July 2010 Sampling
Lambda (per day)		day ⁻¹	9.589E-04	PA DEP Number Please! Spreadsheet
KOC			58	PA DEP Number Please! Spreadsheet

Output (Distance from Source Where Concentration Equals Respective Ground Water MSC)				
Contaminant	Starting Concentration (mg/L)	GW MSC ¹ Non-Residential (mg/L)	Predicted Concentration (mg/L)	Predicted Distance to Meet Non-Residential GW MSC (Rounded to the Nearest foot)
Sim 1 - Benzene	0.0890	0.0050	0.0050	166

¹ ACT 2 TGM, Appendix A, Table 1 MSC for a Non-residential Used Aquifer with Total Dissolved Solids less than or equal to 2500.

Table F.2
Quick Domenico
Fate and Transport Model Input and Output
AOI-7 Shallow Groundwater
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Project 2574601 - Sunoco Philadelphia Refinery
Prepared by Terrance Stanley
Date Prepared 8/24/2010

Generic Input Parameters				Data Source
Source Identification (or Well ID)			C-133	
Sample Date			7/15/2010	
Source Width		ft	100	Delineated LNAPL (100' default if no plume is present)
Source Thickness		ft	15	URS, 2002 (average thickness of the UUA)
Perpendicular Distance to Location of Concern	y	ft	0	Set equal to zero to focus on centerline of simulated plume
Vertical Axis Perpendicular to x and y	z	ft	0	Set equal to zero to focus on centerline of simulated plume
Longitudinal Dispersivity	A _x	ft	50	Estimate based on knowledge of site geology and contaminants present
Transverse Dispersivity	A _y	ft	5.0	Quick Domenico User's Manual
Vertical Dispersivity	A _z	ft	0.0001	Quick Domenico User's Manual
Hydraulic Conductivity	k	ft/day	4.64	Secor (2002b) (average based on site-wide slug testing)
Hydraulic Gradient	i	ft/ft	0.0058	C-56/C-133 July 2010
Porosity	n	decimal fraction	0.35	Site soil analyses
Soil Bulk Density	p _b	g/cm ³	1.7225	ACT 2 TGM Default
Fraction of Organic Carbon	f _{OC}	decimal fraction	0.005	ACT 2 TGM Default
Time		days	1.00E+99	Steady-State Conditions

Chemical Specific Input Parameters				Data Source
Sim 1				
Contaminant			Chrysene	
Source Concentration (mg/L)		mg/L	0.0080	July 2010 Sampling
Lambda (per day)		day ⁻¹	3.452E-04	PA DEP Number Please! Spreadsheet
KOC			490000	PA DEP Number Please! Spreadsheet

Output (Distance from Source Where Concentration Equals Respective Ground Water MSC)				
Contaminant	Starting Concentration (mg/L)	GW MSC ¹ Non-Residential (mg/L)	Predicted Concentration (mg/L)	Predicted Distance to Meet Non-Residential GW MSC (Rounded to the Nearest foot)
Sim 1 - Chrysene	0.0080	0.0019	0.0019	1

¹ ACT 2 TGM, Appendix A, Table 1 MSC for a Non-residential Used Aquifer with Total Dissolved Solids less than or equal to 2500.

Table F.3
Quick Domenico
Fate and Transport Model Input and Output
AOI-7 Shallow Groundwater
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Project 2574601 - Sunoco Philadelphia Refinery
Prepared by Terrance Stanley
Date Prepared 8/26/2010

Generic Input Parameters				Data Source
Source Identification (or Well ID)			C-142	
Sample Date			7/20/2010	
Source Width		ft	100	Delineated LNAPL (100' default if no plume is present)
Source Thickness		ft	15	URS, 2002 (average thickness of the UUA)
Perpendicular Distance to Location of Concern	y	ft	0	Set equal to zero to focus on centerline of simulated plume
Vertical Axis Perpendicular to x and y	z	ft	0	Set equal to zero to focus on centerline of simulated plume
Longitudinal Dispersivity	A _x	ft	50	Estimate based on knowledge of site geology and contaminants present
Transverse Dispersivity	A _y	ft	5.0	Quick Domenico User's Manual
Vertical Dispersivity	A _z	ft	0.0001	Quick Domenico User's Manual
Hydraulic Conductivity	k	ft/day	4.64	Secor (2002b) (average based on site-wide slug testing)
Hydraulic Gradient	i	ft/ft	0.0043	C-56/C-58 July 2010
Porosity	n	decimal fraction	0.35	Site soil analyses
Soil Bulk Density	ρ _b	g/cm ³	1.7225	ACT 2 TGM Default
Fraction of Organic Carbon	f _{oc}	decimal fraction	0.005	ACT 2 TGM Default
Time		days	1.00E+99	Steady-State Conditions

Chemical Specific Input Parameters				Data Source
Sim 1				
Contaminant			Chrysene	
Source Concentration (mg/L)		mg/L	0.0640	July 2010 Sampling
Lambda (per day)		day ⁻¹	3.452E-04	PA DEP Number Please! Spreadsheet
KOC			490000	PA DEP Number Please! Spreadsheet

Output (Distance from Source Where Concentration Equals Respective Ground Water MSC)				
Contaminant	Starting Concentration (mg/L)	GW MSC ¹ Non-Residential (mg/L)	Predicted Concentration (mg/L)	Predicted Distance to Meet Non-Residential GW MSC (Rounded to the Nearest foot)
Sim 1 - Chrysene	0.0640	0.0019	0.0019	3

¹ ACT 2 TGM, Appendix A, Table 1 MSC for a Non-residential Used Aquifer with Total Dissolved Solids less than or equal to 2500.

Table F.4
Quick Domenico
Fate and Transport Model Input and Output
AOI-7 Shallow Groundwater
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Project 2574601 - Sunoco Philadelphia Refinery
Prepared by Terrance Stanley
Date Prepared 9/13/2010

Generic Input Parameters				Data Source
Source Identification (or Well ID)			C-56	
Sample Date			7/27/2010	
Source Width		ft	100	Delineated LNAPL (100' default if no plume is present)
Source Thickness		ft	15	URS, 2002 (average thickness of the UUA)
Perpendicular Distance to Location of Concern	y	ft	0	Set equal to zero to focus on centerline of simulated plume
Vertical Axis Perpendicular to x and y	z	ft	0	Set equal to zero to focus on centerline of simulated plume
Longitudinal Dispersivity	A _x	ft	50	Estimate based on knowledge of site geology and contaminants present
Transverse Dispersivity	A _y	ft	5.0	Quick Domenico User's Manual
Vertical Dispersivity	A _z	ft	0.0001	Quick Domenico User's Manual
Hydraulic Conductivity	k	ft/day	4.64	Secor (2002b) (average based on site-wide slug testing)
Hydraulic Gradient	i	ft/ft	0.0081	C-56/C-58 July 2010
Porosity	n	decimal fraction	0.35	Site soil analyses
Soil Bulk Density	p _b	g/cm ³	1.7225	ACT 2 TGM Default
Fraction of Organic Carbon	f _{OC}	decimal fraction	1	ACT 2 TGM Default
Time		days	1.00E+99	Steady-State Conditions

Chemical Specific Input Parameters				Data Source
Sim 1				
Contaminant			Lead	
Source Concentration (mg/L)		mg/L	0.0158	July 2010 Sampling
Lambda (per day)		day ⁻¹	2.740E-08	PA DEP Number Please! Spreadsheet
KOC			890	PA DEP Number Please! Spreadsheet

Output (Distance from Source Where Concentration Equals Respective Ground Water MSC)				
Contaminant	Starting Concentration (mg/L)	GW MSC ¹ Non-Residential (mg/L)	Predicted Concentration (mg/L)	Predicted Distance to Meet Non-Residential GW MSC (Rounded to the Nearest foot)
Sim 1 - Lead	0.0158	0.0050	0.0050	478

¹ ACT 2 TGM, Appendix A, Table 1 MSC for a Non-residential Used Aquifer with Total Dissolved Solids less than or equal to 2500.

Table F.5
Fate and Transport Screening Results for Groundwater
Predicted Distance to Achieve Groundwater Screening Standard
AOI-7 Wells
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Chemical Name	Location	C-111	C-133	C-142	C-56
	Sample ID	C-111_072710	C-133_071510	C-142_072010	C-56_072710
	Sample Date	7/27/2010	7/15/2010	7/20/2010	7/27/2010
	Sample Matrix	Groundwater	Groundwater	Groundwater	Groundwater
Volatile Organic Compounds	Units	Result	Result	Result	Result
Benzene	ft	166	--	--	--
Semi-volatile Organic Compounds					
Chrysene	ft	--	1	3	--
Metals					
Lead	ft	--	--	--	478

Notes:

PADEP - Pennsylvania Department of Environmental Protection

-- = Detected concentration (if any) is below PADEP MSC for groundwater therefore it was not included in the Quick Domenico analysis.

All predicted distances rounded to the nearest foot.

26 = Predicted distance to attenuate to PADEP MSC is greater than distance to AOI 7 boundary.

APPENDIX G

Development of Site-Specific Standards and Risk Assessment

APPENDIX G
DEVELOPMENT OF SITE-SPECIFIC STANDARDS
AOI 7: SUNOCO PHILADELPHIA REFINERY
PHILADELPHIA, PENNSYLVANIA

Based on the current and future intended non residential site use, an exposure assessment was conducted for all compounds in surficial soil which exceeded the non residential statewide health standards in AOI 7. Potential human health exposures for the Refinery are for an industrial worker scenario.

Direct contact exposure pathways to surface soil, groundwater, and LNAPL is for the industrial scenario because of Sunoco's established excavation procedures, PPE requirements and soil handling procedures, as they are described in Appendix K of the 2004 Current Conditions Report (CCR). However, because direct contact to surface soils could occur outside of excavation activities, shallow soil samples were collected in AOI 7 to further evaluate this pathway under a non-residential (on-site worker) scenario.

Based on the recent characterization data collected, concentrations of benzene naphthalene, 1,2,4-trimethylbenzene (1,2,4-TMB), 1,3,5-trimethylbenzene (1,3,5-TMB) and lead were detected above the non-residential soil MSCs in surficial soil (0-2 feet). In accordance with Section IV of the PADEP's Technical Guidance Manual (TGM) (dated June 8, 2002), to reduce the list of compounds carried through the risk assessment, the COCs listed above were further screened against the EPA Region III Risk-Based Concentrations RBCs (aka, EPA Regional Screening Levels) for industrial soil; however, the above listed compounds also exceeded Region III's RBCs.

For all compounds that exceed both the non-residential statewide health standards and EPA Region III RBCs, site-specific standards were calculated using PADEP default intake parameters for an on-site worker and, where appropriate, a risk level of 10^{-4} . For calculating a site-specific standard for on-site workers exposed to lead, Sunoco used the Society of Environmental Geochemistry and Health (SEGH) model used by PADEP to

develop the non-residential MSC. The input parameters used to develop the site-specific standards for benzene and lead are provided in Tables G-1 through G-5.

The site-specific standards for the organic compounds (calculated in Tables G-1 through G-5) are as follows:

Compound	Calculated Site-Specific Standard (mg/kg)
Benzene	2,160
Naphthalene	56,780
1,2,4-TMB	320
1,3,5-TMB	320
Lead	3,140

The site-specific screening level for benzene, naphthalene, 1,2,4-TMB and 1,3,5-TMB were calculated for inhalation, based on the calculations specified in 25 Pa. Code § 250.306(b)(1). These calculations used the PADEP's default parameters, and an updated target risk level of 1E-4, in consideration of the site-specific conditions (PADEP's default target risk level is 1E-5).

As presented in Table G-1 through G-4, based on the revised target risk level, the derived site-specific standards for benzene and naphthalene in soil are 2,160 mg/kg (rounded) and 56,780 mg/kg, and for both 1,2,4-TMB and 1,3,5-TMB 320 mg/kg, for an onsite worker, and they are consistent with the values used in the previous SCR/RIR prepared for AOIs 1, 4, 5, 6, 8 and 9. Concentrations of benzene, naphthalene and 1,2,4-TMB and 1,3,5-TMB detected in the surface soil samples collected in AOI 7 are below the site-specific standards and, therefore, risk to an on-site worker due to exposure is considered to be within the acceptable ACT 2 range.

The site-specific screening level for lead was calculated for ingestion. As presented in 25 Pa. Code § 250.306(e), Appendix A, Table 7, the non-residential soil screening value

for lead is based on the method presented in the report 'The Society for Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead in Soil' (Wixson, 1991). The model used by the PADEP and developed by SEGH was also used to calculate the site specific criterion for the refinery. Based on the SEGH model and PADEP's default parameters, PADEP's non-residential direct contact MSC default value for lead in surface soil is 1,000 mg/kg. To develop a site-specific criteria for lead, some of the parameters used by the PADEP were updated in consideration of site-specific conditions and updated lead data collected from recent studies. These parameters are discussed in the following paragraphs.

Target blood lead concentration (T) – The default target blood lead concentration used by the PADEP to develop the non-residential MSC is 20 ug/dL; however, the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) recommends that worker blood lead levels be maintained below 40 ug/dL (OSHA, 29 CFR 1910.1025) to prevent adverse health effects for most workers from exposure to lead throughout a working lifetime. To minimize adverse reproductive health effects, OSHA further recommends that the blood lead levels of workers (both male and female) who intend to have children should be maintained below 30 ug/dL. Based on the action levels provided by OSHA the value used for T in the site specific calculation has been revised to 30 ug/dL.

Geometric mean background blood lead concentration (B) – B is the background blood lead concentration in the target population from sources other than soil and dust. The PADEP's default value for B is 4 ug/dL and, as summarized in PADEPs reference document (Wixson, 1991), is based on data gathered in the United Kingdom from young children. The US Center for Disease Control and Prevention (CDC) in Atlanta, GA has monitored blood lead levels in US children and adults since 1976 and, based on the most recent results published by the National Center for Environmental Health of the CDC (NCEH, 2005), the mean blood lead concentration for an adult 20 years of age or older is 1.56 ug/dL.

Based on the more recent study by the US CDC, the value used for B in the site specific calculation has been revised to 1.56 ug/dL.

Slope of blood lead to soil lead (δ) – The PADEP's default value for δ is 7.5 ug/dL blood per ug/g soil; however, based on recommendations by the United Kingdom's Department for Environment, Food, and Rural Affairs (DEFRA, 2002) the reasonable range of δ values is between 2 and 5 ug/dL blood per ug/g soil and should be selected based on site-specific information. Based on the DEFRA's guidance, low values of δ relate primarily to groups of older children, well maintained (dense) vegetative cover, low bioavailability, heavier textured soils, and good personal grooming habits. Higher values of δ tend to be found in groups of children between the ages of 18 and 24 months, sparse vegetation, soluble lead salts, light textured or soils with low organic matter, and poor personal grooming habits. Based on the suggested range for δ by the DEFRA and because access to the refinery is restricted and PPE is required we believe a value of 7.5 ug/dL is too conservative. Because the soils at the refinery are sandy with low organic matter we selected the highest value within the range suggested by the SEGH, 5.0 ug/dL.

As presented in Table G-5, based on the revised parameters, the derived site-specific standard for lead in soil is 3,140 mg/kg for a refinery worker, and is consistent with the value calculated in the SCR/RIR prepared for AOI 9. Concentrations of lead detected in the surface soil samples collected in AOI 7 are below the site-specific standards and, therefore, risk to an on-site worker due to exposure is considered to be within the acceptable ACT 2 range.

In addition to calculating the site-specific standards for benzene, naphthalene, 1,2,4-TMB, 1,3,5-TMB and lead, the cumulative risk of exposure was also calculated. Lead exposure is dependent on the blood/lead concentration and not risk based; therefore, lead could not be incorporated into the cumulative risk calculation.

The cumulative hazard index is the combined index for exposure to non-carcinogenic compounds, and it cannot exceed 1. For AOI 7, the cumulative hazard index for exposure to the non-carcinogenic compounds is larger than the PADEP's requirement of 1.0. Potential exposure within the areas of BH-10-28, which has the highest elevated concentrations of naphthalene, 1,2,4-TMB and 1,3,5-TMB, will be addressed by Sunoco through implementation of a remedy which will either remediate or eliminate the potential pathway to onsite workers.

The total cumulative risk is the combined risk of exposure to the concentrations of carcinogenic compounds, which for AOI 7 is benzene. In accordance with the TGM, the total cumulative risk cannot exceed 10^{-4} . As presented in Table G-6, the total cumulative risk of exposure to the carcinogenic compounds in AOI 7 is $1.76\text{E-}06$, and therefore, no remedies are required for AOI 7 to address direct contact to benzene.

References

DEFRA. (2002). Soil Guideline values for Lead Contamination. Bristol, UK: R&D Publication SGV 10 Environment Agency.

NCEH. (2005). Third National Report on Human Exposure to Environmental Chemicals. Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Laboratory Sciences. Atlanta, Georgia. NCEH. Pub. No. 05-0570.

Wixson, B.G., (1991). The Society of Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead in Soil. Trace Substances in Environmental Health. 11-20.

Table G-1
Derivation of Site-Specific Soil Value
for Benzene¹
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Region III RBC ⁵				5,400
Parameter	Abbreviation	Assumption	Units	Source
Transport Factor	TF	13100	mg/kg / mg/m ³	25 Pa. Code § 250, Appendix A Table 5
Absorption	Abs	1	unitless	25 Pa. Code § 250.307(d)
Exposure Time	ET	8	hr/day	25 Pa. Code § 250.307(d)
Exposure Frequency	EF	180	d/yr	25 Pa. Code § 250.307(d)
Target Risk ²	TR	0.0001	mg/kg	
Inhalation Cancer Slope Factor	CSF _I	0.027	mg/kg-day ⁻¹	25 Pa. Code § 250, Appendix A Table 5
Averaging Time for Carcinogens	AT _C	70	yr	25 Pa. Code § 250.307(d)
Inhalation Factor	IF _{ADJ}	0.4	unitless	25 Pa. Code § 250.307(d)

Site-Specific, Non-Residential (Onsite Worker) Screening Value

2,160 mg/kg
2,160,000 ug/kg

Notes:

1. The site specific screening value was calculated for inhalation based on the calculation specified in 25 Pa. Code 250.307(b)(1)

$$MSC \text{ (mg/kg)} = \frac{TR \times AT_C \times 365 \text{ days/year} \times TF}{CSF_I \times Abs \times ET \times EF \times IF_{ADJ}}$$

2. The target risk level was modified from PADEP's default (1E-5) to 1E-4.

Table G-2
Derivation of Site-Specific Soil Value
for Naphthalene¹
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Region III RBC ⁵				5,400
Parameter	Abbreviation	Assumption	Units	Source
Target Health Quotient	TR	1		25 Pa. Code § 250.306(d)
Oral Reference Dose	RfD _o	0.02	mg/kg-day ⁻¹	25 Pa. Code § 250, Appendix A Table 5
Body Weight	BW	70	kg	25 Pa. Code § 250.306(d)
Averaging Time	AT _{DC}	25	yr	25 Pa. Code § 250.306(d)
Absorption	Abs	1	unitless	25 Pa. Code § 250.306(d)
Exposure Frequency	EF	180	d/yr	25 Pa. Code § 250.306(d)
Exposure Duration	ED	25	yr	25 Pa. Code § 250.306(d)
Conversion Factor	CF	1.00E-06	kg/day	25 Pa. Code § 250.306(d)
Ingestion Rate	IngR	50	mg/day	25 Pa. Code § 250.306(d)

Site-Specific, Non-Residential (Onsite Worker) Screening Value

56,780 mg/kg
56,780,000 ug/kg

Notes:

1. The site specific screening value was calculated for ingestion based on the calculation specified in 25 Pa. Code 250.306(b)

$$MSC \text{ (mg/kg)} = \frac{THQ \times RfD_o \times BW \times AT_{DC} \times 365 \text{ days/year}}{Abs \times EF \times ED \times IngR \times CF}$$

Table G-3
Derivation of Site-Specific Soil Value
for 1,2,4-Trimethylbenzene¹
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Region III RBC ⁵				5,400
Parameter	Abbreviation	Assumption	Units	Source
Transport Factor	TF	13100	m ³ /kg	25 Pa. Code § 250, Appendix A Table 5
Body Weight	BW	70	kg	25 Pa. Code § 250.307(d)
Absorption	Abs	1	unitless	25 Pa. Code § 250.307(d)
Exposure Time	ET	8	hr/day	25 Pa. Code § 250.307(d)
Exposure Frequency	EF	180	d/yr	25 Pa. Code § 250.307(d)
Exposure Duration	ED	25	yr	26 Pa. Code § 250.307(d)
Target Hazard Quotient	THQ	1	unitless	27 Pa. Code § 250.307(d)
Inhalation Reference Dose	RfDi	0.0017	mg/kg-day	25 Pa. Code § 250, Appendix A Table 5
Averaging Time for Non-carcinogens	AT _{NC}	25	yr	25 Pa. Code § 250.307(d)
Inhalation Rate	IR	1.25	m ³ /hr	25 Pa. Code § 250.307(d)

Site-Specific, Non-Residential (Onsite Worker) Screening Value

320 mg/kg
320,000 ug/kg

Notes:

1. The site specific screening value was calculated for inhalation based on the calculation specified in 25 Pa. Code 250.307(a)(1)

$$MSC \text{ (mg/kg)} = \frac{THQ \times RfDi \times BW \times AT_{NC} \times 365 \text{ days/year} \times TF}{Abs \times ET \times EF \times ED \times IR}$$

31,000

Table G-4
Derivation of Site-Specific Soil Value
for 1,3,5-Trimethylbenzene¹
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Region III RBC ⁵				5,400
Parameter	Abbreviation	Assumption	Units	Source
Transport Factor	TF	13100	m ³ /kg	25 Pa. Code § 250, Appendix A Table 5
Body Weight	BW	70	kg	25 Pa. Code § 250.307(d)
Absorption	Abs	1	unitless	25 Pa. Code § 250.307(d)
Exposure Time	ET	8	hr/day	25 Pa. Code § 250.307(d)
Exposure Frequency	EF	180	d/yr	25 Pa. Code § 250.307(d)
Exposure Duration	ED	25	yr	26 Pa. Code § 250.307(d)
Target Hazard Quotient	THQ	1	unitless	27 Pa. Code § 250.307(d)
Inhalation Reference Dose	RfDi	0.0017	mg/kg-day	25 Pa. Code § 250, Appendix A Table 5
Averaging Time for Non-carcinogens	AT _{NC}	25	yr	25 Pa. Code § 250.307(d)
Inhalation Rate	IR	1.25	m ³ /hr	25 Pa. Code § 250.307(d)

Site-Specific, Non-Residential (Onsite Worker) Screening Value

320 mg/kg
320,000 ug/kg

Notes:

1. The site specific screening value was calculated for inhalation based on the calculation specified in 25 Pa. Code 250.307(a)(1)

$$MSC \text{ (mg/kg)} = \frac{THQ \times RfDi \times BW \times AT_{NC} \times 365 \text{ days/year} \times TF}{Abs \times ET \times EF \times ED \times IR}$$

Table G-5
Derivation of Site-Specific Soil Value
for Lead¹
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Region III RBC ⁵				5,400
Parameter	Abbreviation	Assumption	Units	Source
Blood lead target concentration	T	30	ug/dL	OSHA 29CFR1910.1025 App A
Geometric standard deviation of the blood lead distribution	G	1.4	unitless	25 Pa. Code § 250, Appendix A Table 7
Geometric mean background blood lead concentration from sources other than soil or dust (for ages > 20 years old)	B	1.56	ug/dL	NCEH Pub. No. 05-0570 (NCEH, 2005)
Number of standard deviations corresponding to the degree of protection required for the population at risk	n	1.645	unitless	25 Pa. Code § 250, Appendix A Table 7
Response of the blood lead versus soil lead relationship	δ	5	ug/dL blood / ug/g soil	DEFRA, 2002

Site-Specific, Non-Residential (Onsite Worker) Screening Value

3,140 ug/g (mg/kg)
3,140,000 ug/kg

Notes:

1. The site specific screening value for Lead was calculated for ingestion based on the SEGH model as specified by 25 Pa. Code 250.306(e)

$$MSC \text{ (mg/kg)} = \frac{[(T/G^n) - B] \times 1000}{\delta}$$

DEFRA. (2002). Soil Guideline values for Lead Contamination. Bristol, UK: R&D Publication SGV 10 Environment Agency.

NCEH. (2005). Third National Report on Human Exposure to Environmental Chemicals. Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Laboratory Sciences. Atlanta, Georgia. NCEH. Pub. No. 05-0570.

Table G-6
Summary of Site Specific Cumulative Risk Evaluation
AOI 7 Site Characterization Report
Sunoco Philadelphia Refinery
Philadelnhia, Pennsylvania

				Benzene (71-43-2)		Naphthalene (91-20-3)		1,2,4 - Trimethylbenzene (95-63-6)		1,3,5-Trimethylbenzene (108-67-8)		Lead (7439-92-1)	
Location ID	Sample ID*	Sample Interval	Sample Date	Reported Result (ug/kg)	Calculated Risk	Reported Result (ug/kg)	Calculated Hazard Quotient	Reported Result (ug/kg)	Calculated Hazard Quotient	Reported Result (ug/kg)	Calculated Hazard Quotient	Reported Result (mg/kg)	Calculated Blood Lead Concentration ⁴ (ug/dL)
Region III RBC ⁵				5,400		18,000		260,000		10,000,000		800	
AOI-7	BH-10-05_1.5-2.0	1.5-2	6/9/2010	3	1.39E-10	1,000	1.76E-05	7	2.21E-05	6	0.0000	411	3
AOI-7	BH-10-06_1.2-1.7	1.2-1.7	6/9/2010	0.7	3.25E-11	3,300	5.81E-05	2	6.33E-06	ND	--	266	3
AOI-7	BH-10-07_1.0-1.5	1-1.5	6/10/2010	ND	--	ND	--	ND	--	ND	--	305	3
AOI-7	BH-10-08_1.5-2.0	1.5-2	6/10/2010	370	1.72E-08	ND	--	210	6.64E-04	ND	--	444	3
AOI-7	BH-10-09_1.2-1.7	1.2-1.7	6/10/2010	2	9.29E-11	4,600	8.10E-05	ND	--	ND	--	1,230	3
AOI-7	BH-10-10_1.5-2.0	1.5-2	6/10/2010	160	7.43E-09	3,300	5.81E-05	890	2.82E-03	99	0.0003	725	3
AOI-7	BH-10-11_1.5-2.0	1.5-2	6/10/2010	56	2.60E-09	1,500	2.64E-05	430	1.36E-03	85	0.0003	184	3
AOI-7	BH-10-12_1.5-2.0	1.5-2	6/10/2010	4	1.86E-10	3,800	6.69E-05	6	1.90E-05	3	0.0000	414	3
AOI-7	BH-10-13_1.5-2.0	1.5-2	6/9/2010	2	9.29E-11	1,000	1.76E-05	ND	--	ND	--	320	3
AOI-7	BH-10-14_1.5-2.0	1.5-2	6/9/2010	260	1.21E-08	4,900	8.63E-05	290	9.17E-04	120	0.0004	531	3
AOI-7	BH-10-15_1.4-1.9	1.4-1.9	6/9/2010	4	1.86E-10	310	5.46E-06	ND	--	ND	--	280	3
AOI-7	BH-10-16_1.5-2.0	1.5-2	6/9/2010	850	3.95E-08	ND	--	240	7.59E-04	ND	--	616	3
AOI-7	BH-10-17_1.5-2.0	1.5-2	6/9/2010	460	2.14E-08	1,400	2.47E-05	4400	1.39E-02	2,400	0.0076	48	3
AOI-7	BH-10-18_1.5-2.0	1.5-2	6/9/2010	0.8	3.72E-11	3,100	5.46E-05	ND	--	ND	--	478	3
AOI-7	BH-10-19_0.5-1.0	0.5-1	6/9/2010	ND	--	ND	--	ND	--	ND	--	365	3
AOI-7	BH-10-20_1.3-1.8	1.3-1.7	6/8/2010	3	1.39E-10	1,200	2.11E-05	ND	--	ND	--	179	3
AOI-7	BH-10-21_1.0-1.5	1-1.5	6/8/2010	ND	--	9,200	1.62E-04	ND	--	ND	--	869	3
AOI-7	BH-10-22_1.5-2.0	1.5-2	6/8/2010	5	2.32E-10	3,700	6.52E-05	ND	--	ND	--	304	3
AOI-7	BH-10-23_1.0-1.5	1-1.5	6/7/2010	19	8.83E-10	110	1.94E-06	ND	--	ND	--	623	3
AOI-7	BH-10-24_1.0-1.5	1-1.5	6/7/2010	94	4.37E-09	1,400	2.47E-05	830	2.63E-03	340	0.0011	411	3
AOI-7	BH-10-25_1.2-1.7	1.2-1.7	6/7/2010	31,000	1.44E-06	5,500	9.69E-05	200	6.33E-04	ND	--	79	3
AOI-7	BH-10-26_1.5-2.0	1.5-2	6/7/2010	3	1.39E-10	3,300	5.81E-05	ND	--	ND	--	2,040	3
AOI-7	BH-10-27_1.5-2.0	1.5-2	6/8/2010	ND	--	21,000	3.70E-04	16000	5.06E-02	8,000	0.0253	393	3
AOI-7	BH-10-28_1.5-2.0	1.5-2	6/7/2010	1,600	7.43E-08	30,000	5.28E-04	280,000	8.86E-01	130,000	0.4112	155	3
AOI-7	BH-10-29_0.7-1.2	0.7-1.2	6/7/2010	10	4.65E-10	200	3.52E-06	ND	--	ND	--	395	3
AOI-7	BH-10-30_1.5-2.0	1.5-2	6/7/2010	380	1.77E-08	11,000	1.94E-04	240	7.59E-04	ND	--	250	3
AOI-7	BH-10-31_1.5-2.0	1.5-2	6/8/2010	470	2.18E-08	7,300	1.29E-04	1100	3.48E-03	450	0.0014	610	3
AOI-7	BH-10-32_0.5-1.0	0.5-1	6/8/2010	4	1.86E-10	640	1.13E-05	2	6.33E-06	ND	--	298	3
AOI-7	BH-10-33_1.5-2.0	1.5-2	6/8/2010	ND	--	ND	--	ND	--	ND	--	43	3
AOI-7	BH-10-34_1.0-1.5	1-1.5	6/8/2010	ND	--	ND	--	ND	--	ND	--	84	3
AOI-7	BH-10-35_1.3-1.7	1.3-1.7	6/8/2010	ND	--	ND	--	ND	--	ND	--	93	3
AOI-7	C-129_1-2	1-2	6/2/2010	3	1.39E-10	4,200	7.40E-05	ND	--	ND	--	252	3
AOI-7	C-130_1-2	1-2	6/2/2010	ND	--	ND	--	ND	--	ND	--	814	3
AOI-7	C-131_1-2	1-2	6/3/2010	ND	--	6,500	1.14E-04	ND	--	ND	--	396	3
AOI-7	C-136_1-2	1-2	5/28/2010	7	3.25E-10	550	9.69E-06	ND	--	ND	--	218	3
AOI-7	C-138_1-2	1-2	5/27/2010	12	5.58E-10	110	1.94E-06	14	4.43E-05	7	0.0000	103	3
AOI-7	C-139_1-2	1-2	6/2/2010	ND	--	ND	--	ND	--	ND	--	99	3
AOI-7	C-140_1-2	1-2	5/26/2010	ND	--	470	8.28E-06	ND	--	ND	--	99	3
AOI-7	C-142_1-2	1-2	6/3/2010	100	4.65E-09	2,000	3.52E-05	180	5.69E-04	90	0.0003	1,370	3
AOI-7	C-143_1-2	1-2	6/3/2010	2,000	9.29E-08	270	4.76E-06	250	7.91E-04	240	0.0008	164	3
Cumulative Total ¹ :				1.76E-06		2.41E-03		9.66E-01		4.49E-01			

Total Cumulative Risk for Carcinogens²: 1.76E-06 < 1 in 10,000
Hazard Index for Non-Carcinogens³: 1.42 > 1

Notes:

- ND - Not Detected
BOLD - Indicates locations with concentrations exceeding PADEP's Non-Residential Soil MSC.
¹ Cumulative total of detected concentrations greater than the PADEP Non-Residential Soil MSC.
² Total cumulative risk of detected concentrations of benzene greater than the PADEP Non-Residential Soil MSC
³ Total Hazard Index of detected concentrations of naphthalene, 1,2,4-TMB, and 1,3,5-TMB greater than the PADEP Non-Residential Soil MSC.
⁴ Calculated based on site specific parameters provided in Table F-6. OSHA, 29CFR1910.1025, Appendix A, recommends that blood lead levels be maintained below 30 ug/dL.
⁵ http://www.epa.gov/reg3hscd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_MAY2010.pdf
*All soil samples collected and analyzed were unsaturated.

APPENDIX H

LNAPL Characterization Data

Appendix H
Table 1
AOI 7 LNAPL Characterization Summary Table
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

Interpretation of Product Types, Proportions, and Weathering						Similarities to Other Samples in Study		
Characterization Results Compiled for CCR (TGI Job No. 04046 - Analyzed in March 2004)								
Well ID	Density g/cc (60°F)	LNAPL Type(s)	Torkelson LNAPL Type(s)	Proportion (%)	Weathering	Quite Similar To	Fairly Similar To	Somewhat Similar To
C-65	0.9162	Lube Oil	Lube Oil	60	Extreme	C-106 & PZ-204		All other lube oils in study
			Residual Oil	40	Severe		All other residual oils in study except A-133	
C-106	0.9306	Lube Oil	Lube Oil	60	Extreme	C-65 & PZ-204		All other lube oils in study
			Middle Distillate	35		A-136 & B-43	N-68 & S-104	All other middle distillates in study
			Gasoline	5				All other gasolines in study
C-107	0.9371	Residual Oil	Residual Oil	100	Extreme		N-14	All other residual oils in study except A-133
Characterization Results Compiled for AOI 7 Site Characterization Activities (TGI Job No. 10099 - Analyzed in July 2010)								
C-143	0.8676	Middle Distillate	Middle Distillate	50	Extreme			S-297
			Heavier Virgin Naphtha	30	Severe	Unique		
			Heavier Material	20	Extreme			All other heavier materials in study

Notes:

Heavier material could either be crude oil or residual oil.
g/cc - Grams per cubic centimeter
TGI - Torkelson Geochemistry, Inc.
NA - Not Applicable
? - Tentative identification
CCR - 2004 Sunoco Current Conditions Report
LNAPL - Light Non Aqueous Phase Liquid
All LNAPL results reported were analyzed by TGI.
Product interpretations were provided by TGI.

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Tulsa, OK 74114-3233
Phone: 918-749-8441 e-mail: info@torkelsongeochem.com
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Phone: 918-749-8441
Fax: 918-749-6005

e-mail: BTorkelson@torkelsongeochemistry.com

Page 1 of 1

CHAIN-OF-CUSTODY RECORD

Project: Sunoco, Inc. Philadelphia Refinery

Location: 3144 Passyunk Avenue, Philadelphia, PA 19145

Report/Bill To: Langan Engineering & Envtl Services
Address: P.O. Box 1569

Doyelstown, PA 18901-0218

Proj. No.: AOIS 2, 3, & 7 SCRs/RIRs

Phone: 215.481.8500

P.O.: _____

Fax: 215.481.0501

Sampled By: Tim Deik

e-mail: owenster@langua.com

<p>Additional Instructions</p> <p>Samples to be analyzed for Fingerprint (QC Characterization) and</p> <p>Density. Include a "Brief Description/Interpretation" of LNA_{PL} to be consistent with existing LNA_{PL} types for Sunoco Philadelphia.</p> <p>Must have data results no later than July 30, 2010.</p>	<p>Requested Turn-Around Time:</p> <p>Data needed by July 30th</p>
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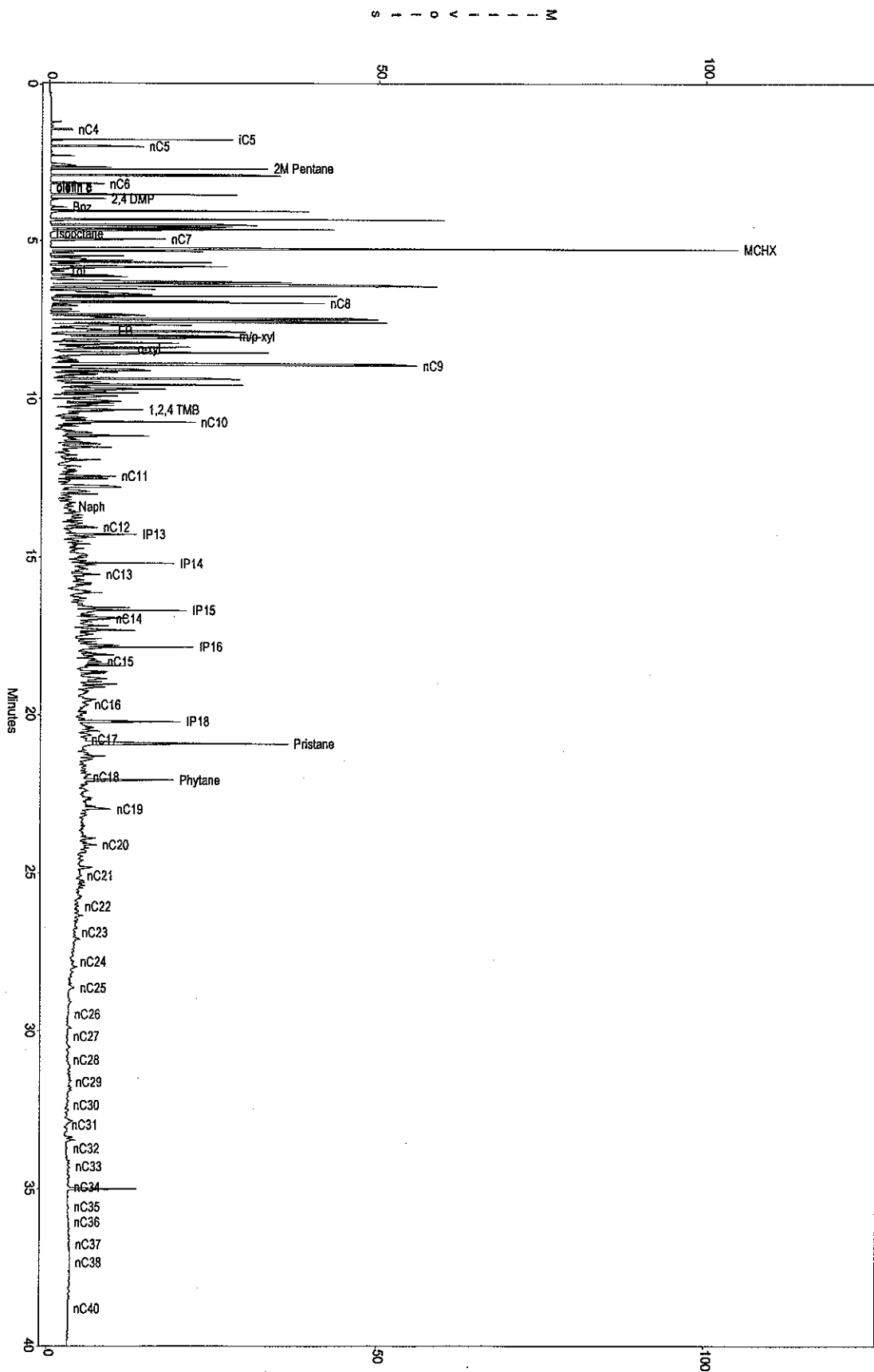
Requested Turn-Around Time:	Data needed by July 30th
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RELEASED TO FED EX EXP.	SAME DATE		
	<i>[Signature]</i>	7-19-10	0845

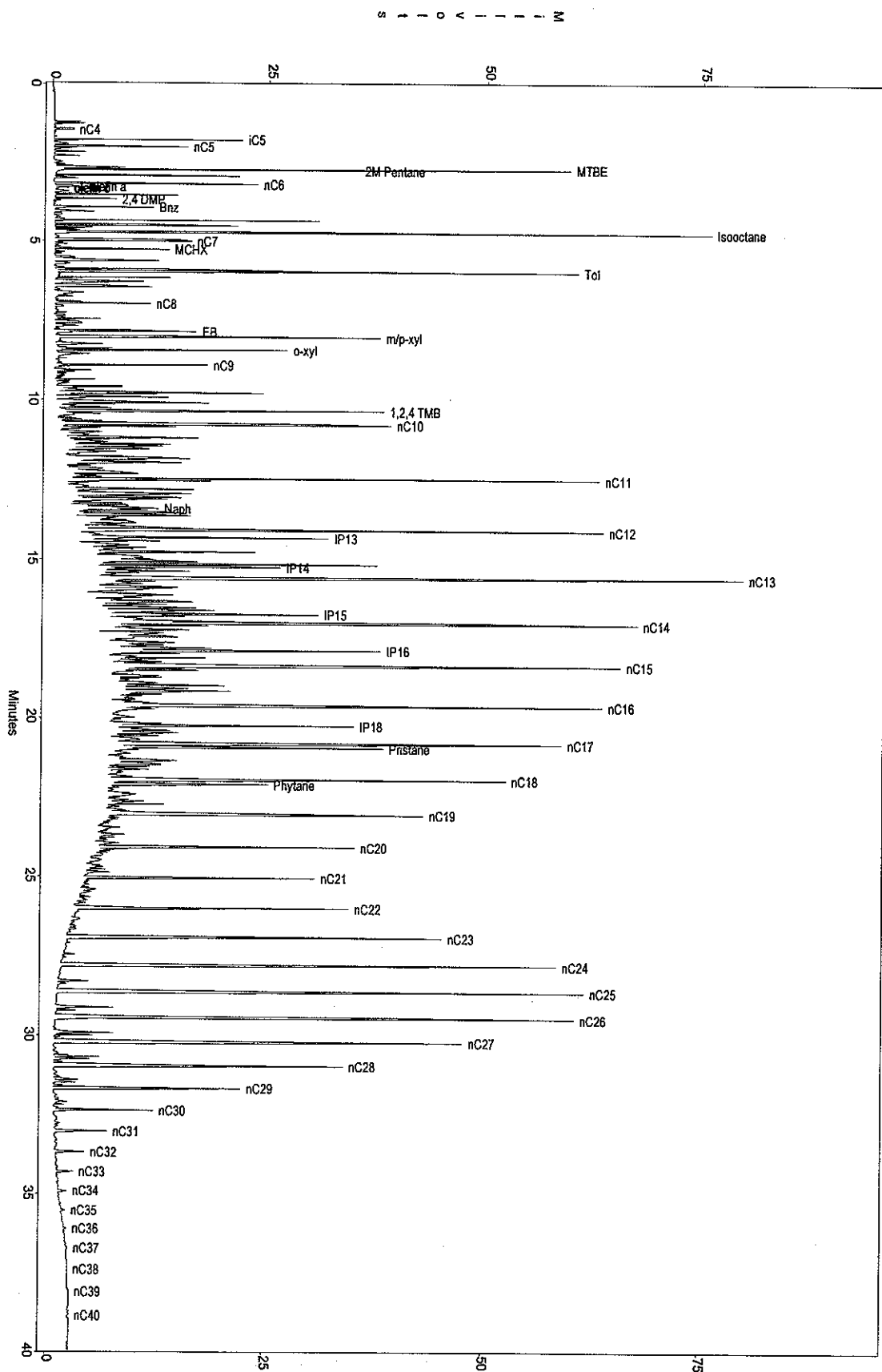
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 Acquired : Jul 20, 2010 11:28:51

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Sunoco, Inc., Philadelphia Refinery
 Sample ID : Gas/Dies/Max std
 Acquired : Jul 20, 2010 09:47:53

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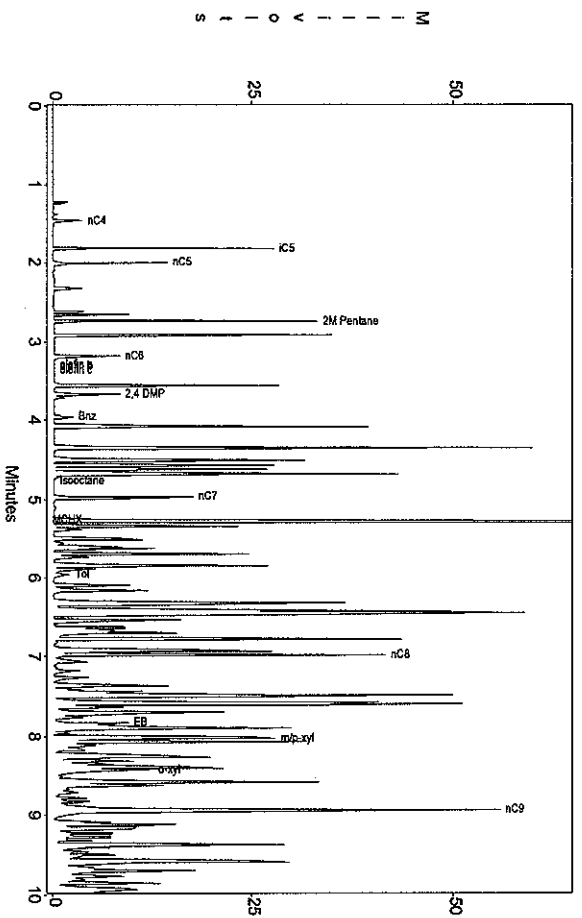
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Sunoco, Inc., Philadelphia Refinery

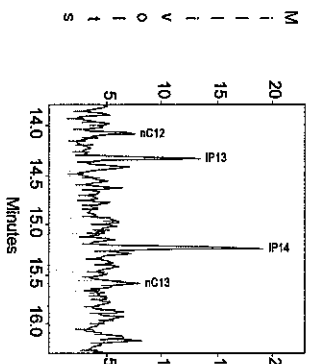
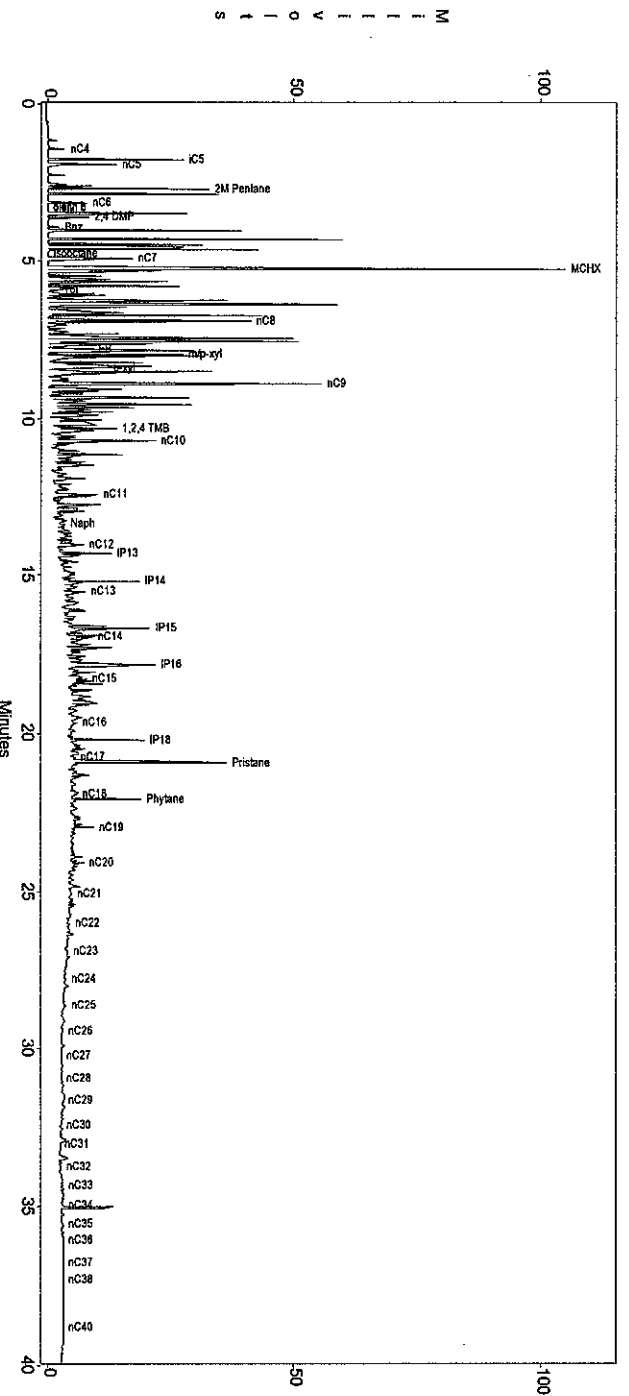
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Acquired : Jul 20, 2010 11:28:51

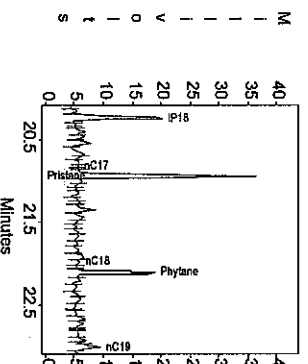
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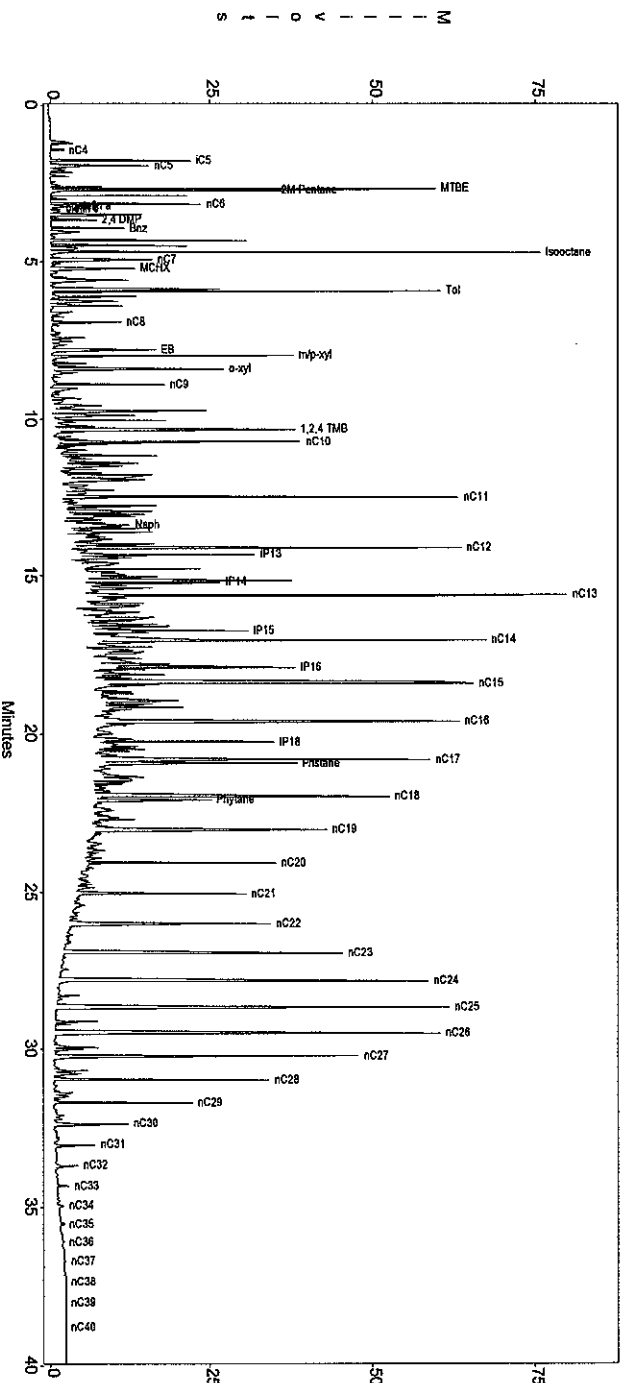
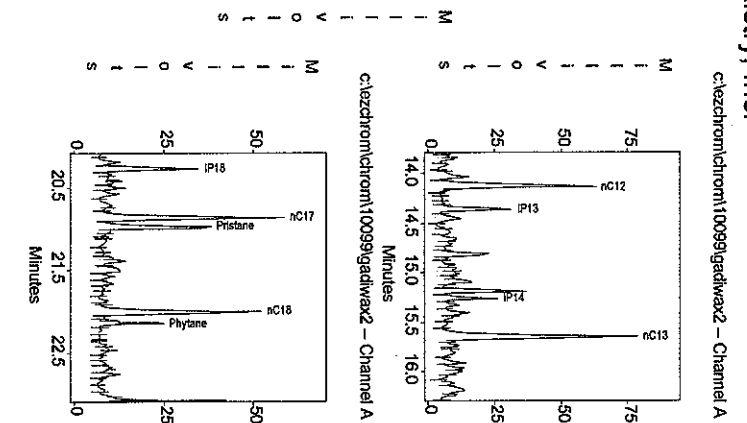
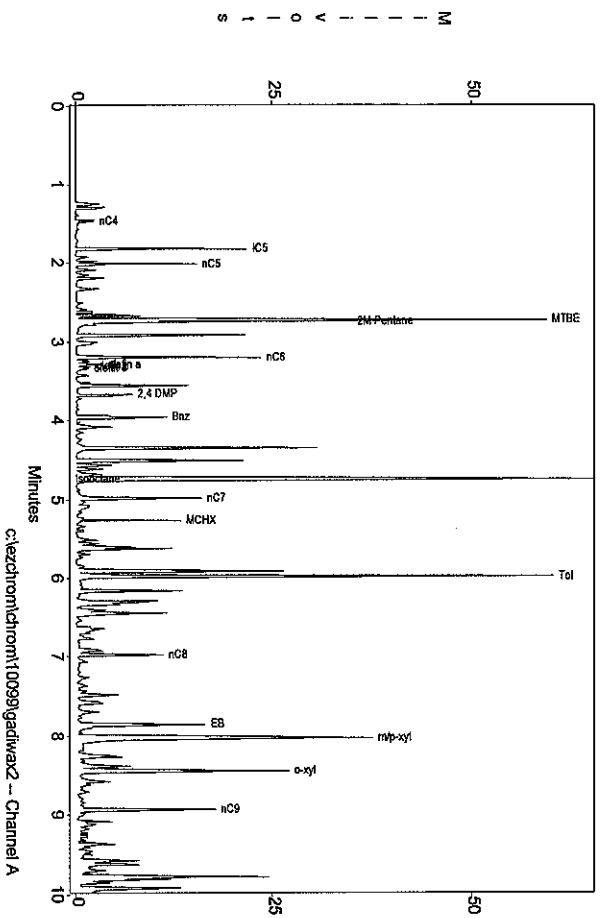
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Peak	Area	Height
nC4	2466	3530
nC5	26659	27746
nC6	11629	14336
nC7	0	0
2M Pentane	30430	33150
nC8	8194	8347
olefin a	31	22
olefin b	87	79
olefin c	170	131
2,4 DMP	8824	8480
Bnz	3682	2470
Isocane	66	28
nC9	20662	17512
nC10	175772	184822
nC11	3534	2045
nC12	56205	41636
nC13	13984	9360
nC14	48714	27779
nC15	27084	12621
nC16	103240	55740
nC17	21432	13644
nC18	35895	21414
nC19	18468	9121
nC20	5146	2309
nC21	13946	5931
nC22	23181	11735
nC23	36530	17192
nC24	12747	6018
nC25	37102	18746
nC26	22855	7069
nC27	37739	19641
nC28	15382	5566
nC29	7722	3124
nC30	42407	17021
nC31	5390	2594
nC32	81585	33254
nC33	6651	2466
Pyrene	41071	15565
nC34	18528	5838
nC35	8969	3423
nC36	2753	766
nC37	2350	782
nC38	1492	453
nC39	1618	483
nC40	2799	700
nC41	1023	328
nC42	200	104
nC43	304	155
nC44	741	432
nC45	396	214
nC46	93	36
nC47	333	172
nC48	1103	305
nC49	46	61
nC50	190	102
nC51	147	91
nC52	30	45
nC53	39	44
nC54	0	0
nC55	108	28

Sunoco, Inc., Philadelphia Refinery
Sample ID : Gas/Dies/Wax std
Acquired : Jul 20, 2010 09:47:53

c:\ezchrom\chrom1\0099\gadwax2 -- Channel A



Peak	Area	Height
nC4	1984	2386
nC5	15414	21815
nC6	11667	15453
MTBE	49307	59479
2M-Pentane	33096	34918
nC8	22290	23338
olefin a	3612	3418
olefin b	1724	1722
olefin c	1971	1548
2,4 DMP	7274	7143
Bnz	14167	11489
Isooctane	106520	75535
nC7	19179	15820
MCHX	15682	13181
Tol	85518	60313
nC9	13430	11072
EB	23107	16249
m,p-xyt	81108	37519
o-xyt	39137	26870
1,2,4 TMB	24717	17580
nC10	61297	38172
nC11	124394	61224
Naph	19826	9956
nC12	128262	66646
IP13	52642	28790
IP14	40766	22703
IP15	171610	75744
IP16	39477	24563
IP17	151755	60419
IP18	75603	37151
nC15	156310	59695
nC16	142887	57295
IP18	65882	28830
IP18	129175	52347
nC17	74492	31881
Pr-Isoctane	91720	45871
Phytane	44075	18464
nC19	83344	36711
nC20	61701	30048
nC21	54690	26538
nC22	68336	31525
nC23	106107	43174
nC24	160461	57025
nC25	186168	68645
nC26	183641	59685
nC27	134561	46943
nC28	82385	33357
nC29	45276	21535
nC30	21360	11336
nC31	11214	6091
nC32	6031	3388
nC33	3767	1885
nC34	1832	982
nC35	1844	547
nC36	546	265
nC37	326	167
nC38	241	92
nC39	236	68
nC40	153	45

Torkelson Geochemistry, Inc.

Density Measurements

Paar DMA 512 / DMA 60		ASTM Method 4052		
Sample	Density gm/ml	Temp. of Measurement	Job Number	Date
C-143	0.8676	60F	10099	7/20/10
S-282	0.8104	60F	10099	7/20/10
S-285	0.8921	60F	10099	7/20/10
S-297	0.8229	60F	10099	7/20/10
S-313	0.8694	60F	10099	7/20/10
S-315	0.8552	60F	10099	7/20/10



Torkelson Geochemistry, Inc.

2528 S. Columbia Place
Tulsa, OK 74114-3233

Phone: 918-749-8441 e-mail: BTorkelson@aol.com
Fax: 918-749-6005

CHAIN-OF-CUSTODY RECORD

Project: Sun-Philadelphia Refinery COA
Location: Philadelphia, PA

Report/Bill To: Colleen Costello
Address: 30 South 17th St, Suite 1500
Philadelphia, PA 19103

Additional Instructions

Proj. No.:

Phone: 215.864.0640

P.O.:

Fax: 215.864.0671

Sampled By: M. Brad Sparacate & Tim Deik

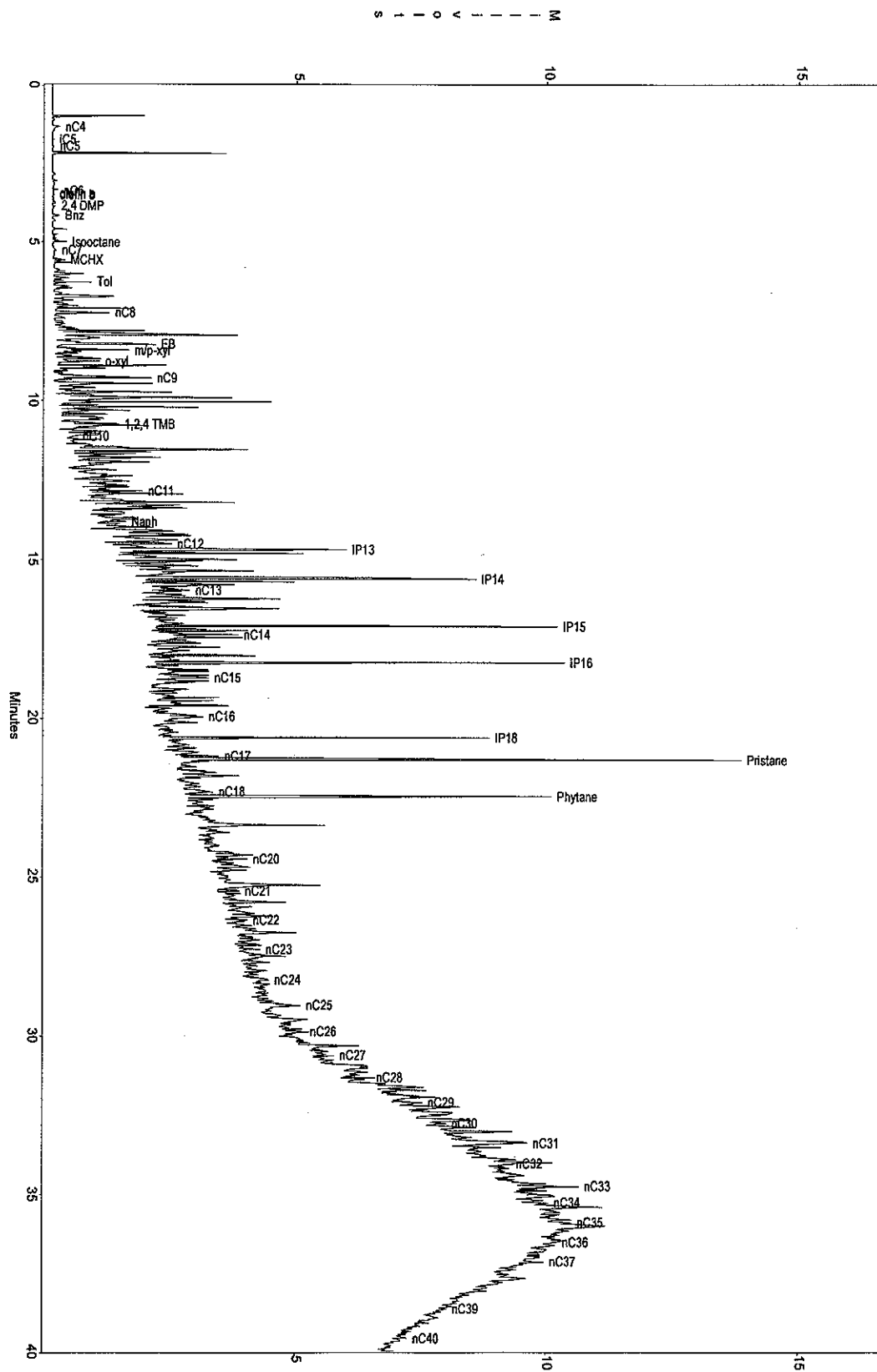
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Requested Turn-Around Time:

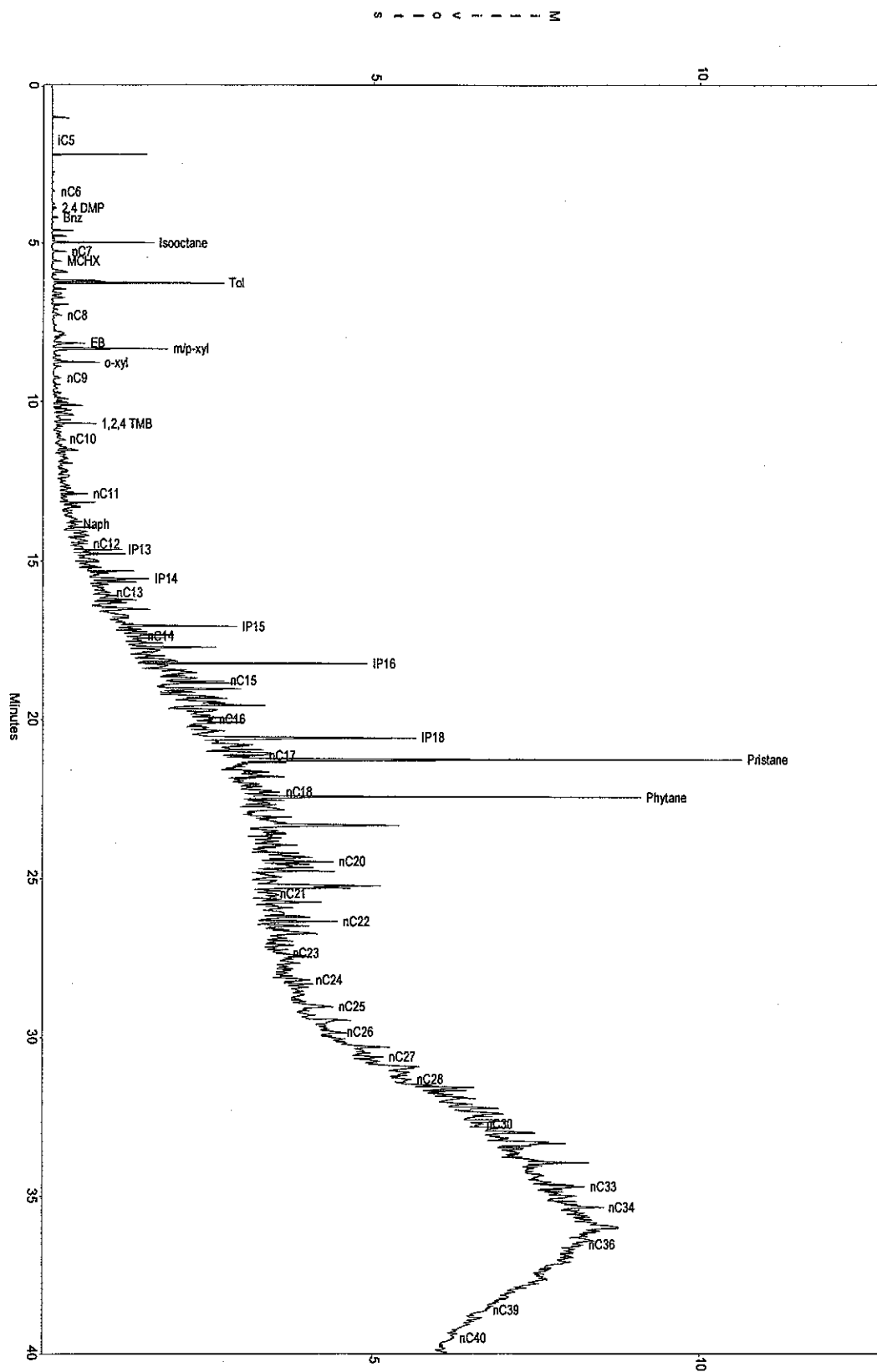
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					Total # Of Vials	GC Characterization	Specific Gravity		
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2	A-13				1 X		X X		
3	B-144				1 X		X X		
4	C-106				1 X		X X		
5	A-133				1 X		X X		
6	C-65				1 X		X X		
7	B-43				1 X		X X		
8	B-39				1 X		X X		
9	A-136				1 X		X X		
10	C-107				1 X		X X		

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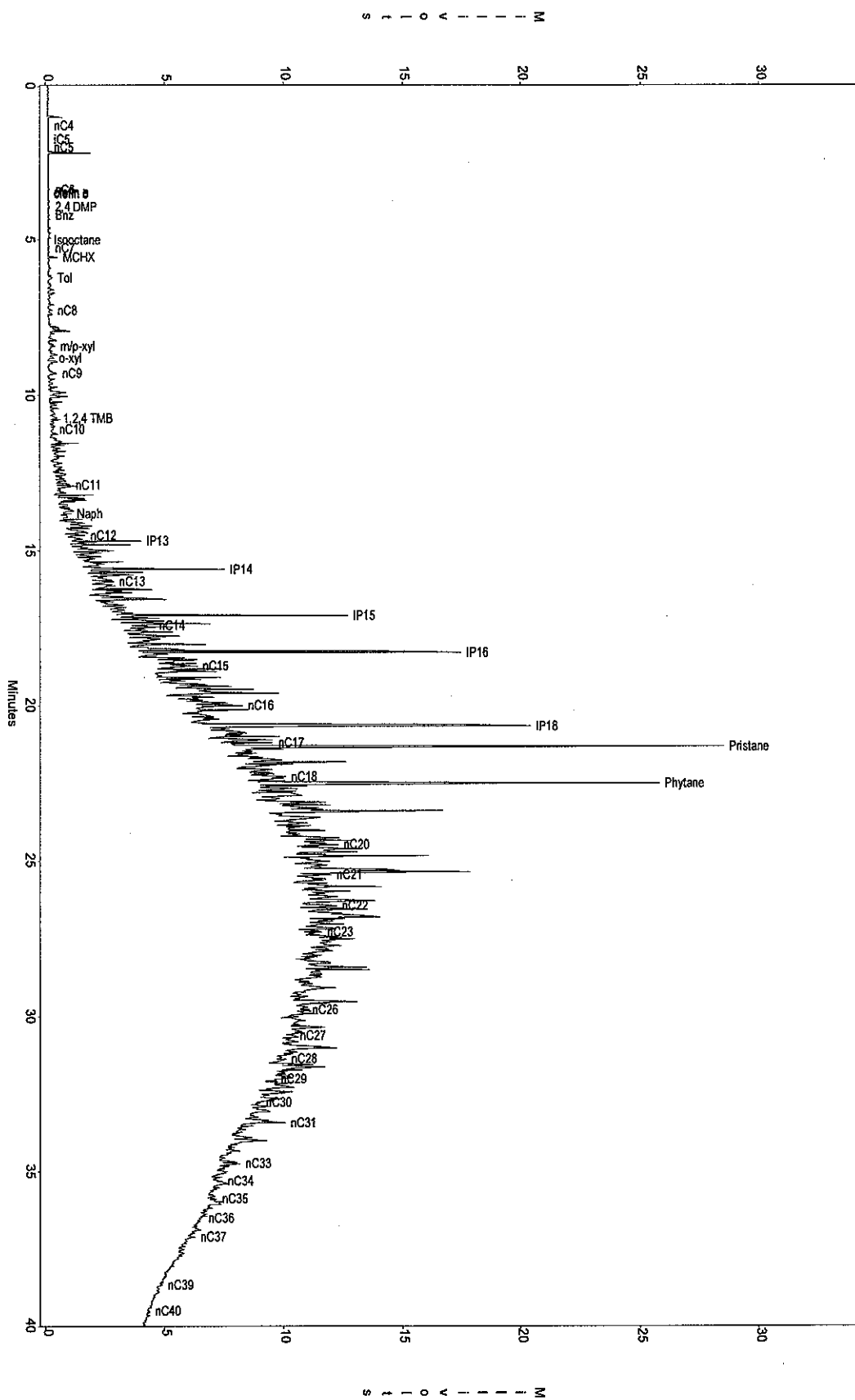


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Sun - Philadelphia Refinery COA
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Acquired : Mar 06, 2004 18:02:57

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Acquired : Mar 08, 2004 07:50:05

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