REMEDIAL INVESTIGATION REPORT

PRIMARY FACILITY IDENTIFICATION NUMBER 778376
AREA OF INTEREST 2

PHILADELPHIA ENERGY SOLUTIONS REFINING & MARKETING, LLC
PHILADELPHIA REFINING COMPLEX
PHILADELPHIA, PENNSYLVANIA

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July 20, 2017
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1.0 INTRODUCTION

This Remedial Investigation Report (RIR) has been prepared for Area of Interest (AOI) 2 at the Philadelphia Energy Solutions Refining and Marketing LLC (PES) Refining Complex (Complex). Sunoco Inc. (R&M) (Sunoco) transferred the Complex to PES on September 8, 2012. Sunoco retained the remediation liability prior to this date. The remediation liability was transferred to Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen) on December 30, 2013. The remediation program is currently being performed under a Buyer Seller Agreement signed by Sunoco, PES and the Pennsylvania Department of Environmental Protection (PADEP) in September 2012.

Site remediation at the Complex is ongoing as part of previously-established programs and the 2012 Buyer Seller Agreement as described below. The Complex has operated, and is planned to continue operating, as an oil refinery, marketing terminal and petrochemical complex.

Regulatory Overview

Sunoco and the PADEP entered into a Consent Order & Agreement (CO&A) in December 2003 with respect to the Complex. 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 Complex into 11 AOIs, and presented a prioritization of the AOIs based on specific risk factors. 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 all 11 AOIs in accordance with the 2003 CO&A. For each AOI that has been characterized, Sunoco prepared and submitted a corresponding Site Characterization Report (SCR) in accordance with the Revised Phase II Corrective Action Activities schedule that was included in the CCR.

In October 2006, Sunoco submitted a Notice of Intent to Remediate (NIR) to the PADEP for the Complex entering the Complex into the Act 2 program. This NIR was later updated and submitted again to the PADEP in November 2014. In November 2011, the Complex was formally entered into the PA One Cleanup Program between the United States Environmental Protection Agency (EPA) – Region III and PADEP. In November 2011, Sunoco submitted a revised *Work Plan for Sitewide Approach Under the One Cleanup Program* (Work Plan for

Sitewide Approach) to document the Sitewide remedial approach extending beyond the requirements of the 2003 CO&A.

Sunoco submitted a Site Characterization Work Plan (Work Plan) for AOI 2 on March 19, 2010, to the PADEP and EPA. This Work Plan summarized proposed activities to be completed to characterize AOI 2 in accordance with the objectives of the CCR. The Work Plan was implemented between April and July 2010 and the results were summarized in a SCR/RIR submitted to PADEP and EPA on September 29, 2010. The PADEP responded to the submittal of the SCR/RIR with a combined AOI comment letter dated April 11, 2011 that included specific comments regarding the AOI 2 SCR/RIR.

On April 7, 2016, PADEP, EPA, Evergreen and Langan Engineering & Environmental, Inc. (Langan) met to discuss proposed additional characterization activities within AOI 2. The PADEP forwarded meeting notes, dated April 12, 2016, summarizing discussion points from the meeting.

In accordance with the Work Plan for Sitewide Approach, Evergreen is submitting this RIR for AOI 2 to formerly satisfy the requirements of Act 2. This report describes site characterization work included in the 2010 AOI 2 SCR/RIR, as well as additional site characterization work completed in 2016 to supplement the previous work.

The supplemental work was completed to:

- Further characterize quality of surface (0-2 feet interval) and subsurface (2-15 feet interval) soil,
- Address regulated storage tank closures and release incidents for certain tanks in AOI 2,
- Delineate horizontal and vertical impacts in soils,
- Further characterize groundwater conditions in areas where constituents of concern (COCs) were previously detected above their respective screening criteria,
- Further characterize and delineate light non-aqueous phase liquid (LNAPL),
- Investigate the potential vapor intrusion to indoor air pathway,
- Further evaluate geology and hydrogeology, and
- Further evaluate contaminant fate and transport qualitatively.

The supplemental characterization work considered PADEP's and EPA's comments to previous work performed, addressed release incidents related to Evergreen's operational history not

addressed through the PADEP's Tank Program, and PADEP issues that were identified after the 2010 SCR/RIR was prepared.

In accordance with Act 2, the required public and municipal notices for this report have been prepared and issued. Appendix A includes a copy of the original Complex NIR, the updated Complex NIR, as well as the report notices and their proof of receipt/publication. Also included in Appendix A is correspondence from the PADEP with regard to AOI 2.

1.1 AOI 2 Area Description

The area historically known as the Philadelphia Refinery is divided into three areas known as the North Yard, South Yard and West Yard (encompassing AOI 1 through AOI 4 and AOI 10). AOI 2, also known as the Point Breeze Processing Area, is located on the east side of the Schuylkill River. AOI 2 is bordered by Passyunk Avenue to the north, AOI 1 to the east, Hartranft Street to the south and the Schuylkill River to the west (Figure 1 and Figure 2). AOI 2 encompasses approximately 111 acres and the majority of AOI 2 is covered by impervious surfaces. A sheet pile bulkhead, which is keyed into the Middle Clay layer, extends along a portion of the western boundary of the AOI, between the AOI and the Schuylkill River. Exposed shoreline exists in the northern portion of AOI 2 at a break in the sheet pile bulkhead. However, adjacent to the exposed shoreline there exists a stone and concrete vertical wall that lies between the river and River Road. The extent of the sheet pile bulkhead and the vertical wall is shown in Figure 2. The impervious surface coverage is displayed on the historic and current site features provided in Appendix B.

The Philadelphia Refinery (including AOI 2) was acquired from Atlantic Richfield Company (ARCO) by Atlantic Petroleum Corporation in September 1985. The facility was then purchased by Sunoco in 1988 and transferred by Sunoco to PES in 2012.

1.2 Complex and AOI 2 Operational History

The Complex has a long history of petroleum transportation, storage, and processing. The oldest portion of the Complex started petroleum-related activities in the 1860s when the Atlantic Refining Company established an oil distribution center. In the 1900s, crude oil processing began followed by full-scale gasoline production during World War II. In addition to refining crude oil, various chemicals, such as acids and ammonia, were also produced at the Complex for a time.

Historically the northern area of the AOI 2, which currently consists of office buildings and paved parking areas, was once used as process areas (Batch Stills) and processed material storage areas. The area north of the Short Pier was referred to as the Barrel Wharf. East of the Short Pier is currently an open area that was formerly an electric cogeneration facility. These area uses and other historic and current site features are provided in Appendix B. There are no Resource Conservation and Recovery Act (RCRA) solid waste management units (SWMUs) located within AOI 2.

1.3 AOI 2 Current Use

Currently, AOI 2 has the only active dock (Short Pier) for loading/offloading refined products in the Point Breeze Facility. The Short Pier is located along the western boundary of AOI 2. The bulkhead located along the Short Pier area is constructed of steel and wood extending to the river bottom, and concrete facing and wood decking extending a few feet above the Schuylkill River's low tide level.

AOI 2 is primarily comprised of crude distillation units, fluid catalytic cracking (FCC), reforming, distillate hydrotreating, low sulfur gasoline, and alkylation units, sulfur recovery, maintenance facilities, boiler feedwater and wastewater treatment plant, parking areas, office buildings, tanks and laboratories. The Pollock Street Sewer, a Philadelphia Water Department combined sanitary/stormwater sewer, traverses the central portion of AOI 2 from east to west (Figure 2). The Pollock Street Sewer enters the Complex along 26th Street (eastern boundary for AOI 1) and extends to the AOI 2 western boundary where it discharges to the Schuylkill River.

The existing monitoring well network in AOI 2 includes a total of 115 accessible monitoring points: 107 unconfined aquifer monitoring wells or inactive recovery wells, four lower aquifer monitoring wells, two piezometers, and two river gauges. Currently there are 15 active recovery wells, and three horizontal recovery wells (HW-1, HW-2, and HW-3) to prevent LNAPL from entering the Schuylkill River through migration along/through the Pollock Street Sewer. There are 22 unconfined monitoring wells and three recovery wells that are currently unable to be located or are damaged within AOI 2. Twenty-eight of the monitoring wells were installed in 2010 as part of the site characterization in AOI 2. Five monitoring wells were installed in 2011 along the sheet pile wall to investigate LNAPL occurrence and groundwater conditions. Fifteen monitoring wells were installed in 2012 and 2013 to further investigate LNAPL occurrence and groundwater conditions. Two monitoring wells were installed in 2016 to further investigate groundwater conditions and

function as point of compliance wells. The existing monitoring well network in AOI 2 is illustrated on Figure 3.

Groundwater gauging and sampling of select monitoring wells in AOI 2 occurs on an annual basis. This monitoring is completed by Stantec on behalf of Evergreen. Annual gauging activities and groundwater results are reported to the PADEP and EPA in semiannual Groundwater Remediation Status Reports. The reports also include the results of Evergreen's annual perimeter monitoring well sampling program.

1.4 Selection of Constituents of Concern and Screening Rationale

The COCs for soil and groundwater in AOI 2 are listed in Table 1 of this report. The COCs for the completed activities include all current constituents from the Pennsylvania Corrective Action Program CAP Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E of PADEP's Closure Requirements for Underground Storage Tank Systems, with the exception of the waste oil parameters since waste oil is only stored in small tanks within the facility maintenance garages. In May 2009, two additional COCs, 1,2,4-trimethylbenze (1,2,4-TMB) and 1,3,5-trimethylbenzene (1,3,5-TMB), were added to the list of COCs by Sunoco based on the PADEP's revisions to the petroleum short list of compounds and at the request of the PADEP. The COC listing for groundwater was also revised in 2012 to match the soil COC list. The additional compounds added to the groundwater COC list included anthracene, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, and benzo(b)fluoranthene.

The screening of the COCs was dependent upon the media of concern where all soil and groundwater screening levels were obtained from the PADEP Non-Residential medium specific concentrations (MSCs) for soils and groundwater last updated on August 27, 2016. These screening levels apply to all COCs except for surface soil lead values where a Complex-established site-specific standard (SSS) for lead has been approved by the PADEP.

Media of Concern

The media of concern for AOI 2 include soil and groundwater. The potential vapor intrusion into indoor air exposure pathway was evaluated by completing a site-specific indoor air evaluation. Surface water was evaluated as a receptor in relation to facility activities.

Surface Soil – 0 to 2 Feet Interval

Surface or shallow (0-2 feet) soil samples were collected at each soil boring/monitoring well location that represents a potentially complete direct contact exposure pathway to Complex workers. These surface soil results were screened against the PADEP non-residential soil direct contact MSCs and the Complex-established SSS for lead. The SSS for lead was submitted in the Human Health Risk Assessment (HHRA) by Langan in 2015 and was approved by the PADEP on May 6, 2015.

Subsurface Soil – 2 to 15 Feet Interval

Subsurface or deep (2-15 feet) soil samples were collected at several locations to either vertically characterize surface soil exceedances or to characterize subsurface soils where only a surface sample was previously collected. These subsurface soil results were screened against the PADEP non-residential soil direct contact MSCs.

Groundwater

Groundwater sample results were screened against the PADEP non-residential, used-aquifer (total dissolved solids (TDS<2,500) Statewide Health Standards (SHS) groundwater MSCs. This report includes a qualitative fate-and-transport analysis for groundwater. Evergreen is preparing a separate, quantitative site-wide fate-and-transport analysis for the Complex.

Surface Water

The Schuylkill River borders AOI 2 to the west. A sheet pile wall and a vertical wall exist along portions of the border with the river. Evergreen will be examining site-wide surface water compliance in future reporting.

Vapor Intrusion into Indoor Air

To evaluate the potential vapor intrusion into indoor air exposure pathway, indoor air sample results were screened against the current (January 2017) one-tenth of the current PADEP Non-Residential Indoor Air SHS Vapor Intrusion Screening Values. The results were also compared to the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs), the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs), and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). The EPA Industrial Regional Screening Levels (RSLs) were included in the comparison to identify COCs. Initially, the results were compared to the EPA Industrial

RSLs established at a target cancer risk of 1E-05 and hazard quotient of 0.1. If vapor intrusion is the only potentially complete exposure pathway, these RSL-based screening levels are the prevailing risk-based screening levels for assessment of the indoor air inhalation pathway (PADEP 2015). The results were also conservatively compared to the EPA industrial RSLs established at a target cancer risk of 1E-06 and hazard quotient of 0.1.

1.5 Overview of Investigative Framework and Remedial Approach for AOI 2

The current remediation program for the Complex is described in the 2003 CO&A between PADEP and Sunoco and the Work Plan for Sitewide Approach. Below is a general summary of the regulatory framework for the Complex:

- 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.
- In 2005, PADEP, EPA, and Sunoco 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.
- In October 2006, Sunoco submitted a NIR to the PADEP for the refinery entering the refinery into the Act 2 program, excluding the Belmont Terminal.
- In September 2007, Sunoco held a public involvement meeting in South Philadelphia, Pennsylvania.
- On March 19, 2010 Sunoco submitted a Work Plan for Site Characterization for AOI-2 in accordance with the Phase II Corrective Action Schedule.
- On September 29, 2010, Sunoco submitted the AOI 2 SCR/RIR to the PADEP for review.
- On April 11, 2011, PADEP provided their comments to the AOI 2 SCR/RIR. The comments agreed with SCR/RIR's recommendation to perform additional site characterization activities related to following: further evaluation and delineation of soil exceedances, provide a revised evaluation of the flux of dissolved contaminant from groundwater to the Schuylkill River, assess the vapor intrusion pathway for buildings and further evaluation of the Pollock Street sewer.

- On November 8, 2011, the EPA provided an acknowledgment letter to Sunoco formerly accepting the Sunoco Complex into the One Cleanup Program.
- On November 30, 2011, Sunoco submitted a revised *Work Plan for Sitewide Approach Under the One Cleanup Program* (Work Plan for Sitewide Approach), to document the Sitewide remedial approach extending beyond the requirements of the 2003 CO&A. PADEP and EPA reviewed and provided input to this report. Sunoco submitted a letter of commitment stating the Complex will be remediated according to the Work Plan for Sitewide Approach.
- In November 2014, Evergreen submitted an updated NIR to the PADEP for the Complex, excluding the Belmont Terminal.
- On February 24, 2015, Langan, on behalf of Evergreen, submitted an HHRA report for a SSS of lead in soil for the PES Refinery, the Sunoco Partners Marketing & Terminals, LP Belmont Terminal (Belmont Terminal) and the Sunoco Partners Marketing & Terminals, LP Marcus Hook Industrial Complex (MHIC) (Langan 2015). This HHRA was approved by the PADEP in a letter dated May 6, 2015.
- On April 7, 2016, a meeting was conducted to discuss Evergreen's Work Plans for AOI 2 between PADEP, EPA, Evergreen and Langan personnel. Mr. David Brown of the PADEP provided a summary of notes from the meeting through electronic mail on April 12, 2016, which are included in Appendix A.

2.0 SITE DESCRIPTION

2.1 Geology

The Complex occurs within the up-dip limits of the Atlantic Coastal Plain, generally within two miles of the "Fall Line," where crystalline bedrock of the Appalachian foothills intersects the ground surface (outcrops). The Atlantic Coastal Plain is a physiographic province that is defined as having relatively flat topography and as being underlain by a characteristic wedge of unconsolidated sediments that thicken in a southeasterly direction, away from sediment source areas in the Appalachian Mountains. These sediments were deposited atop a sloping bedrock surface in complex fluvial, estuarine, and marginal marine environments along the passive Atlantic margin. Overall, subsidence of the Piedmont land surface in conjunction with cyclical sea-level fluctuations have been the primary controlling mechanisms driving periods of deposition, non-deposition and erosion in the Atlantic Coastal Plain (Trapp and Meisler, 1992). In general, the resulting sedimentary record in the

vicinity of the Complex is complex, largely incomplete, and under-represented by only Cretaceous and Quaternary deposits, separated by a regional disconformity. A summary of those deposits within AOI 2 is presented below.

Since 2010, 23 unconfined aquifer monitoring wells ranging between approximately 25 to 38 feet below ground surface (bgs) and 57 soil borings were completed to further characterize geology in AOI 2. Each monitoring well and soil boring location was continually logged by a field geologist. Monitoring well construction details for the AOI 2 monitoring wells are provided in Table 2, and boring/monitoring well construction logs for the existing monitoring wells are provided in Appendix C of this report.

Soil stratigraphy from the numerous borings and monitoring wells completed in AOI 2 was used to characterize the geologic conditions beneath AOI 2. A 3-dimensional (3D) geologic model of AOI 2 was generated with C Tech Development Corporation's Earth Volumetric Studio (EVS) software using historic and recently completed borings and monitoring well logs. One cross-section trending north to south and one trending east to west were created from the 3D geologic model. The plan view key for the cross sections is provided as Figure 4, and the geologic cross sections are provided as Figures 5 and 6. The depiction of the geology beneath AOI 2, as shown in Figures 5 and 6, differs from that depicted in the 2010 SCR because of refinement of the geologic model based upon supplemental subsurface data obtained since 2010.

The following paragraphs describe the primary geologic units beneath AOI 2 beginning with the deepest units to the shallowest units.

BEDROCK

Wissahickon Formation – Bedrock beneath the Complex and AOI 2 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. The weathered zone of the Wissahickon Schist was encountered approximately 79 to 104 feet bgs at boring B-3 and monitoring well S-294D, respectively. The depth of bedrock shown on the cross-sections is interpolated using the natural neighbor 3D interpolation method within EVS software.

CRETACEOUS DEPOSITS

The Cretaceous deposits are configured in a southeasterly-thickening wedge, overlain by the much younger Quaternary deposits, and underlain by the Wissahickon Formation. The wedge is made up of a series of vertically alternating aquifers and confining units called the Potomac-Raritan-Magothy (PRM) aquifer system. Each of the geological units of the PRM progressively pinches-out to the northwest. The PRM aquifer system consists of six units:

- Upper Clay unit;
- Upper Sand unit;
- Middle Clay unit;
- Middle Sand unit;
- Lower Clay unit, and
- Lower Sand unit.

Lower Sand Unit of the PRM – Throughout the majority of the Complex, the Wissahickon Formation is overlain by the Lower Sand, which is the lowest member of the PRM aquifer system. As shown in Figures 5 and 6, the Lower Sand overlies bedrock in AOI 2.

The Lower Sand beneath AOI 2 is fine gravel and course sand that grades upward into medium-to-fine sands which contains layers of silts and clay. The Lower Sand is located approximately 48 to 70 feet bgs, and ranges in thickness between approximately 13.5 to 34 feet. The extent of the Lower Sand beneath AOI 2 is consistent with the extent illustrated by United States Geological Survey (USGS) (Greenman et. al., 1961) and with the generalized cross section prepared in 1992 by Dames and Moore presented in the CCR.

Lower Clay – Where present, the Lower Clay overlays the Lower Sand in AOI 2. The Lower Clay was only identified in four borings/monitoring wells within AOI 2 (S-302D, S-305D, B-4, and B-5), and is characterized as a low permeability reddish-brown, brown or gray clay, silty clay, sandy clay or sandy silt.

As shown in Figures 5 and 6, the Lower Clay is discontinuous, but where present, is thickest in the southeast (up to approximately 16 feet thick at monitoring well S-305D) and pinches out to the north and west. Where present, the Lower Clay functions as a confining unit to the Lower Sand.

Middle Sand - The Middle Sand is fairly extensive throughout AOI 2 except where removed along the Short Pier during installation of the bulkhead (absent in borings B-4, B-7 and B-8). The Middle Sand appears to pinch out in the southeast corner of AOI 2 (absent at monitoring well S-305D). Borings within AOI 2 indicate the Middle Sand is a white, gray, brown to red, fine to coarse sand, with varying amounts gravel and silt, and occasional silt and clay lenses. As shown in Figures 5 and 6, the Middle Sand ranges in thickness from approximately zero feet to 22 feet. Where the Lower Clay is absent, the Middle Sand directly overlies the Lower Sand for a combined thickness of up to approximately 49 feet (monitoring well S-294D).

Middle Clay – The Middle Clay appears to be laterally continuous throughout AOI 2, except where removed along the Short Pier during installation of the bulkhead (absent in borings B-4, B-7 and B-8). The Middle Clay was identified in several borings throughout the remainder of AOI 2 ranging in thickness between approximately 6 feet (recovery/monitoring wells RW-102, RW-103, S-302D, and S-305D) and 24 feet (monitoring well S-72D). Borings within AOI 2 indicate the Middle Clay is an orange to gray silty clay or clayey silt with varying amounts of fine sand, and occasional fine sand lenses. Where present the Middle Clay functions as a confining unit to the Middle Sand.

QUATERNARY DEPOSITS

Trenton Gravel – Throughout most of the Complex, the Trenton Gravel typically overlies the Cretaceous deposits with thicknesses up to approximately 30 feet. The Trenton Gravel is of Pleistocene Age (Ice Age; less than 2 million years) and is a heterogeneous unit comprised of a predominant brown to gray sand, gravel and minor amounts of clay (Owens and Minard, 1979). Boring log data indicate the Trenton Gravel is laterally continuous throughout AOI 2, except where removed along the Short Pier. Within AOI 2 the Trenton Gravel ranges in thickness from approximately five feet (monitoring wells S-347 and S-338) to 22 feet (monitoring well S-72D).

Recent (Holocene) Alluvium – Recent deposits of richly organic, dark gray mud, silt, and fine sand underlie the channels and tidal flats of the Delaware and Schuylkill Rivers. These sediments are most abundant in south Philadelphia near the confluence of the Delaware and Schuylkill Rivers, and can be up to 78 feet thick (Greenam et al., 1961). The Holocene Alluvium in AOI 2 generally consists of predominantly gray, muddy (silt and clay) deposits with occasional sandy, gravelly, and organic-rich lenses. As shown in Figures 5 and 6, the

Holocene Alluvium ranges in thickness from approximately zero feet to 25 feet (monitoring well S-151).

Anthropogenic Fill

The anthropogenic fill varies in composition across AOI 2 and includes silt, sand, gravels, cobbles, clay, cinder ash, brick, wood, and glass. As shown in Figures 5 and 6, anthropogenic fill covers the ground surface throughout AOI 2 and ranges in thickness between approximately 1.5 feet (monitoring well S-64) to over 50 feet along the Short Pier. As implied earlier, the thick fill materials near the Short Pier are representative of backfilling activities following the installation of the bulkhead along the Schuylkill River.

2.2 Hydrogeology

The hydrogeologic frame work is defined by grouping geologic units that are laterally extensive and have similar hydrogeologic properties. The generalized hydrostratigraphy of the Complex consists of seven layers (Schreffler, 2001, Sloto 1988):

- Layer 1: combined Anthropogenic Fill, Holocene Alluvium and Trenton Gravel
- Layer 2: Upper Clay unit of the PRM (not present in AOI 2)
- Layer 3: Upper Sand unit of the PRM (not present in AOI 2)
- Layer 4: Middle Clay unit of the PRM
- Layer 5: Middle Sand unit of the PRM
- Layer 6: Lower Clay unit of the PRM, and
- Layer 7: Lower Sand unit of the PRM.

Within AOI 2, the hydrogeologic framework consists of three layers. The first layer is the combined anthropogenic fill, Holocene Alluvium, and Trenton Gravel (which is referred to as the unconfined aquifer and makes up the water table aquifer). The second layer is the Middle Clay confining unit (referred to as the clay aquitard) which lies beneath the unconfined aquifer. Beneath the clay aquitard is the Middle Sand, Lower Clay, and Lower Sand. The Lower Clay is discontinuous throughout AOI 2, and the Middle Sand and Lower Sand are hydraulically connected for a significant portion throughout the AOI. Therefore, the combined Middle Sand, Lower Clay, and Lower Sand comprise the lower aquifer (layer 3). The lower aquifer lies above the Wissahickon Schist bedrock.

2.2.1 Aquifer and Aquitard Properties

In August 2016, three Shelby Tube soil samples were collected within AOI 2 to determine aquifer and aquitard properties (Appendix C). One soil sample was collected from the Trenton Gravel (monitoring well S-423 at approximately 21.2 to 22 feet bgs) and two soil samples were collected from the Middle Clay (monitoring well S-422 at approximately 25 to 25.4 feet bgs and monitoring well S-423 at approximately 33.4 to 33.8 feet bgs).

Grain size analysis (sieve analysis and hydrometer test) was performed on the sample of the Trenton Gravel, described as an orange brown well-graded sand silt and gravel (Unified Soil Classification System group name SW-SM). The grain size analysis of the Trenton Gravel determined the sample is comprised of 66.2 percent sand, 25.7 percent gravel, and 8.1 percent silt/clay. Based on the grain size analysis, it is assumed the effective porosity of the Trenton Gravel sample is similar to the value reported by Morris and Johnson (1967) of 0.16 for a glacial till predominantly comprised of sand. In the calibrated groundwater flow model created by the USGS (Schreffler, 2001) an effective porosity of 0.3 was used for the unconfined aquifer.

Hydraulic conductivity tests in accordance with the American Society of Testing and Materials (ASTM) method D5084 were performed on both of the soil samples from the Middle Clay. The laboratory derived hydraulic conductivity values for the Middle Clay at monitoring wells S-422 and S-423 were 5.78×10^{-4} feet per day (ft/day) or 2.04×10^{-7} centimeters per second (cm/sec) and 9.89×10^{-4} ft/day or 3.49×10^{-8} cm/sec, respectively. These hydraulic values are typical of the range of values reported for clay (Domenico and Schwartz, 1990). In the calibrated groundwater flow model created by the USGS (Schreffler, 2001) a similar hydraulic conductivity value of 3.28×10^{-5} ft/day was used for the Middle Clay in the area of AOI 2 (Layer 4, Zone 1).

2.2.2 Unconfined Aquifer Groundwater Occurrence and Flow

As defined above, the unconfined aquifer is the combined anthropogenic fill/Holocene Alluvium/Trenton Gravel which makes up the water table aquifer. Groundwater gauging data collected by Aquaterra Technologies, Inc. (Aquaterra) in August and October of

2016 were used to generate groundwater flow figures for the unconfined aquifer (Figure 7 and Figure 8). Langan utilized groundwater elevation data obtained from Philadelphia Gas Works (PGW) for the October 2016 groundwater flow figures. The groundwater elevation data from these gauging events is provided in Table 3a and 3b. Historical groundwater gauging data information is provided in Appendix C. Monitoring well construction details and hydrostratigaphic unit classification for all monitoring wells in AOI 2 are provided in Table 2. All available logs for wells installed in AOI 2 are provided Appendix C of this report. Groundwater contours in Figures 7 and 8 are truncated at the AOI 2 boundary due to separate gauging events in surrounding AOI's, therefore; attached in Appendix C is Figure 4 "Water-Table Groundwater Elevation Map May 2016" from the Groundwater Remediation Status Report First Half 2016 prepared by Stantec and dated July 29, 2016. Based on the groundwater elevations as shown in Figure 7 and Figure 8, the following observations can be made:

- Recharge to the unconfined aquifer within AOI 2 appears to occur in the north of the AOI at the potentiometric high point centered on monitoring well S-298. This area corresponds to one of the few unpaved areas within AOI 2, and is located topographically down slope from a large asphalt-paved parking lot. It is assumed during precipitation events surface runoff preferentially recharges the unconfined aquifer in this unpaved area.
- From this potentiometric high point groundwater flows radially outward, with the majority of flow within the AOI towards the south under a typical hydraulic gradient of 0.006 feet/feet (ft/ft).
- Several piezometers and monitoring wells (PZ-101, S-174, S-178, S-304, and S-316) were selectively omitted during the contouring of the groundwater elevations from August and October 2016. These wells are located near the Pollock Street sewer and exhibited anomalously high hydraulic head elevations in comparison to surrounding wells. The higher head elevations in these wells may be attributed to localized leaking of the sewer and are not representative of the overall potentiometric surface of the unconfined aquifer within AOI 2.
- A component of groundwater flow in AOI 2 is towards the Pollock Street West End remediation system which consists of a total of 10 4-inch diameter recovery wells on the east side of River Road, and 20 6-inch

diameter recovery wells on the west side of River Road. A hydraulic capture zone has developed around this active remedial system and was observed during both the August and October 2016 gauging events.

- Observations made from the August and October 2016 data are consistent with flow observations made from previous gauging events.

2.2.3 Lower Aquifer Groundwater Occurrence and Flow

As referenced above, within AOI 2 the Middle Sand, Lower Clay, and the Lower Sand comprise the lower aquifer, which is a confined aquifer. This lower aquifer is separated from the unconfined aquifer by the Middle Clay confining unit. Head potentials observed during the October 2016 gauging event in unconfined and lower aquifer monitoring well pairs confirm the two aquifers are hydraulically separated. The head differences measured in August 2016 between the two aquifers ranged between 0.79 feet (monitoring wells S-305/S-305D) to 3.23 feet (monitoring wells S-302/S-302D). The observed head differences correspond to downward vertical hydraulic gradients ranging between 0.015 ft/ft to 0.051 ft/ft.

Interpreted groundwater flow patterns and hydraulic gradients in the lower aquifer within AOI 2 are depicted on groundwater elevation maps (Figures 9 and 10) created using groundwater gauging data collected by Aquaterra in August and October 2016. Groundwater flow in the lower aquifer is generally consistent for both gauging events with flow towards the south under gradients ranging between 0.0005 ft/ft and 0.001 ft/ft during the August and October 2016 gauging events, respectively. Groundwater contours in Figures 7 and 8 are truncated at the AOI 2 boundary due to separate gauging events in surrounding AOI's, therefore; attached in Appendix C is Figure 5 "Lower Aquifer Groundwater Elevation Map May 2016" from the Groundwater Remediation Status Report First Half 2016 prepared by Stantec and dated July 29, 2016.

2.2.4

2.3 Surface Water

No surface water features are located in AOI 2. The nearest surface water body to AOI 2 is the Schuylkill River which comprises the western boundary of AOI 2. A segmented sheet pile wall that is keyed into the Middle Clay along portions of the Schuylkill River as shown in

Figures 2. This sheet pile wall is part of the Short Pier bulkhead and is also located along/through the Pollock Street Sewer. Exposed shoreline exists in the northern portion of AOI 2 at a break in the sheet pile bulkhead. However, adjacent to the exposed shoreline there is an existing stone and concrete vertical wall that lies between the river and River Road (see Figure 2). Unconfined groundwater interaction with the Schuylkill River tends to be limited in areas where the sheet pile wall and vertical wall exist. Evergreen will be examining site-wide surface water compliance in future reporting.

3.0 SITE CHARACTERIZATION ACTIVITIES

Initial site characterization activities in AOI 2 were performed between April and July 2010 and the results were summarized in a SCR/RIR submitted to PADEP and EPA on September 29, 2010. Based on the findings of the SCR/RIR, additional site characterization activities were completed between 2010 and 2016. Site characterization activities were completed by Aquaterra and Langan in coordination with Evergreen. These activities were executed in accordance with the Evergreen Quality Assurance/Quality Control (QA/QC) Plan and Field Procedures Manual provided in Appendix D. The following sections summarize the supplemental site characterization activities completed in AOI 2.

3.1 Surface Soil Borings and Sampling

In 2010, a total of 21 surface soil samples were collected for analysis of site COCs where all of the soil samples were collected during the advancement of monitoring wells within AOI 2.

After the submission of the SCR/RIR in September 2010, additional surface soil characterization work was performed in AOI 2. In March and April 2013, a total of 29 surface soil samples were collected for analysis of site COCs for delineation purposes. Thirteen of the soil samples were collected during the advancement of monitoring wells within AOI 2, six of the soil samples were collected for support of tank closure activities and the remaining 10 soil samples were to further characterize soils in AOI 2.

In July 2016, an additional soil sampling event was conducted and included the collection of 26 surface soil samples. Three of the soil samples were collected for delineation of an exceedance of the SSS for lead, two of the soil samples were collected during the advancement of monitoring wells within AOI 2, 12 of the soil samples were collected to

support tank closures, and nine of the soil samples were collected to support previous tank open incidents.

The locations of all soil borings are shown on Figure 3 and the boring logs are provided in Appendix C. All soil samples were collected using stainless steel hand augers. Soil borings were advanced to a depth of two feet bgs at each location in accordance with the Work Plan documents and then surface soil samples were collected and the Evergreen QA/QC Plan and Field Procedures Manual.

Surface soil samples from 2010 were submitted to Lancaster Laboratories, Inc. (LLI) of Lancaster, Pennsylvania for analysis of site COCs. The soil samples collected from 2013 were submitted to Accutest Laboratories (Accutest), Inc. of Dayton, NJ. The soil samples collected in 2016 were submitted to Pace Analytical Services (Pace) of Pittsburgh, Pennsylvania, for analysis of site COCs. A summary of the soil analytical results screened against the PADEP non-residential surface soil direct contact MSCs and SSS for lead is provided in Table 4 and the results are discussed in Section 5. A summary of the PADEP non-residential surface soil direct contact MSC and SSS for lead exceedances are illustrated in Figure 11. The laboratory analytical reports are provided as Appendix E.

3.2 Subsurface Soil Borings and Sampling

Between March and April 2013, 48 subsurface soil samples were collected between depths of two feet bgs and the soil/water interface to characterize subsurface soil. These samples were collected during the advancement of monitoring well borings or soil borings to vertically delineate previously-identified COC or lead exceedances in surface soil above the PADEP non-residential soil MSC (prior to the approval of the SSS for lead). Twenty-one of the soil samples were collected during the advancement of monitoring wells within AOI 2 and 27 of the soil samples were collected to further characterize soils in AOI 2.

In July 2016, a total of 15 subsurface soil samples were collected during the advancement of monitoring wells, in support of tank closures, and as part of existing tank open incidents. Two of the soil samples were collected during the advancement of monitoring wells within AOI 2, six were collected in support of tank closures, and the remaining seven of the soil samples were collected due to previous tank open incidents.

The locations of all soil borings are shown on Figure 3 and the boring logs are provided in Appendix C. All soil samples were collected utilizing a stainless steel hand auger. Soil

borings were advanced to between 2 feet below grade and the soil water interface in accordance with the Evergreen QA/QC Plan and Field Procedures Manual.

The soil samples collected from 2013 were submitted to Accutest and the samples collected from 2016 were submitted to Pace Analytical. A summary of the soil analytical results screened against the PADEP non-residential subsurface soil direct contact MSCs is provided as Table 5 and the results are discussed in Section 5.0. A summary of the PADEP non-residential subsurface soil direct contact MSC exceedances are illustrated in Figure 11. The laboratory analytical reports are provided as Appendix E.

3.3 Storage Tank Closure and Release Incident Investigation Soil Borings

Numerous ASTs were removed from AOI 2 prior to August 5, 1989. Conditions in tank areas where tanks were removed prior to August 5, 1989 are being characterized under the PA One Cleanup Program investigation and are discussed in this AOI 2 RIR.

Tanks in AOI 2 that have been closed or have exhibited a documented release after August 5, 1989 are being addressed under the Tank Program in a Site Characterization Report/Remedial Action Completion Report (SCR/RACR) that will be submitted separately, but in conjunction with this RIR. These regulated storage tank closure or release events are summarized in the following table.

Summary of Regulated Storage Tanks in AOI 2
With Documented Releases or Closed-In-Place Since August 5, 1989
PES Refining Complex, Philadelphia, PA

Tank No.	Closure Type	Documented Release (Yes or No)	Additional Comments
PB 140	Closed in Place	Yes	2005 SCR Issued 2010 Closure Report Issued
PB 141	Closed in Place	No	2010 Closure Report Issued
PB 144	Existing	Yes	No closure report issued. Surface and subsurface soil characterization performed.
PB 145	Existing	Yes	No closure report issued. Surface and subsurface soil characterization performed.
Tank No.	**Closure Type**	**Documented Release (Yes or No)**	**Additional Comments**
PB 150	Closed in Place	Yes	2006 Closure Report Issued. Surface and

			subsurface soil characterization performed.
PB-152	Existing	No – associated with release from PB 150.	No closure report issued. Surface and subsurface soil characterization performed.
PB 201	Closed in Place	No	2008 Closure Report Issued
PB 237	Closed in Place	No	2010 Closure Report Issued
PB 279	Closed in Place	No	2010 Closure Report Issued
PB 298	Closed in Place	No	2010 Closure Report Issued
PB 3V-7	Closed in Place	No	2008 Closure Report Issued

Prior to field investigations for the above tanks were conducted, the PADEP informed Evergreen of two potential release incidents that the PADEP had on file. The first incident was a phone report on June 3, 2007, of a furnace oil release (approximately 500 gallons) from a faulty pipe fitting at the HDS Unit. Evergreen investigated the potential release with PES personnel and identified that the area surrounding the HDS unit is either asphalt or concrete at the surface with no exposed soil in the area. Evergreen concluded that this release was reported to the PADEP, as required, but no impacts to soil or groundwater occurred.

The second release that PADEP inquired about was related to a transfer line between tanks PB-150 and PB-152 which Evergreen concluded should be investigated. The open release reporting letter identified that the vacuum gas oil release was contained in the adjacent sewer system (Guard Separator), recovered by vacuum truck, and returned to the storage tank. Evergreen discussed and investigated the transfer line with PES personnel to discover the transfer line runs west from PB-150, then south towards PB-152, and eventually turns eastward to PB-152. Previous soil samples from advancement of monitoring wells S-361 and S-362 were utilized to investigate soil conditions in this area, in addition to BH-16-23 and BH-16-24. This open release incident is included in the above table.

Based on the summary table above, eight tanks in AOI 2 have been closed-in-place. Closure and corrective action documentation for these tanks (PB 140, PB 141, PB 150, PB 201, PB 237, PB 279, PB 298 and PB 3V-7), consistent with requirements of 25 Pa Code §245.561, was prepared by Stantec (formerly SECOR International Incorporated) and submitted to the PADEP. Corrective action documentation was submitted or protocols were followed for the open release incidents associated with Tanks PB 140,

PB 144, PB 145, PB 150, and PB-152. Corrective action documentation for the open release incident at PB 140 was previously submitted to the PADEP by SECOR. Corrective action documentation was not submitted for the open release incidents associated with tanks PB 144, PB 145, PB 150, and PB 152. The reported release documentation is provided under separate cover in the AOI 2 SCR/RACR.

Soil borings were advanced at these specified tank or tank dike areas and samples were collected to assist with the general site characterization activities described in this RIR. Soil analytical results from these borings are presented in this RIR for informational purposes only and will be used in a separately prepared tank SCR/RACR for closed-in-place tanks and open releases associated with tanks PB 140, PB 144, PB 145, PB 150, and PB 152. The SCR/RACR will be submitted under separate cover to the PADEP in accordance with 25 Pa Code §245 regulations. Ten supplemental borings were completed in 2013 for tanks PB 140, PB 141, PB 201, PB 279, and PB 298 with the collection of surface and/or subsurface soil samples. Six supplemental borings were completed in 2016 for tanks PB 141 and PB 279 with the collection of surface and/or subsurface soil samples. Six supplemental borings were completed in 2016 for tank PB 140 with the collection of surface and/or subsurface soil samples to support tank closure and the PB 140 open release incident. Seven supplemental borings were completed in 2016 for tanks PB 144 and PB 145 with the collection of surface and/or subsurface soil samples to support open release incidents. One of the supplemental borings was a shared soil boring between tanks PB 144 and PB 145. Two supplemental borings were completed in 2016 for tanks PB 150 and PB 152 with the collection of surface soil samples to support the open release incident. No supplemental soil borings were completed for tanks PB 237 and PB 3V-7.

Tank PB 140

The overall soil characterization activities for PB 140 included advancement of 15 soil borings in the former tank area and collection of 15 surface and three subsurface soil samples for laboratory analysis.

The 2005 soil characterization activities (completed by others) for PB 140 where to investigate an open release incident and included advancement of five soil borings (PB-14-1 through PB-140-5) in the release area within the former tank area and the collection of five surface soil samples for laboratory analysis for site COCs.

The 2010 soil characterization activities (completed by others) for PB 140 included the advancement of four soil borings (PB-140NE, PB-140NW, PB-140SE, and PB-140SW) in the former tank area and the collection of four surface soil samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB-140.

The 2016 supplemental soil characterization activities for PB-140 consisted of the advancement of six soil borings (BH-16-04 and BH-16-09) within the tank area where six surface and three subsurface soil samples were obtained for laboratory analysis of site COCs or lead only.

Tank PB 141

The 2010 soil characterization activities (completed by others) for PB-141 included advancement of four soil borings (PB-141NE, PB-141NW, PB-141SE, and PB-141SW) in the former tank area and the collection of four surface soil samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB-141.

The 2016 supplemental soil characterization activities for PB-141 consisted of the advancement of three soil borings (BH-16-10 through BH-16-12) within the tank area where three surface and three subsurface soil samples were obtained for laboratory analysis of site COCs or benzo(a)pyrene only.

Tank PB 144

The 2016 supplemental soil characterization activities for PB-144 consisted of the advancement of four soil borings (BH-16-16 through BH-16-19) in the tank area where four surface and four subsurface soil samples were obtained for laboratory analysis of site COCs. The 2016 soil borings were initiated to investigate the PB-144 open release incident. Soil boring BH-16-19 was a shared soil boring with the PB-145 open release incident investigation.

Tank PB 145

The 2016 supplemental soil characterization activities for PB-145 consisted of the advancement of four soil borings (BH-16-19 through BH-16-22) in the tank area where four surface and four subsurface soil samples were obtained for laboratory analysis of site COCs. The 2016 soil borings were initiated to investigate the PB-145 open release

incident. Soil boring BH-16-19 is a shared soil boring with the PB-144 open release incident investigation.

Tank PB 150

The soil characterization activities (completed by others) for PB-150 included advancement of 11 soil borings in 2006 in the former tank area and the collection of four surface and seven subsurface soil samples for laboratory analysis of site COCs. The 2006 soil characterization activities were conducted to support closure-in-place of PB-150.

The 2016 supplemental soil characterization activities for PB-150 consisted of the advancement of two soil borings (BH-16-23 and BH-16-24) outside of the tank area where two surface soil samples were obtained for laboratory analysis of site COCs. The 2016 soil borings were initiated to investigate the PB-150 open release incident.

Tank PB 152

The 2016 supplemental soil characterization activities for PB-152 consisted of the advancement of two soil borings (BH-16-23 and BH-16-24) outside of the tank area where two surface soil samples were obtained for laboratory analysis of site COCs. The 2016 soil borings were initiated to investigate the PB 150 open release incident.

Tank PB 201

The soil characterization activities (completed by others) for PB-201 included advancement of 13 soil borings in 2010 in the former tank area and the collection of four surface and nine subsurface soil samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB 201.

The 2013 supplemental soil characterization activities for PB-201 consisted of the advancement of one soil boring (BH-13-52) in the tank area where one surface and one subsurface soil sample were obtained for laboratory analysis of site COCs.

Tank PB 237

The 2010 soil characterization activities completed by others, for PB-237 included advancement of four soil borings in the former tank area and the collection of four surface samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB-237.

Tank PB 279

The soil characterization activities completed by others, for PB-279 included advancement of four soil borings in 2010 in the former tank area and the collection of four surface samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB-279.

The 2016 supplemental soil characterization activities for PB-279 consisted of the advancement of three soil borings (BH-16-13 through BH-16-15) in the tank area where surface soil samples were obtained for laboratory analysis of lead.

Tank PB 298

The 2010 soil characterization activities completed by others, for PB-298 included advancement of four soil borings in the former tank area and the collection of four surface samples for laboratory analysis of site COCs. The 2010 soil characterization activities were conducted to support closure-in-place of PB-298.

Tank PB 3V-7

The soil characterization activities (completed by others) for PB-3V-7 included advancement of five soil borings in 2006 in the former tank area and the collection of one surface and four subsurface soil samples for laboratory analysis of potassium and Relative pH. The 2006 soil characterization activities were conducted to support closure-in-place of PB-3V-7.

Designated boring locations for these incidents are displayed on Figure 3 and the boring logs are provided in Appendix C. Utilizing a stainless steel hand auger, soil borings were advanced to a minimum depth between 2 feet bgs and the soil water interface at each location in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. The soil samples were submitted to either Accutest or Pace for analysis. A summary of the surface and subsurface soil analytical results are provided in Table 4 and Table 5, respectively, and the results are discussed in Section 5.0. The laboratory analytical reports are provided as Appendix E.

3.4 Installation of Groundwater Monitoring Wells

As part of the 2010 AOI 2 characterization activities, groundwater monitoring well installation activities were performed between April and July 2010 by Parrat Wolff, Inc.

(PWI) of East Syracuse, New York, Total Quality Drilling (TQD) of Mullica Hill, NJ and East Coast Drilling (ECDI) of Moorestown, NJ under direct supervision of Aquaterra and Langan, and in coordination with Sunoco. Twenty-six unconfined aquifer and three lower aquifer monitoring wells were installed to characterize groundwater in AOI 5. One Lower Sand groundwater monitoring well (S-72D) had existed in AOI 2 prior to the characterization activities.

Additionally, between March and April of 2013, 10 unconfined aquifer monitoring wells within the Trenton Gravel were installed by TQD under the direct supervision of Langan and Aquaterra in coordination with Evergreen. In 2016, two groundwater monitoring wells were installed to further characterize site groundwater within AOI 2 and act as potential point of compliance wells. Evergreen attempted to advance monitoring wells in the northwest portion of AOI2, but as in prior attempts, access restrictions and utilities did not allow for the monitoring wells to be installed in a safe manner. However, Evergreen was able to obtain groundwater elevation data from nearby PGW monitoring wells that were utilized to discern groundwater flow in the northwest corner of AOI 2. The locations of all monitoring wells are shown on Figure 3.

Three Shelby Tube samples were obtained during the well installation of monitoring wells S-422 and S-423 in August 2016. The Shelby Tubes were collected to obtain soil parameters including grain size, hydraulic conductivity, and fraction of organic carbon. The laboratory results for these Shelby Tube samples are provided in Appendix C.

Prior to the installation of monitoring wells, each well location was cleared for subsurface utilities to 8 feet bgs with a back hoe. During clearing of each location, soil samples were collected directly from the backhoe bucket. Samples were then screened with a photoionization detector (PID) and were collected in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. Unconfined aquifer monitoring wells advanced by the drilling subcontractors utilized split spoon samplers to record lithology. Monitoring wells were constructed with a stickup steel protective casing. Following construction, the monitoring wells were developed in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. Well construction details are provided in Table 2. Boring logs depicting monitoring well construction details and soil descriptions are provided as Appendix C.

3.5 Groundwater Monitoring

Monitoring well gauging activities to collect liquid levels from unconfined and lower aquifer

monitoring wells within AOI 2 were performed in July 2010 by Stantec. In June 2013, August 2016, and October 2016, Aquaterra performed monitoring well gauging activities to collect liquid levels from all accessible monitoring points within AOI 2. All well gauging readings from August 2016 and October 2016 are summarized in Table 3a and Table 3b.

The groundwater monitoring data from Table 3a and Table 3b were used to generate unconfined groundwater elevation contours provided as Figure 7 and Figure 8, respectively. Unconfined groundwater flow in both August 2016 and October 2016 appears to be from a potentiometric high point radially outward, with the majority of flow within the AOI towards the south.

The groundwater monitoring data from Table 3a and Table 3b were also used to generate lower aquifer groundwater elevation contours provided as Figure 9 and Figure 10, respectively. Lower aquifer groundwater flow in both August 2016 and October 2016 appears to be generally consistent for both gauging events with flow towards the south.

A recent online well radius search was conducted for the entire site using the Pennsylvania Groundwater Information System (PAGWIS) in November 2016 in order to evaluate potential potable well receptors. The PaGWIS search queried all of the database wells within a 2 mile radius from the center of the PES Refining Complex. Then a one mile distance was utilized to capture the database wells from the PES Refining Complex boundary. The results of this search are included in Appendix C.

3.6 Groundwater Sampling

As part of the 2010 site characterization activities, Aquaterra performed a complete round of groundwater sampling from all accessible monitoring wells in AOI 2 in July 2010. Additional sampling events of select wells were conducted by Stantec as part of annual sampling events and Aquaterra sampled 52 wells in June 2013 to evaluate groundwater conditions. In August and October of 2016, Aquaterra performed two more comprehensive rounds of groundwater sampling in AOI 2. During all of the above referenced groundwater sampling events, there were some monitoring wells that were not sampled due to either presence of LNAPL, pumps in the wells, absence of water, and/or inaccessibility. All groundwater sampling activities were completed in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. The monitoring well sampling summary data sheets are provided as

Appendix C. All groundwater analytical results are provided in Table 6 and displayed on Figures 12a and 12b. The laboratory analytical reports are included as Appendix E.

3.6.1 Sampling Beneath LNAPL

During the AOI 2 comprehensive August and October 2016 groundwater sampling events, groundwater was obtained from the water column beneath LNAPL in six monitoring wells (S-61, S-141, S-174, S-298, S-355, and S-357).

The below-LNAPL groundwater sampling was conducted to obtain dissolved COC data in groundwater in wells with LNAPL and to use this data for the future fate and transport site-wide quantitative modeling. All below-LNAPL sampling activities were completed in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. The monitoring well sampling summary data sheets are provided in Appendix C. The results of the groundwater sampling beneath LNAPL are provided in Table 6 and displayed on Figure 12a. The laboratory analytical reports are included in Appendix E.

3.7 Indoor and Ambient Air Sampling

Stantec collected 14 indoor air samples (AOI 2 Sample 29 through AOI 2 Sample 42) and one outdoor ambient air sample (AOI 2 Sample 43) in the area of four AOI 2 buildings in October 2012 as part of the Sunoco, Inc. (R&M) Philadelphia Refinery Remediation Program indoor air sampling report (Stantec, 2013). A copy of the Stantec 2013 indoor air sampling report is provided in Appendix F. The indoor air samples were collected from the Point Breeze Main Office Building, the Point Breeze Lab, the Point Breeze Refinery Hall, and the Point Breeze Maintenance Shop. These buildings are shown in Figure 13. The one ambient air sample was collected from outside the Point Breeze Gate Area. The indoor air and outdoor ambient air samples were collected as follows:

- Eight indoor air samples from within the Point Breeze Main Office Building, one sample from the safety office, one sample from the medical area, three samples from the 1st floor and three samples from the 2nd floor;
- Two indoor air samples from the Point Breeze Lab, one sample from the west lab and one sample from the 2nd floor office;

- Two indoor air samples from the Point Breeze Refinery Hall, one sample from the 2nd floor conference room and one sample from the 2nd floor east wing;
- Two indoor air samples from the Point Breeze Maintenance Shop, one sample from the break room and one sample from the office; and
- One outdoor ambient air sample was collected outside the Point Breeze gate area, near the four buildings specified above.

The samples were submitted to Columbia Analytical Services of Simi Valley, California (Columbia) for analysis of VOCs by EPA TO-15 method for Evergreen's short list of VOCs. The results of the samples are provided in Table 7 and are discussed in Section 5. The available indoor air field sampling sheets are included in Appendix C. The laboratory analytical report for the samples is provided in Appendix E.

GHD conducted a second round of indoor air sampling in March 2016 where GHD collected six indoor air samples (AOI2-AI-16-001 through AOI2-AI-16-006) and one ambient air sample (AOI2-AA-16-001) within AOI 2. The locations were chosen to supplement the sampling performed by Stantec in 2012, by sampling occupied buildings that had not been sampled in 2012. The indoor air samples were collected as follows:

- One sample from the Short Pier (Building 11);
- One sample from the old Bio/BFW Control Room (Building 5920);
- One sample from the new Bio/BFW Control Room (Building 6228);
- One sample from the 864 Unit Block House (Building 2435);
- One sample from the former area Block House (Building 2520); and
- One sample from the 869/870 Unit Control Room (Building 6624).

An ambient air sample was collected from the Short Pier area. The building locations and the ambient air sample location are shown in Figure 13 and the results are displayed on Table 7 and are discussed in Section 5. Referencing the figure in Appendix B from this RIR and the figure in the 2010 SCR/RIR Appendix A (Appendix J from this RIR), the following determinations were made for not conducting indoor air sampling within the following buildings:

- Building 2201 (Adjacent to the Point Breeze Lab) – under positive pressure;
- Main Office Building – under positive pressure;
- Building 2449 (Maintenance Shop) – not occupied;

- Building 2597 (Garage/Maintenance) – not occupied;
- Building 1465 (Crude Unit #210) – not occupied;
- Building 2460 – not occupied;
- Building 6612 – elevated above ground surface;
- Building 2588 (868 Unit Building) – under positive pressure;
- Building 2594/2595 (Sulfer Unit Building #867) – not occupied;
- Building 6021 – under positive pressure; and
- Other smaller non-numbered buildings – not occupied.

The 2016 samples were submitted to LLI for analysis of VOCs by EPA TO-15 method with the addition of site COCs cumene and naphthalene. The laboratory analytical report for the samples is provided in Appendix E.

3.8 Outdoor Worker Air Sampling

Langan collected five outdoor worker ambient air samples within AOI 2 (AOI2-AA-16-002 through AOI2-AA-16-006). The outdoor air samples were collected from locations based upon PADEP vapor intrusion guidance documents related to vertical separation distance from the ground surface to a LNAPL source or dissolved groundwater plumes. The locations for the outdoor worker air samples are depicted on Figure 13.

The samples were submitted to Pace for analysis of VOCs by EPA TO-15 method for Evergreen's short list of VOCs plus naphthalene. The results of the samples are provided in Table 8 and are discussed in Section 5. The laboratory analytical report for the samples is provided in Appendix E.

3.9 LNAPL Sampling

LNAPL samples for select wells in AOI 2 were previously characterized as described in the CCR. During the 2010 site characterization activities for AOI 2, LNAPL samples were collected from four monitoring wells (S-142, S-297, S-313, and S-315). In June 2013, three additional monitoring wells were sampled for LNAPL (S-360, S-363, and S-406 (previously S-382). For locations that had LNAPL detected, but were not sampled, product types were assigned to wells based on their proximity to previously fingerprinted locations and the results of the fingerprinting analysis.

LNAPL samples were collected using a direct sampling or swabbing method in accordance

with the Evergreen QA/QC Plan and Field Procedures Manual. The LNAPL samples were sent to Torkelson Laboratories (Torkelson) of Tulsa, Oklahoma for characterization. LNAPL characterization data included product types, density, proportions of product, degree of weathering, and similarities to other LNAPL samples collected at the Complex. LNAPL sampling results are provided in Appendix G and modeling results are discussed in Section 5.

Two soil samples were collected in 2010 (S-297 and S-298) and nine soil samples were collected in 2013 above LNAPL plumes (S-313, S-314, S-315, S-316, BH-13-59, BH-13-65, S-315, S-360, and S-363). The results are discussed in Section 5.2. During the August and October 2016 groundwater sampling events, groundwater samples were collected from beneath the LNAPL in select monitoring wells and the results are discussed in Section 5.4.

3.10 Surveying Activities

Following completion of monitoring well installation and soil boring activities, the newly-installed monitoring wells and soil boring locations were surveyed by Langan. Monitoring wells were surveyed 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 overseen by a Pennsylvania licensed surveyor and tied to the NAD 83 state plane horizontal datum and NAVD 88 vertical datum. The survey data for the monitoring wells is presented in Table 2. This survey data was used to update the Geographic Information System (GIS) and site wide database for the Complex and for calculations involving groundwater or LNAPL measurements.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

Sample results for AOI 2 supplemental activities were summarized in 45 soil sample delivery groups and 27 groundwater sample delivery groups provided by Pace Laboratories and the results were evaluated for usability. The laboratory performed quality assurance and quality control (QA/QC) analyses, including analysis of LCS/LCSDs, MS/MSDs, laboratory duplicates, surrogate spikes, initial and continuing calibrations, serial dilutions, instrument tunes, interference check samples, internal standard area counts and method blanks. Laboratory QA/QC summaries are provided in each data package, where available. The analytical data, data qualifiers, and QA/QC results provided in these reports were evaluated to determine whether AOI 2 groundwater, air and soil data met data quality objectives and could be used in

the decision-making process.

Several field and equipment blank samples were collected during the soil and groundwater sampling events, and displayed low-level detections for target analytes. The associated sample results were qualified as "B". All samples were properly preserved and were extracted, prepared, and analyzed within sample hold times.

Target compounds were detected in the laboratory method blanks which resulted in potential high bias for 1,2,4-TMB and 1,3,5-TMB reported in the July 27, 2016 equipment blank and field blank samples. Recoveries in LCS/LCSDs were within acceptable recovery control limits with the exceptions described In Appendix H. Multiple surrogates and MS/SDs recovered outside of the acceptable range as detailed in Appendix H.

Based on the QA/QC evaluation of the laboratory data, the groundwater, air and soil data collected during the site characterization activities are considered usable for characterizing the site, identifying compounds of concern, and delineating potential impacts. For more information regarding data QA/QC, refer to the Evergreen QA/QC Plan and Field Procedures Manual in Appendix D.

5.0 SITE CHARACTERIZATION ANALYTICAL RESULTS

The following sections discuss the analytical results of the site characterization and supplemental site characterization activities performed in AOI 2.

5.1 Surface Soil Analytical Results

The results of the surface soil samples collected in AOI 2 as part of the 2010 characterization activities, as well as the supplemental characterization activities are provided in Table 4. All of the soil samples were collected between the ground surface and two feet bgs and no saturated soils were observed at these depths. The soil sample results were screened against the PADEP non-residential direct contact and soil-to-groundwater MSCs and the PADEP-approved SSS for lead of 2,240 milligrams per kilogram (mg/kg) in Table 4. Sample locations and exceedances of the direct contact MSCs or the SSS for lead are shown in Figure 11. Soil sample exceedances of the PADEP non-residential soil-to-groundwater MSCs are not displayed in Figure 11 as these exceedances will be evaluated through analysis and characterization of the groundwater pathway.

Below is a general summary of the surface soil screening results for the soil sampling activities (outside of tank investigation areas):

- Lead and benzo(a)pyrene were the only COCs detected in surface soil exceeding PADEP non-residential soil direct contact MSCs or the SSS for lead. The SSS for lead was exceeded at four locations (PB-279 SW, PB-140SW, AOI-2_BH-13-64, and AOI2-BH-16-009).
- The PADEP non-residential soil direct contact MSC for benzo(a)pyrene was exceed at three locations (PB-141NE, PB-140NW, and AOI2-BH-16-005).
- Site COCs 1,2-dichloroethane, 1,2,4-TMB, 1,3,5-TMB, benzene, ethylbenzene, ethylene dibromide (EDB), isopropylbenzene (cumene), methyl tertiary butyl ether (MTBE), toluene, xylenes (total), anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(b)fluoranthene, chrysene, fluorene, naphthalene, phenanthrene, and pyrene were not detected in AOI 2 surface soil samples above their respective PADEP non-residential soil direct contact MSCs.
- The surface soil exceedances of the SSS for lead in AOI 2 surface soil have been delineated.
- The surface soil exceedances of the PADEP non-residential soil direct contact MSC for benzo(a)pyrene in AOI 2 surface soil have been delineated.

5.2 Subsurface Soil Results

No subsurface soil samples were collected during the 2010 soil investigations. The results of the subsurface soil samples collected in AOI 2 since 2010 are provided in Table 5. All of the subsurface soil samples were collected between two feet bgs and the soil-to-groundwater interface. The soil sample results were screened against the PADEP non-residential soil direct contact and soil-to-groundwater MSCs in Table 5. Sample locations are shown in Figure 11. No subsurface soil samples exhibited detections above the PADEP non-residential direct contact standard (2-15 feet) for any site COCs. PADEP non-residential soil-to-groundwater MSC exceedances are included in Table 5. Soil sample exceedances of the PADEP non-residential soil-to-groundwater MSCs are not displayed in Figure 11 as these exceedances will be evaluated through analysis and characterization of the groundwater pathway.

5.3 Storage Tank Closure and Release Incident Investigation Soil Borings

The results of the surface and subsurface soil samples collected since 2013 as part of the storage tank closure and release incidents in AOI 2 are provided in Table 4 and Table 5. Field work for the tank investigation activities was in accordance with the Evergreen QA/QC Plan and Field Procedures Manual. All of the surface soil samples were collected between the ground surface and two feet bgs and no saturated soils were observed at these depths. All of the subsurface soil samples were collected between two feet bgs and the soil-to-groundwater interface. The soil sample results were screened against the PADEP non-residential direct contact MSCs and the SSS for lead (surface soil samples only). Sample locations and exceedances of the PADEP non-residential direct contact MSCs or SSS for lead are shown in Figure 11. Below are summaries of the supplemental soil sample results by tank area.

Tank PB-140

The soil characterization sample results for AST PB-140 included surface soil samples BH-16-1 through BH-16-9 and subsurface soil samples from BH-16-4, BH-16-5, and BH-16-6.

- Exceedances for benzo(a)pyrene above the PADEP non-residential direct contact MSC or the SSS for lead were reported in two of the surface soil samples.
- There were no other reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-141

The soil characterization sample results for AST PB-141 included surface and subsurface soil samples BH-16-10 through BH-16-12. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-144

The soil characterization sample results for AST PB-144 included surface and subsurface soil samples BH-16-16 through BH-16-19. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-145

The soil characterization sample results for AST PB-145 included surface and subsurface soil samples BH-16-19 through BH-16-22. There were no reported site COC

exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-150

The soil characterization sample results for AST PB-150 included surface soil samples BH-16-23 through BH-16-24. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-152

The soil characterization sample results for AST PB-152 included surface soil samples BH-16-23 through BH-16-24. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-201

The soil characterization sample results for AST PB-201 included surface and subsurface soil samples BH-13-52. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-237

There were no supplemental soil characterization samples obtained for AST PB-237.

Tank PB-279

The soil characterization sample results for AST PB-279 included surface soil samples BH-16-13 through BH-16-15. There were no reported site COC exceedances of PADEP non-residential MSCs or the SSS for lead within the supplemental soil characterization samples.

Tank PB-298

There were no supplemental soil characterization samples obtained for AST PB-298.

Tank PB-3V-7

There were no supplemental soil characterization samples obtained for AST PB-3V 7.

As stated in Section 3.3 above, the analytical data for these borings is presented in this RIR for informational purposes only and will be used in a separately prepared SCR/RACR for tank closures or open releases associated with tanks PB-140, PB-141, PB-144, PB-145, PB-150, PB-152, PB-201, PB-237, PB-279, PB-298 and PB-3V-7. The SCR/RACR will be submitted under separate cover to the PADEP in accordance with 25 Pa Code §245 regulations.

5.4 Groundwater Results

The results of the unconfined and lower aquifer groundwater samples collected from monitoring wells from 2010 to present are provided in Table 6. The results were screened against the PADEP non-residential used aquifer (TDS<2,500) groundwater MSCs. Figures 12a and 12b illustrate the locations where concentrations of COCs were detected above the groundwater MSCs. A summary of the COC concentrations that were above their respective PADEP non-residential groundwater MSCs are presented below.

- Historically, all site COCs have been detected in the unconfined groundwater within monitoring wells at concentrations exceeding their respective PADEP non-residential groundwater MSCs, except for 1,2-dichloroethane, cumene, and fluorene.
- During the August and October 2016 sampling events, all site COCs were detected with concentrations in unconfined groundwater exceeding their respective PADEP non-residential groundwater MSCs, except 1,2-dichloroethane, 1,3,5-TMB, cumene, toluene, xylenes (total), fluorene, and phenanthrene. No additional COCs were detected in AOI 2 unconfined groundwater above their respective PADEP non-residential groundwater MSCs.
- During the August and October 2016 sampling events, groundwater was obtained from the water column beneath LNAPL in select AOI 2 monitoring wells. The same historical COCs were detected beneath the LNAPL and no additional COCs were detected in AOI 2 unconfined groundwater above their respective PADEP non-residential groundwater MSCs. These results are presented in Table 6 and Figure 12a.
- Historically, the following COCs have been detected in the lower aquifer groundwater within monitoring wells at concentrations exceeding their respective PADEP non-residential groundwater MSCs: lead, 1,2,4-TMB, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and

naphthalene. No other COCs have historically been detected in the lower aquifer within AOI 2 above their respective PADEP non-residential groundwater MSCs.

- Since 2010, lead has been the only COC detected in lower aquifer monitoring wells S-72D, S-302D, and S-305D at concentrations above the PADEP non-residential groundwater MSC; and 1,2,4-TMB, benzene, benzo(a)pyrene, an naphthalene are the only COCs detected at lower aquifer monitoring well S-294D.
- There were no detections of COCs in the lower aquifer above the respective PADEP non-residential MSCs during both of the August and October 2016 groundwater sampling events.
- A PAGWIS 1 mile radius search for registered wells was conducted for AOI 2 in November 2016. The well search results indicated that no public supply wells exist within the 1 mile radius of the Complex. A figure generated from the PAGWIS system is provided in Appendix C. As part of the Complex-wide Cleanup Plan, within any areas of known offsite groundwater plume migration additional efforts will be made to identify any potable wells in that area.

The groundwater data summarized above and presented in Table 6 and Figures 12a and 12b indicate dissolved COCs in groundwater in the unconfined and lower aquifers are characterized within the AOI 2 boundaries with the exception of the western boundary near the inactive Short Pier remediation system. The presence of the sheet pile wall and the vertical wall in this area limits the discharge of dissolved phase COCs in the unconfined aquifer groundwater to the Schuylkill River. Evergreen will be completing a separate evaluation of groundwater and COC flux to the river.

5.5 Indoor and Ambient Air Sampling Results

Stantec collected 14 indoor air sample and one ambient air sample in 2012 and GHD collected six indoor air samples and one ambient air sample in 2016. The Stantec 2012 indoor air sampling report and the GHD Air Data Evaluation Letter are provided in Appendix F. To evaluate the potential vapor intrusion into indoor air exposure pathway, indoor air sample results were screened against the current (January 2017) and one-tenth of the current PADEP Non-Residential Indoor Air SHS Vapor Intrusion Screening Values. The results were also compared to the OSHA PELs, the NIOSH RELs, and the ACGIH TLVs. The EPA industrial RSLs were included in the comparison to identify COCs. Initially, the results were compared to the EPA industrial RSLs established at a target cancer risk of 1E-05 and

hazard quotient of 0.1. If vapor intrusion is the only potentially complete exposure pathway, these RSL-based screening levels are the prevailing risk-based screening levels for assessment of the indoor air inhalation pathway (PADEP 2015). The results were also conservatively compared to the EPA industrial RSLs established at a target cancer risk of 1E-06 and hazard quotient of 0.1. In September 2016, the EPA established a revised reference concentration (RfC) for 1,2,4-TMB and 1,3,5-TMB based on effects on the nervous system (EPA 2016). The revised RfC (6E-02 mg/m^3) was used to derive non-cancer EPA RSLs applicable to both TMBs. The results of the air samples are presented below.

- None of the indoor air samples from 2012 and 2016 exhibited exceedances of the published PADEP, NIOSH, and ACGIH indoor air screening values.
- Fourteen of the 20 indoor air samples from 2012 and 2016 did not exhibit exceedances of the EPA Industrial RSL established at a 1E-05 target cancer risk and hazard quotient of 0.1.
- Three of the 20 indoor air samples from 2012 and 2016 exhibited exceedances only for naphthalene of the EPA industrial RSLs at a target cancer risk of 1E-05 and a hazard quotient of 0.1 indoor air screening values.
- Three of the 20 indoor air samples from 2012 and 2016 exhibited exceedances for multiple COCs of the EPA industrial RSLs at a target cancer risk of 1E-05 and a hazard quotient of 0.1 indoor air screening values. COCs with exceedances include 1,2,4-TMB, naphthalene, and total xylenes.
- Four of the 20 indoor air samples from 2012 and 2016 exhibited exceedances only for naphthalene of one-tenth of the PADEP indoor air SHS screening values and the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values.
- Six of the 20 indoor air samples from 2012 and 2016 exhibited exceedances for only benzene of one-tenth of the PADEP indoor air SHS screening values and the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values.
- Four of the 20 indoor air samples from 2012 and 2016 exhibited exceedances for multiple COCs of one-tenth of the PADEP indoor air SHS screening values COCs with exceedances include 1,2,4-TMB, 1,3,5-TMB, benzene, ethylbenzene, naphthalene, and total xylenes.
- Four of the 20 indoor air samples from 2012 and 2016 exhibited exceedances for multiple COCs of the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values. COCs with exceedances include

1,2,4-TMB, benzene, ethylbenzene, naphthalene, and total xylenes.

- Six of the 20 indoor air samples from 2012 and 2016 did not exhibit exceedances of any of the indoor air screening values.
- Similar to the indoor air samples, the ambient air samples from 2012 and 2016 did not exhibit exceedances of the published PADEP, NIOSH, and ACGIG indoor air screening values.
- The ambient air sample from 2012 did not exhibit exceedances of one-tenth of the PADEP indoor air SHS screening values and the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values.
- The ambient air sample from 2016 exhibited an exceedance for benzene of one-tenth of the PADEP indoor air SHS screening values and the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values.

It should be noted that some of the laboratory reporting limits were greater than the applicable PADEP screening values. The results of the air samples are provided in Table 7 and building sample locations are displayed in Figure 13.

5.6 Outdoor Worker Air Sampling Results

Langan collected five outdoor worker ambient air samples in 2016 from select locations from within AOI 2 based upon PADEP vapor intrusion guidance documents. The air sample results are provided in Table 8 and outdoor worker ambient air sample locations are displayed in Figure 13. Concentrations of constituents in outdoor air are below the applicable ACGIH TLVs and NIOSH RELs for all analytes as displayed in Table 8. The results of the outdoor air samples will be addressed in the Human Health Risk Assessment for the PES Refining Complex.

5.7 LNAPL Characterization Results

In August 2016, Aquaterra gauged 80 accessible monitoring wells in AOI 2. Twelve of these monitoring wells (S-141, S-159, S-174, S-298, S-302, S-328, S-338, S-346, S-420, S-48, S-61, and S-65) contained measureable LNAPL. The thickness of the LNAPL ranged from a sheen to 1.07 feet.

In October 2016, Aquaterra gauged 74 accessible monitoring wells in AOI 2, and recorded measurable LNAPL in many of the same wells as observed during August 2013, with the

exception of monitoring wells S-328 and S-420, which did not contain LNAPL in October 2016; and monitoring wells S-338, S-61, and S-65, which were not gauged in October 2016. Piezometer PZ-100 and monitoring well S-355 contained LNAPL in October 2016, whereas LNAPL was not identified in August 2016. The thickness of the LNAPL during the October 2016 gauging ranged from 0.02 to 1.75 feet.

In November 2016, Aquaterra completed a more comprehensive gauging, inclusive of recovery wells. During the November 2016 event, Aquaterra gauged 132 accessible wells within AOI 2. Twenty-nine of these monitoring wells and twelve recovery wells contained measureable LNAPL. The thickness of the LNAPL ranged from a sheen to 7.33 feet. The extent of the LNAPL in AOI 2, and the apparent thickness of LNAPL as measured during the November 2016 gauging event is illustrated in Figure 14.

The previous LNAPL characterization data for AOI 2, obtained as part of the CCR and the 2010 site characterization activities, is provided in Appendix G. In June 2013, three additional monitoring wells were sampled for LNAPL [S-360, S-363, and S-406 (previously S-382[, and characterization data from these wells are also included in Appendix G. No additional LNAPL samples were collected during the 2016 site characterization activities.

Based on the LNAPL characterization performed by Torkelson during the CCR and the site characterization activities, there are four LNAPL mixtures in AOI 2. These include previous designations of: lube oil, middle distillate, gasoline, kerosene, naptha, condensate, heavier material, alkylate, and residual oil. As of July 2016, new LNAPL site-wide classifications were adopted with definitions as follows:

- Light Distillates - Light distillates include liquid petroleum gas (LPG), aviation gasoline, gasoline, and naphtha. Samples previously identified as alkylate were also characterized as light distillate. The samples grouped into the light distillate category included samples that were characterized to be more than 90 percent gasoline, heavy virgin naphtha or reformed light naphtha. The light distillate samples have an average viscosity of 0.67 centipoise and an average density of 0.78 g/ml.
- Middle Distillates - Middle distillates include kerosene, jet fuel, diesel fuels, and light fuel oils. The samples grouped into the middle distillate category included samples that were characterized to be more have an average viscosity of 3.72 centipoise and an average density of 0.83 g/ml.

- Mixes of Light/Middle Distillates - The samples grouped into the light/middle distillate category included samples that were characterized to be intermediate mixes of light and middle distillate products. Laboratory results from samples previously identified as condensate were reviewed by the same laboratory to determine the accurate category as condensate can be a general term for multiple types of products from various processes. Per Torkelson's analysis, the condensate samples in AOI-2 were categorized as mixtures of light and middle distillate. The light/middle distillate samples have an average viscosity of 0.85 centipoise and an average density of 0.80 g/ml.
- Heavy Distillates - Heavy distillates include fuel oil, residual oil, lube oil, and heavy atmospheric gas oil. The heavy distillate samples have an average viscosity of 5.8 centipoise and an average density of 0.9 g/ml.
- Residuum - Includes waxes and asphalts.
- Crude oil.

Based on the new classifications, Light Distillate, Mixes of Light/Middle Distillate, Middle Distillate and Heavy Distillate LNAPL plumes currently exist in AOI 2. These new classifications are displayed on Figures 12a, 12b, and 14. In particular, the light distillate LNAPL plume (previously alkylate plume) near the southern boundary with AOI 4 is not associated with plumes in AOI 4 due to differing types of LNAPL in the northern portion of AOI 4. In addition, as depicted in Figures 12a, 12b, and 14, LNAPL in monitoring well S-311 was not detected. Figures 12 and 14 include LNAPL gauging data from November 2016.

LNAPL characterization results are presented in Table G.1 of Appendix G. The LNAPL product types summarized in Table G.1 were applied to the November 2016 gauging data to generate the LNAPL plumes illustrated in Figure 14. LNAPL trend graphs are presented in Figures G-1 to G-7 and provided in Appendix G. These monitoring/recovery wells were selected due to previous LNAPL history and location outside of existing recovery system capture zones. Also provided in Appendix G is Figure 10 "Apparent LNAPL Thickness and Types" from the 2010 AOI 2 SCR/RIR and Figure G-8 "Apparent LNAPL Thickness June 2013" for historical LNAPL context. The LNAPL figures from 2010 and 2013 do not include the new July 2016 LNAPL designations referenced above.

Based on the LNAPL type, delineation of LNAPL bodies, historical LNAPL trend graphs, groundwater flow/gradients, and the LNAPL modeling performed as part of the CCR, LNAPL within AOI 2 with the exception of the middle distillate plume in the northwest of

the AOI, are considered to be immobile or hydraulically controlled by the active remedial systems. The potential mobility of the middle distillate plume in the northwest is further described in Section 7.4. Additionally, the low concentrations of dissolved COCs detected in groundwater samples collected beneath LNAPL indicate the LNAPL bodies within AOI 2 are a not a significant source for dissolved COCs in groundwater. Therefore, no additional LNAPL modeling was completed as part of this RIR.

6.0 FATE AND TRANSPORT ANALYSIS

The following sections describe the qualitative fate and transport evaluation completed in AOI 2. This fate and transport evaluation is provided in more detail in Appendix I. A quantitative assessment utilizing the site-wide groundwater model will be presented in a future submittal.

6.1 Soil

No fate and transport modeling was completed for the soil analytical results since the soil-to-groundwater pathway is evaluated through groundwater data. Potential exposure pathways for AOI 2 are discussed in more detail in Section 9.

6.2 Groundwater

In September 2015, representatives from Evergreen's team, PADEP and EPA met to discuss the F&T approach for the Complex. It was agreed upon during the meeting that initial AOI RIRs would contain a summary of the groundwater characterization results and identify where the groundwater MSCs were exceeded throughout the Complex, not only at the Point of Compliance. To achieve this, the RIR would include an evaluation of groundwater analytical data, groundwater flow direction and groundwater velocity to evaluate the potential for groundwater in exceedance of the MSC to migrate off-site. In addition, Evergreen, its consultants, and the PADEP agreed that the RIRs would include a qualitative assessment of F&T and that a site-wide quantitative assessment would be completed using a groundwater model to support attainment in the Final Report. A qualitative assessment of F&T of COCs in groundwater in AOI 2 is provided in Appendix I. The qualitative assessment includes information regarding the following conditions in AOI 2:

- Geologic framework;
- Hydrogeologic conditions;

- Hydrologic conditions;
- Anthropogenic features (such as the Pollock Street Sewer, remedial systems, the sheet pile wall, and the vertical wall along the Schuylkill River); and
- COC temporal trends and spatial distribution.

6.3 LNAPL

As part of the 2010 AOI 2 SCR/RIR (included in Appendix J), Evergreen evaluated LNAPL mobility across the site using the API LNAPL Model as a tool for assessing LNAPL volume, mobility, and recoverability across the Complex. Based on consistently detected LNAPL types, relatively stable LNAPL distribution, consistent historical groundwater flow conditions and previously completed API LNAPL Model evaluations, LNAPL in AOI 2, with the exception of the middle distillate plume in the northwest of the AOI, are considered to be immobile or hydraulically controlled by the active remedial systems. The potential mobility of the middle distillate plume in the northwest is further described in Section 7.4. No new LNAPL modeling was completed as part of this report. Additionally, the low concentrations of dissolved COCs detected in groundwater samples collected beneath LNAPL indicate the LNAPL plumes within AOI 5 are a not a significant source for dissolved COCs in groundwater.

7.0 CONCEPTUAL SITE MODEL

A preliminary conceptual site model (CSM) for the Complex, including AOI 2, was presented in the CCR and was later refined in the 2010 AOI 2 SCR/RIR. Data collected from site characterization activities completed since the submittal of the 2010 AOI 2 SCR/RIR were used to further refine the CSM in this report. The 2010 AOI 2 SCR/RIR and other historical reports for AOI 2 are provided in Appendix J. The current CSM for AOI 2 is described in the following sections:

7.1 Description and Site Use

AOI 2, also known as the Point Breeze Processing Area, is bordered by Passyunk Avenue to the north, AOI 1 to the east, Hartranft Street to the south, and the Schuylkill River to the west. AOI 2 encompasses approximately 111 acres and the majority of AOI 2 is covered by impervious surfaces. Currently, AOI 2 has the only active dock for loading/offloading of

refined products in the Point Breeze facility. The site is comprised of crude distillation units, FCC, reforming, distillate hydrotreating, low sulfur gasoline, and alkylation units, sulfur recovery, maintenance facilities, boiler feedwater and wastewater treatment plant, parking areas, office buildings, tanks and laboratories.

AOI 2 is located within a fenced and secured area to prevent unauthorized access. Prior to any work being completed within AOI 2, appropriate work permits, safety and security measures must be approved by PES Refining Complex personnel. AOI 2 is under the control of PES's health and safety administrative procedures and is regulated by OSHA. The current and future intended use of AOI 2 is non-residential.

7.2 Geology and Hydrogeology

The following describes geologic and hydrogeologic conditions in AOI 2:

- Anthropogenic fill is present throughout AOI 2 and ranges in thickness between approximately 1.5 feet to greater than 50 feet along the Short Pier area. The thick fill materials near the Short Pier are representative of backfilling activities following the installation of the bulkhead along the Schuylkill River.
- The Holocene Alluvium is present throughout most of AOI 2 ranging in thickness from approximately zero feet to 25 feet.
- The Trenton Gravel is laterally continuous throughout AOI 2, except where removed along the Short Pier during installation of the bulkhead. Within AOI 2, the Trenton Gravel ranges in thickness from approximately five feet to 22 feet.
- The Middle Clay appears to be laterally continuous throughout AOI 2, except where removed along the Short Pier, ranging in thickness from approximately 6 feet to 24 feet. Where present the Middle Clay functions as a confining unit to the Middle Sand.
- The Middle Sand is fairly extensive throughout AOI 2 except where removed along the Short Pier. The Middle Sand appears to pinch out in the southeast corner of AOI 2, and ranges in thickness from approximately zero to 22 feet.
- The Lower Clay is discontinuous throughout AOI 2, but where present, is thickest in the southeast (up to approximately 16 feet) and pinches out to the north and west. Where present the Lower Clay functions as a confining unit to the Lower Sand.
- The Lower Sand is located approximately 48 feet to 70 feet bgs, and ranges in thickness between approximately 13.5 feet to 34 feet. Beneath the Lower Sand

is the Wissahickon Schist bedrock.

- The depth to weathered bedrock beneath AOI 2 was encountered from approximately 79 to 104 feet bgs. The hydrogeologic framework for AOI 2 consists of three layers. Layer 1 is the unconfined aquifer, which consists of the combined anthropogenic fill, Holocene alluvium, and Trenton Gravel. Layer 2 is the Middle Clay confining unit (clay aquitard). Layer 3 is the combined Middle Sand, Lower Clay, and Lower Sand (lower aquifer), which is a confined aquifer. Recharge to the unconfined aquifer within AOI 2 appears to occur in the north of the AOI at the potentiometric high point centered on monitoring well S-298. This area corresponds to one of the few unpaved areas within AOI 2, and is located topographically down slope from a large asphalt-paved parking lot. It is assumed during precipitation events surface runoff preferentially recharges the unconfined aquifer in this unpaved area.
- From this potentiometric high point, groundwater flows radially outward, with the majority of flow within the AOI towards the south.
- A component of groundwater flow in AOI 2 is towards the Pollock Street West End remediation system. A hydraulic capture zone around the remediation system was observed during both the August and October 2016 gauging events.
- Groundwater flow in the lower aquifer is towards the south.

7.3 Compounds of Concern

The following summarizes relevant information concerning COCs by media in AOI 2:

Soil

- Lead was the only COC in surface soil detected above the PADEP non-residential soil direct contact MSCs or the SSS for lead (outside of tank investigation areas). Areas where lead exceeded the SSS for lead have been delineated.
- Benzo(a)pyrene and lead are the only COCs in surface soil detected above the PADEP non-residential soil direct contact MSCs or the SSS for lead in tank investigation areas. Areas where these COCs exceeded either the PADEP non-residential surface soil direct contact MSCs or the SSS for lead have been delineated.
- No COCs in subsurface soil were detected above the PADEP subsurface soil direct contact MSCs throughout AOI 2.

Groundwater

- 1,2-dichloroethane, cumene, and fluorene are the only COCs in unconfined aquifer groundwater that were not detected above their respective PADEP non-residential groundwater MSCs. All other COCs were detected in the unconfined aquifer groundwater at concentrations above their respective PADEP non-residential groundwater MSCs.
- Prior to 2016, lead, 1,2,4-TMB, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and naphthalene were the COCs in the lower aquifer groundwater that were detected above their respective PADEP non-residential groundwater MSCs.
- There were no detections of COCs in the lower aquifer above the respective PADEP non-residential MSCs during both the August and October 2016 groundwater sampling events.

Indoor Air

- Fourteen of the 20 indoor air samples collected in 2012 and 2016 exhibited exceedances of one-tenth of the PADEP indoor air SHS screening value, and/or the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of

0.1 indoor air screening values, and/or the EPA industrial RSLs at a target cancer risk of 1E-05 and a hazard quotient of 0.1 indoor air screening values.

- The following compounds were detected at concentrations exceeding one-tenth of the PADEP indoor air SHS screening value:
    - Benzene, ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, naphthalene, and total xylenes.
- The following compounds were detected at concentrations exceeding the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values stated above:
    - Benzene, ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, naphthalene, and total xylenes.
- The following compounds were detected at concentrations exceeding the EPA industrial RSLs at a target cancer risk of 1E-05 and a hazard quotient of 0.1 indoor air screening values:
    - 1,2,4-TMB, naphthalene, and total xylenes.
- No COCs in indoor air were detected above the PADEP, NIOSH, and ACGIH indoor air SHS screening values during the 2012 and 2016 indoor air sampling events.

7.4 LNAPL Distribution and LNAPL Mobility

The following summarizes relevant information concerning LNAPL distribution in AOI 2:

- There are four different identified types or mixtures of LNAPL identified in AOI 2; these consist of light distillates, mixes of light/middle distillates, middle distillates, and heavy distillate.
- The majority of LNAPL in AOI 2 is located in the area of the Pollock Street remedial systems (Pollock Street West End System and Pollock Street Horizontal Well System) and is actively being controlled and recovered.
- Since the installation of monitoring well S-348 in 2012, LNAPL has generally been present at this well at apparent thicknesses less than 0.5 feet. In May 2016 and November 2016, apparent LNAPL thicknesses of 3.72 and 7.33 feet, respectively, were observed at monitoring well S-348. Monitoring well S-348 is located along the

Pollock Street Sewer in between horizontal wells HW-1 and HW-2. Therefore, LNAPL at this well is most likely being recovered by the Pollock Street Horizontal Well System. Evergreen will continue to monitor LNAPL presence and thickness at this well as part of the Complex-wide Cleanup Plan.

- Possible LNAPL plume expansion or mobility was identified at the middle distillate plume in the northwest of AOI 2 surrounding monitoring wells S-297, S-355, S-357, and S-423 (Figure 14). Historically, LNAPL has been present at monitoring well S-297 at apparent thicknesses less than 1.5 feet, and with apparent thicknesses less than 0.5 feet since August 2015. Monitoring well S-423 was installed in July 2016 to provide down gradient delineation of the LNAPL (middle distillate) at monitoring well S-297. LNAPL was not observed during installation of monitoring well S-423 or during the August and October 2016 gauging events. However, in November 2016 an apparent LNAPL thickness of 0.54 feet was measured at this well. Monitoring well S-357 (located approximately 139 feet southwest of monitoring well S-297) has also exhibited a slight increase of apparent LNAPL thickness of 0.34 feet in January 2014 to 1.18 feet in November 2016, with fluctuating thicknesses over the gauging history. LNAPL thickness at monitoring well S-355 has remained stable with apparent thicknesses ranging between 0 and 0.46 feet since installation in 2013. Evergreen will continue to monitor wells in the vicinity of this LNAPL plume and evaluate the potential mobility as part of the Complex-wide Cleanup Plan. Please note that two new monitoring wells have been installed downgradient and to the west of the vertical wall for evaluating this LNAPL plume along with groundwater conditions.
- All other LNAPL lateral extents and thicknesses throughout AOI 2 are generally stable.
- Based on the LNAPL modeling performed as part of the CCR and the stable lateral extent and observed thickness, the LNAPL plumes within AOI 2, with the exception of the middle distillate plume in the northwest of the AOI, are considered to be immobile or hydraulically controlled by the active remedial systems.

7.5 Fate and Transport of COCs

- No fate and transport modeling was completed for the soil. The soil-to-groundwater pathway will be evaluated through analysis and characterization of the groundwater pathway.

- A qualitative assessment was completed to assess the potential fate and transport of dissolved petroleum impacts and refine the current CSM for AOI 2.
- For the AOI 2 CSM plume stability assessment, benzene and MTBE, the most mobile of the COCs, was the focus of the qualitative evaluation.
- Three benzene plumes (Benzene Plume 1 through 3), and two MTBE plumes (MTBE Plume 1 and 2) were identified in the unconfined aquifer within AOI 2. These plume areas are summarized below and are further described in Appendix I.
    - Benzene Plume 1 is located near the inactive Short Pier remediation system. The dissolved benzene in groundwater (Benzene Plume 1) appears to be related to the small LNAPL plume (mix of light/middle distillate) near the Short Pier remediation system. Based on the horizontal extent of Benzene Plume 1 in July 2010 and August 2016, it appears the plume is shrinking. Benzene concentration trends in monitoring wells SD-1 and S-337 indicate both the source area and downgradient extent of Benzene Plume 1 is decreasing.
    - Benzene Plume 2 is a large dilute plume in the northeast portion of AOI 2. Based on the benzene iso-concentration maps created for July 2010 and August 2016, the horizontal extent of Benzene Plume 2 appears to be stable or decreasing. The COC concentration trends at monitoring well S-295 indicate the source area of Benzene Plume 2 is decreasing. COC concentration trends in monitoring wells S-294 and S-300 indicate the downgradient extent of Benzene Plume 2 is stable.
    - Benzene Plume 3 is located near the active Pollock Street West End remediation system, and appears to be related to the LNAPL plume (heavy distillate) near the remediation system. Based on the horizontal extent of Benzene Plume 3 in July 2010 and August 2016, it appears the plume is stable or decreasing. Based on the proximity to the Pollock Street West End remediation system and the stable extent of the plume, it is reasonable to assume the remediation system is providing hydraulic control of Benzene Plume 3, and limiting horizontal migration of dissolved COCs. Benzene concentration trends in monitoring wells S-252 and S-306 indicate the source area of Benzene Plume 3 is decreasing.

  - MTBE Plume 1 is located near the inactive Short Pier remediation system. The dissolved MTBE in groundwater (MTBE Plume 1) may be related to the small LNAPL plume (light distillate) near the Short Pier remediation system. Based on the horizontal extent of MTBE Plume 1 in July 2010 and August 2016, it appears the plume is stable or shrinking. The MTBE concentration trends at monitoring well S-71 indicate the source area for MTBE Plume 1 has been steadily decreasing since 2010. Based on the limited sampling data at monitoring well S-355 it is unclear whether MTBE concentrations at this well are increasing or stable. However, based on the horizontal extent of MTBE Plume 1 observed in July 2010 and August 2016, MTBE Plume 1 appears to be stable.
  - MTBE Plume 2 is an isolated MTBE plume centered on monitoring well S-300. Based on the horizontal extent of MTBE Plume 2 in July 2010 and August 2016, it appears the plume is stable. The MTBE concentration trend at monitoring well S-300 indicates MTBE Plume 2 is stable.

- All identified groundwater plumes within AOI 2 generally appear to be stable or decreasing. Based on the qualitative assessment groundwater impacts within AOI 2 are characterized within the Complex boundaries and transport of dissolved phase COCs to potential receptors is limited by hydraulic control of active remediation systems or the sheet pile wall and the vertical wall along the Schuylkill River.

7.6 Potential Migration Pathways and Site Receptors

The following summarizes potential migration pathways and site receptors for AOI 2.

- AOI 2 is situated within a fenced and secured area to prevent unauthorized access.
- The potential direct contact pathway to soil greater than two feet is deemed incomplete based on PES's on-site permit and PPE procedures which limit exposure to soil encountered in excavations.
- The potential direct contact pathway to groundwater is deemed incomplete based on PES's on-site permit and PPE procedures which prevent exposure to groundwater that may be encountered in excavations.
- Benzene, ethylbenzene, naphthalene, and xylenes (total) were detected at concentrations above the site-specific standards of one-tenth the PADEP SHS

and the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values during the 2012 and 2016 indoor air sampling events. Also during the 2012 and 2016 indoor air sampling events, 1,2,4-TMB and 1,3,5-TMB were detected at concentrations above the site-specific standards of one-tenth the PADEP SHS. However, none of the buildings within AOI 2 had indoor air samples that exhibited COC exceedances above the PADEP indoor air SHS screening values. Langan is preparing a Human Health Risk Assessment for the PES Refining Complex to address any exceedances of the vapor intrusion screening values.

- LNAPL is contained within the boundaries of AOI 2 and the Complex. The potential direct contact pathway to LNAPL is deemed incomplete based on PES's on-site permit and PPE procedures which limit exposure to LNAPL that may be encountered in excavations.
- Dissolved phase COCs in the unconfined aquifer above the groundwater MSCs are contained within the boundary of AOI 2 or the Complex.
- The areas with surface soil concentrations above COC direct contact MSCs and lead above the SSS have been delineated and will be remediated by Evergreen to eliminate the potential exposure pathway. The remediation activities will be discussed in a separate Complex-wide Cleanup Plan.
- A recent online well radius search was conducted for the entire site using the PAGWIS in November 2016 in order to evaluate potential potable well receptors. Based on the PAGWIS search completed in 2016, there are no existing public or private water supply wells within a 1 mile radius of the facility boundary.

8.0 REMEDIAL SYSTEM UPDATE

The Pollock Street Sewer Total Fluids Recovery System was reconfigured and expanded in 2012 due to increased quantities of LNAPL within the Pollock Street Sewer Outfall. The reconfiguration of the Pollock Street Sewer Total Fluids Recovery System, the Horizontal Well System, and the Short Pier System are described below. Operation and maintenance data for all of the AOI 2 recovery systems, as well as well gauging and sampling data for AOI 2, has previously been reported to the PADEP and EPA in the remediation status reports for the Complex.

Pollock Street Vertical Well System

The Pollock Street Vertical Well System is an inactive remedial system in AOI 2. The Pollock Street Vertical Well System consisted of ten vertical recovery wells (RW-100 through 109) installed in 1995. The system has been methodically taken offline as replacement recovery wells/systems have been brought on line (i.e. horizontal wells and the West End System.)

Pollock Street Horizontal Well System

The Pollock Street Horizontal Well System is one of two active remedial systems in AOI 2. The Pollock Street Horizontal Well System, which was installed between 2004 and 2006, consists of total fluids (groundwater and LNAPL) recovery from three horizontal recovery wells (HW-1, HW-2, and HW-3) along the Pollock Street Sewer. The volume of LNAPL recovered from individual horizontal recovery wells cannot be ascertained based on the system discharge configuration. Total fluids are pumped directly into a closed Benzene Waste Operations *National Emission Standards for Hazardous Air Pollutants (BWON)* controlled sewer and are processed through the Point Breeze Processing Area Wastewater Treatment Plant. The total fluids recovery for the Pollock Street Horizontal Well System, as of the end of December 2016, included over 93 million gallons of groundwater and LNAPL (over 8 million gallons of total fluid in the second half of 2016). This system can operate at a total fluids recovery of at least one million gallons per month.

Pollock Street West End System

The Pollock Street West End System is another of two active remedial systems in AOI 2. The Pollock Street West End System is a total fluids recovery system (groundwater and LNAPL) that includes ten 4-inch diameter recovery wells on the east side of River Road and twenty 6-inch diameter recovery wells on the west side of River Road. The system recovery wells were installed over a period from late 2011 through early 2012. The system includes pneumatic submersible pumps where groundwater and LNAPL are processed through an oil/water separator. The water is then discharged to an onsite process sewer (S-10 Sump) which sends the water for treatment in the Point Breeze Wastewater Treatment Plant. The recovered LNAPL is transferred to two 550-gallon tanks. The LNAPL is processed by the Complex. Since startup through December 2016, the system has recovered a total of over 30 million gallons of

groundwater and over 6o thousand gallons of LNAPL.

Pollock Street Sewer Outfall

The Pollock Street Sewer Outfall is the not a remedial system in AOI 2 but is located in AOI 2 and serves as an operational check on the status and functionality of the Pollock Street recovery systems from preventing LNAPL from entering the Schuylkill River. A sheet pile wall was installed in the area of the Pollock Street Sewer outfall system in order to minimize tidal influence into nearby recovery wells and a tide gate system was installed in the mid- 1990's on the Pollock Street Sewer outfall to minimize tidal flux within the sewer. A skimmer, also installed in the mid-1990's, is located at the outfall and discharges to a refinery process sewer. The Pollock Street Sewer Outfall is visually monitored two times per day and field observations are recorded. Evergreen maintains spill control equipment (absorbent booms and sweeps) around the tide gate area to minimize and prevent release of fugitive LNAPL into the Schuylkill River, which are changed out once per week. The outfall skimmer is only operational during times of LNAPL occurrence in the sewer outfall.

Short Pier System

The Short Pier Total Phase Extraction System is an inactive remediation system located along the western boundary of AOI 2. This system was shut-down in January 2002 due to the lack of LNAPL in the vicinity of the system and the system has remained offline since then.

Passyunk Avenue Sewer

The Passyunk Avenue Sewer is not a remedial system but is a combined sewer outfall (CSO) that borders AOI 2 to the north. PES personnel check the outfall on a daily basis during low tidal cycles. No LNAPL was identified to be discharging from the Passyunk Avenue Sewer during the second half of 2016.

9.0 EXPOSURE ASSESSMENT

9.1 Human Health

A human health risk assessment has been completed for lead in site soils, as summarized

in Section 1.4. Soil results that exceed the SSS for lead, or the non-residential direct contact MSC for the other COCs, are to be addressed through pathway elimination under the SSS or through engineering controls, the details of which will be identified in the Complex-wide Cleanup Plan. Groundwater results that exceed the non-residential MSC at the point of compliance will be addressed through engineering controls or by pathway elimination under the SSS, and will also be identified in the Complex-wide Cleanup Plan. Langan is preparing a Human Health Risk Assessment for the PES Refining Complex to address any exceedances of the vapor intrusion screening values.

9.2 Ecological

The majority of AOI 2 is covered with impervious surfaces. Some areas are covered by soil and gravel; however, they are not likely to serve as a breeding area, migratory stopover, or primary habitat for wildlife. In August 2013, a request was submitted to the Pennsylvania Natural Diversity Inventory (PNDI) database to identify potential endangered, threatened and special concern wildlife near the project area.

The PNDI search from August 2013 identified one potential impact to the Great Egret under the jurisdiction of PA Game Commission (PGC) and one unspecified potential impact to "Rare, Candidate, Threatened and Endangered Species" under the jurisdiction of PA Fish & Boat Commission (PAFBC). A PGC response letter dated September 27, 2013, and a PAFBC response letter dated September 23, 2013, indicated "no impact" determinations from both agencies. The agency notification and response letters are included in Appendix A.

A new PNDI search was conducted on August 4, 2016, due to the two year expiration of the original PNDI clearance. The August 4, 2016 PNDI search did not result in any additional potential impacts to threatened or endangered species. The updated PNDI search is included in Appendix A.

No surface water features are located in AOI 2. The nearest surface water body to AOI 2 is the Schuylkill River, which borders the western boundary. A sheet pile wall is present in some areas between AOI 2 and the Schuylkill River as illustrated in Figure 2. Groundwater interaction with surface water/sediment is restricted by the sheet pile wall where present. A vertical wall east of Schuylkill Avenue along the river exists where the sheet pile wall is absent. This vertical wall assists with restricting interaction between groundwater/LNAPL and the surface water/sediment of the Schuylkill River. Evergreen will be examining site-

wide surface water compliance in future reporting.

10.0 COMMUNITY RELATION ACTIVITIES

A Community Relation Plan (CRP) that includes public involvement with local residents to inform them of the anticipated investigations and remediation activities was completed as part of the original NIR submittal in 2006. A revised NIR was submitted in 2014. The purpose of the CRP is to provide a mechanism for the community, government officials, and other interested or affected citizens to be informed of on-site activities related to the remediation program at the Site. This plan incorporates aspects of public involvement under both PADEP's Act 2 program and EPA's RCRA Corrective Action program. Sunoco held an initial public meeting to present the strategy and give a status update of the project, and will present updates on the remediation program to the Community Action Plan (CAP) on an as requested basis. The CAP meets on a monthly basis and includes members of the community, local officials and PES employees.

This report and future Act 2 reports will include the appropriate municipal and public notices in accordance with the provisions of Act 2. Notices will be published in the Pennsylvania Bulletin and a summary of the notice will appear in a local newspaper. A copy of the original NIR, the 2014 NIR and the Act 2 report notifications for this RIR are included in Appendix A.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the completed activities, the following conclusions and recommendations have been developed for AOI 2:

SOIL

- Four surface soil locations (two related to tank areas) exhibited exceedances above the non-residential soil direct contact MSC for benzo(a)pyrene or the SSS for lead. These areas have been delineated and will be addressed by Evergreen as part of the forthcoming Complex-wide Cleanup Plan.
- No subsurface soil locations exhibited exceedances above the non-residential soil direct contact MSCs.
- Any soils that exhibited exceedances of the soil-to-groundwater MSCs the corresponding soil-to-groundwater pathway will be evaluated through analysis and characterization of the groundwater pathway.

GROUNDWATER

- Recharge to the unconfined aquifer within AOI 2 appears to occur in the north of the AOI at the potentiometric high point centered on monitoring well S-298. From this potentiometric high point groundwater flows radially outward, with the majority of flow within the AOI towards the south. A component of groundwater flow in AOI 2 is towards a capture zone created by the Pollock Street West End remediation system. Localized leaking of the Pollock Street Sewer may occur within AOI 2. The lower aquifer is separated from the unconfined aquifer by the Middle Clay confining unit. Groundwater flow in the lower aquifer is generally consistent for both gauging events with flow towards the south.
- During the August and October 2016 sampling events, all site COCs were detected with concentrations in unconfined groundwater exceeding their respective PADEP non-residential groundwater MSCs, except 1,2-dichloroethane, 1,3,5-TMB, cumene, toluene, xylenes (total), fluorene, and phenanthrene.
- There were no detections of COCs in the lower aquifer greater than the respective PADEP non-residential MSCs during both of the August and October 2016 groundwater sampling events.
- These and other historic groundwater quality results will be evaluated using a Complex-wide quantitative groundwater model to support fate and transport analysis and remediation standard attainment demonstration in the Final Report.
- Based on qualitative groundwater trends and groundwater flow direction in the unconfined aquifer, concentrations of the above mentioned dissolved COCs are characterized within AOI 2 to the north, east, and south, and are not expected to exceed the groundwater MSCs at the site boundaries or affect site receptors in these directions.
- Dissolved phase COCs in groundwater in the western portion of AOI 2 are either characterized or, hydraulically controlled by active remedial systems, or their discharge to the Schuylkill River is limited by the sheet pile bulkhead or the vertical wall.
- As previously mentioned, Evergreen recently installed two monitoring points by hand between the river and the vertical wall to aid in delineation of the LNAPL plume which is present east of the wall. During installation, evidence of LNAPL in the soil borings for the new wells was not observed. However, these monitoring wells will be added to the Complex-wide groundwater monitoring program.
- Unconfined groundwater samples collected from beneath LNAPL in select

monitoring wells exhibited similar historical COCs concentrations compared to monitoring wells without LNAPL. These results will also be utilized in a Complex-wide quantitative groundwater model to support fate and transport analysis and remediation standard attainment demonstration in the Final Report.

- Excavations in AOI 2 are governed by PES's permitting procedures which protect against potential exposures to groundwater that could be encountered in an excavation. These site procedures will be recorded in the UECA for the Complex or AOI 2.

SURFACE WATER

- Evergreen will be completing a separate evaluation of groundwater and COC flux to the Schuylkill River pathway under separate cover.

INDOOR AIR

- Based on the results of the 2012 and March 2016 indoor air samples, none of the buildings within AOI 2 had indoor air samples that exhibited COC exceedances above the PADEP, NIOSH, or ACGIH indoor air SHS screening values. Indoor air samples collected in 2012 and 2016 exhibited exceedances of one-tenth of the PADEP indoor air SHS screening value, and/or the EPA industrial RSLs at a target cancer risk of 1E-06 and a hazard quotient of 0.1 indoor air screening values, and/or the EPA industrial RSLs at a target cancer risk of 1E-05 and a hazard quotient of 0.1 indoor air screening values. However, some of the laboratory reporting limits were above the applicable PADEP screening values. These buildings will be further evaluated by Evergreen as part of the forthcoming Complex-wide Human Health Risk Assessment report and the Complex-wide Cleanup Plan.

LNAPL

- The majority of LNAPL in AOI 2 is located in the area of the Pollock Street remedial systems (Pollock Street West End System and Pollock Street Horizontal Well System) and is actively being controlled and recovered.
- Recently installed monitoring wells on the riverside of the vertical wall did not display evidence of LNAPL during installation. These monitoring wells will be added to the Complex-wide groundwater monitoring program.
- The horizontal extents of the LNAPL plumes within AOI 2, relative to the Complex boundaries, have been characterized. Based on the LNAPL types, LNAPL modeling results and historic groundwater gauging and sampling activities, LNAPL present in

AOI 2, with the exception of the middle distillate plume in the northwest of the AOI, is relatively immobile or hydraulically controlled by the active remedial systems. Evergreen will continue to monitor wells in the vicinity of this LNAPL plume and evaluate the potential mobility as part of the Complex-wide Cleanup Plan.

- LNAPL does not appear to have the potential to migrate off-site. PES will continue to monitor the Pollock Street Sewer Outfall for fugitive LNAPL.
- Additionally, the low concentrations of dissolved COCs detected in groundwater samples collected beneath LNAPL indicate the LNAPL bodies within AOI 2 are a not a significant source for dissolved COCs in groundwater.
- There are no complete direct contact exposure pathways for LNAPL within AOI 2 because of on-site permitting procedures and required PPE which limit potential exposure.
- Evergreen will continue to monitor the LNAPL condition at the Pollock Street West End System as part of the Complex-wide Cleanup Plan.

12.0 LIST OF CONTACTS

Below is the list of contacts associated with the RIR:

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13.0 SIGNATURES

The following parties are participating in the remediation at this time and are seeking relief from liability under Act 2 of 1995:



Tiffani L. Doerr, PG
Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC

This Act 2 RIR has been prepared in accordance with the final provisions of Act 2 and the June 8, 2002 Land Recycling Program Technical Guidance Manual.

14.0 REFERENCES

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TABLES

Table 1
Constituents of Concern
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

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

VOCs	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 (EDB)	106-93-4
Methyl Tertiary Butyl Ether	1634-04-4
Toluene	108-88-3
Xylene (Total)	1330-20-7

SVOCs/ PAHs	CAS No.
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Benzo(g,h,i)perylene	191-24-2
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. In May 2009, two additional COCs, 1,2,4-trimethylbenze (1,2,4-TMB) and 1,3,5-trimethylbenzene (1,3,5-TMB), were added to the list of COCs by Evergreen based on the PADEP's revisions to the petroleum short list of compounds and at the request of the PADEP. The COC listing for groundwater was also revised in 2012 to follow the soil COC listing.

Table 2
Existing Well Summary
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

AOI #	Well ID	Former Well ID[1]	Well Status/ Description	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]								References	Product Characterization		
											Well Completion Depth (feet below ground surface)	Well Diameter (inches)	Top of Inner Casing Elevation (feet above mean sea level)[4]	Ground Surface Elevation (feet above mean sea level)	Top of Screen Elevation (feet above mean sea level)	Bottom of Screen Elevation (feet above mean sea level)	Depth to Screen (feet below ground surface)	Screen Length (feet)		Specific Gravity[5]	Source[6]	Percentage and Product Type(s)
2	C-HEADER	--	--	222231.819	2684451.87	Monitoring Well	Unconfined	--	Y	5/28/2003	21	2	20.61	20.888	19.888	-0.112	1	20	Aquaterra 2003	0.8623	S-130	Condensate 100% (Extreme)
2	HW-1 (end)	--	--	222330.08	2683772.02	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	HW-1 (start)	--	--	222371.44	2683456.01	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	HW-2 (end)	--	--	222256.97	2684316.5	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	HW-2 (start)	--	--	222306.99	2683954.8	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	HW-3 (end)	--	--	222156.92	2684857.61	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	HW-3 (start)	--	--	222235.8	2684343.43	Horizontal Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	PGW-MW-8S	PGW-8S	--	224040.79	2684217.8	Monitoring Well	Unconfined	Y	Y	9/29/2003	39.5	4	35.08	--	--	--	25	15	Weston, 2003, Survey Data from 6-1-12 Gauging	--	--	--
2	PGW-MW-8D	--	--	223961.52	2684089.38	Monitoring Well	Lower Aquifer	Y	Y	9/30/2003	79	4	35.11	--	--	--	69	10	Weston, 2003	--	--	--
2	PH-71	--	Destroyed	--	--	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--	USGS, 1989	--	--	--
2	PH-72	--	Destroyed	--	--	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--	USGS, 1989	--	--	--
2	PZ-100	--	Damaged	222350.3	2683602.32	Temporary Piezometer	Unconfined	--	--	--	--	2	18.071	17.05	--	--	--	--	Handex, 2004	--	--	--
2	PZ-101	--	--	222295.98	2683594.66	Temporary Piezometer	Unconfined	--	--	--	--	--	17.17	--	--	--	--	--	Handex, 2004	--	--	--
2	RW-100	PH-6	Active	222348.922	2683341.466	Recovery Well - Active	Unconfined	Y	Y	5/4/1994	31	6	20.726	20.338	1.338	-8.662	19	10	GES, 1994	0.8692	S-158	Residual Oil 90% (Extreme), Naphtha1 10% (Extreme)
2	RW-101	PH-10	Active	222383.836	2683489.458	Recovery Well - Active	Unconfined	Y	Y	5/9/1994	30.5	6	19.77	19.37	1.37	-8.63	18	10	GES, 1994	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	RW-102	PH-8	Active	222320.524	2683598.667	Recovery Well - Active	Unconfined	Y	Y	5/10/1994	29	6	17.47	17.24	0.24	-9.76	17	10	GES, 1994	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	RW-103	PH-7	Active	222358.12	2683770.036	Recovery Well - Active	Unconfined	Y	Y	5/9/1994	31	6	20.01	19.76	-0.24	-10.24	20	10	GES, 1994	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	RW-104	--	Active	222446.462	2682959.542	Recovery Well - Active	Unconfined	Y	Y	8/18/1995	20	6	8.96	10.11	2.11	-15.89	8	18	GES, 1995	0.875	RW-117	NA (NA)
2	RW-105	--	Active	222412.361	2682963.694	Recovery Well - Active	Unconfined	Y	Y	8/10/1995	20	6	8.68	10.13	2.13	-7.87	8	10	GES, 1995	0.875	RW-117	NA (NA)
2	RW-106	--	Active	222348.374	2682946.186	Recovery Well - Active	Unconfined	Y	Y	8/9/1995	20	6	9.3	10.29	2.29	-7.71	8	10	GES, 1995	0.875	RW-117	NA (NA)
2	RW-107	--	Active	222272.017	2682915.348	Recovery Well - Active	Unconfined	--	--	--	--	6	10.55	10.2	--	--	--	--	Handex, 2004	--	--	--
2	RW-108	--	Inactive	222180.78	2682895.3	Recovery Well - Inactive	Unconfined	Y	Y	8/9/1995	20	6	9.9	9.34	1.34	-8.66	8	10	GES Boring, 1995	--	--	--
2	RW-109	--	Inactive	222084.011	2682882.538	Recovery Well - Inactive	--	--	--	--	--	--	9.852	9.512	--	--	--	--	Handex, 2004	0.9211	N-68	Lube Oil 50% (Extreme), Middle Distillate 50% (Extreme)
2	RW-113	--	--	222408.839	2682987.553	Recovery Well	Unconfined	N	N	--	30	6	10.23	11.1	1.1	-18.9	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-114	--	--	222391.753	2683022.894	Recovery Well	Unconfined	N	N	--	30	6	13.01	14.4	4.4	-15.6	10	20	Sunoco, 2012	0.856	--	--
2	RW-115	S-345	--	222371.149	2682980.135	Recovery Well	Unconfined	N	N	--	30	6	10.2	11.3	1.3	-18.7	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-116	B-3 & S-334	--	222340.325	2682987.254	Recovery Well	Unconfined	N	N	--	30	6	10.81	11.89	1.89	-18.11	10	20	URS, 2011	0.875	RW-117	NA (NA)
2	RW-117	S-343	Active	222319.91	2682964.149	Recovery Well	Unconfined	N	N	--	30	6	9.78	10.94	0.94	-19.06	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-118	S-341	--	222302.273	2682998.926	Recovery Well	Unconfined	N	N	--	30	6	11.82	12.97	2.97	-17.03	10	20	Sunoco, 2012	0.875	RW-118	NA (NA)
2	RW-119	S-340	--	222332.003	2683012.657	Recovery Well	Unconfined	N	N	--	30	6	12.85	13.94	3.94	-16.06	10	20	Sunoco, 2012	0.856	--	--
2	RW-120	S-339	--	222352.858	2683026.776	Recovery Well	Unconfined	N	N	--	19	6	13.58	14.77	4.77	-4.23	10	9	Sunoco, 2012	0.856	--	--
2	RW-121	S-250	--	222376.239	2683050.397	Recovery Well	Unconfined	N	N	--	30	6	15.3	16.3	11.3	-8.7	5	20	Sunoco, 2012	0.856	--	--
2	RW-122	--	Active	222264.771	2682978.087	Recovery Well	Unconfined	N	N	--	30	6	10.24	11.42	1.42	-18.58	10	20	Sunoco, 2012	0.8417	RW-122	--
2	RW-123	S-342	--	222296.448	2682969.047	Recovery Well	Unconfined	N	N	--	30	6	9.97	10.98	0.98	-19.02	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-124	--	Active	222249.641	2682957.982	Recovery Well	Unconfined	N	N	--	30	6	9.16	10.28	0.28	-19.72	10	20	Sunoco, 2012	0.8412	--	--
2	RW-125	--	--	222428.048	2683040.046	Recovery Well	Unconfined	N	N	--	30	6	14.27	15.7	5.7	-14.3	10	20	Sunoco, 2012	0.856	--	--
2	RW-126	--	--	222285.475	2682935.601	Recovery Well	Unconfined	N	N	--	30	6	9.23	10.35	0.35	-19.65	10	20	Sunoco, 2012	0.8412	--	--
2	RW-127	--	--	222383.189	2683036.131	Recovery Well	Unconfined	N	N	--	30	6	13.9	15.35	5.35	-14.65	10	20	Sunoco, 2012	0.856	--	--
2	RW-128	--	Active	222437.797	2682987.634	Recovery Well	Unconfined	N	N	--	30	6	8.43	9.8	-0.2	-20.2	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-129	--	Active	222434.172	2683008.073	Recovery Well	Unconfined	N	N	--	30	6	9.83	11.45	1.45	-18.55	10	20	Sunoco, 2012	0.875	RW-117	NA (NA)
2	RW-600	--	Unable to Locate	223296.182	2683368.779	Monitoring Well	Unconfined	N	Y	6/3/1997	24.83	6	9.051	9.07	4.49	-15.51	5	20	Handex, 1997	--	--	--
2	RW-601	--	Damaged	223212.994	2683325.051	Recovery Well	Unconfined	N	Y	6/5/1997	24.58	6	11.683	11.894	7.564	-12.436	4	20	Handex, 1997	0.7677	S-110	--
2	RW-602	--	Inactive	223248.57	2683337.66	Recovery Well - Inactive	Unconfined	N	Y	6/6/1997	24.92	6	8.13	8.13	3.46	-16.54	5	20	Handex, 1997	0.8229	S-297	Middle Distillate 75% (Extreme), Aviation Gasoline 15% (Extreme), Heavier Material 10% (Extreme)
2	RW-603	--	Unable to Locate	--	--	Recovery Well	--	Y	Y	--	--	--	--	--	--	--	--	--	Handex, 2001	--	--	--
2	S-105	--	Damaged	223163.98	2683300.396	Monitoring Well	Unconfined	Y	Y	7/10/1996	10	2	12.531	11.14	8.14	1.14	3	7	Handex, 1996	--	--	--
2	S-106	--	--	223225.623	2683321.415	Monitoring Well	Unconfined	Y	Y	7/10/1996	19.59	2	11.363	11.663	9.163	-7.837	3	17	Handex, 1996	--	--	--
2	S-107	--	--	223258.144	2683338.425	Monitoring Well	Unconfined	Y	Y	7/10/1996	18.41	2	12.314	10.995	8.495	-5.505	3	14	Handex, 1996	0.7677	S-110	--
2	S-108	--	--	223294.27	2683361.62	Monitoring Well	Unconfined	Y	Y	6/10/1996	17.09	2	10.721	8.962	5.962	-8.038	3	14	Handex, 1996	0.8236	S-109	--
2	S-109	--	Destroyed	223248.05	2683300.83	Monitoring Well	Unconfined	Y	Y	6/10/1996	10.08	2	10.13	10.16	7.66	0.66	3	7	Handex Boring log	0.8236	S-109	--
2	S-110	--	--	223250.196	2683409.695	Monitoring Well	Unconfined	Y	Y	6/11/1996	27.16	2	25.672	23.077	16.077	-3.923	7	20	Handex Boring log	0.7677	S-110	--
2	S-128	PS-1	Destroyed	222366.54	2683653.78	Monitoring Well	Unconfined	Y	Y	5/7/2002	30	4	20.72	20.13	10.13	-9.87	10	20	Aquaterra 2002	--	--	--
2	S-129	PS-2	Destroyed	222366.11	2683689.83	Monitoring Well	Unconfined	Y	Y	5/7/2002	30	4	21.03	20.29	10.29	-9.71	10	20	Aquaterra 2002	--	--	--
2	S-130	PS-3	--	222280.476	2684124.413	Monitoring Well	Unconfined	Y	Y	5/8/2002	28	4	22.48	20.411	12.411	-7.589	8	20	Aquaterra 2002	0.8623	S-130	Condensate 100% (Extreme)
2	S-131	PS-4	Damaged	222307.096	2684099.695	Monitoring Well	Unconfined	Y	Y	5/8/2002	26	4	18.76	18.91	12.91	-7.09	6	20	Aquaterra 2002	0.8623	S-130	Condensate 100% (Extreme)
2	S-132	PS-5	--	222242.913	2684094.998	Monitoring Well	Unconfined	Y	Y	5/8/2002	30	4	21.029	21.241	11.241	-8.759	10	20	Aquaterra 2002	--	--	--
2	S-133	PS-6	--	222302.858	2684055.92	Monitoring Well	Unconfined	Y	Y	5/9/2002	28	4	22.024	19.631	11.631	-8.369	8	20	Aquaterra 2002	--	--	--
2	S-134	PS-7	--	222208.58	2684440.917	Monitoring Well	Unconfined	Y	Y	5/9/2002	28	4	22.033	20.613	12.613	-7.387	8	20	Aquaterra 2002	--	--	--
2	S-135	PS-9	--	222277.622	2684161.965	Monitoring Well	Unconfined	Y	Y	--	28	4	23.19	20.34	12.34	-7.66	8	20	Aquaterra 2002	0.8623	S-130	Condensate 100% (Extreme)
2	S-136	PS-8	--	222257.296	2684134.648	Monitoring Well	Unconfined	Y	Y	5/13/2002	28	4	20.594	20.948	12.948	-7.052	8	20	Aquaterra 2002	0.8623	S-130	Condensate 100% (Extreme)
2	S-137	PS-7	Damaged	222273.202	2684043.263	Monitoring Well	Unconfined	Y	Y	5/13/2002	28	4	20.044	20.464	12.464	-7.536	8	20	Aquaterra 2002	--	--	--
2	S-138	PS-11	Destroyed	222508.29	2683504.86	Monitoring Well	Unconfined	Y	Y	5/14/2002	28	4	22.89	21.65	13.65	-6.35	8	20	Aquaterra 2002	0.8957	S-138	Lube Oil 90% (Extreme), Gasoline1 10% (Extreme)
2	S-139	PS-12	--	222391.788	2683570.196	Monitoring Well	Unconfined	Y	Y	5/14/2002	28	4	21.462	18.901	10.901	-9.099	8	20	Aquaterra 2002	--	--	--
2	S-140	PS-13	--	222441.116	2683479.476	Monitoring Well	Unconfined	Y	Y	5/14/2002	28	4	22.032	20.468	12.468	-7.532	8	20	Aquaterra 2002	--	--	--
2	S-141	PS-14	--	222387.422	2683426.715	Monitoring Well	Unconfined	Y	Y	5/15/2002	28	4	21.923	19.965	11.965	-8.035	8	20	Aquaterra 2002	0.8692	S-158	Residual Oil 90% (Extreme), Naphtha1 10% (Extreme)
2	S-142	PS-15	--	222347.94	2683609.121	Monitoring Well	Unconfined	Y	Y	5/15/2002	28	4	19.84	17.81	9.81	-10.19	8	20	Aquaterra 2002	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	S-143	PS-16	Damaged	222448.692	2683521.683	Monitoring Well	Unconfined	Y	Y	5/15/2002	28	4	22.719	21.345	13.345	-6.655	8	20	Aquaterra 2002	0.8957	S-138	Lube Oil 90% (Extreme), Gasoline1 10% (Extreme)
2	S-144	PS-17	Unable to Locate	222338.23	2683681.59	Monitoring Well	Unconfined	Y	Y	5/15/2002	28	4	21.71	19.67	11.67	-8.33	8	20	Aquaterra 2002	--	--	--
2	S-145	MW-A	Unable to Locate	223242.14	2683324.16	Monitoring Well	Unconfined	Y	Y	1/14/2002	14	4	10.38	10.96	8.96	-1.04	2	10	Secor, 2003	--	--	--
2	S-146	MW-B	Destroyed	223263.11	2683325.13	Monitoring Well	Unconfined	Y	Y	1/15/2002	9.5	4	8.8	9.4	8.9	-0.1	1	9	Secor, 2003	--	--	--
2	S-147	MW-C	Unable to Locate	223227.953	2683311.082	Monitoring Well	Unconfined	Y	Y	1/15/2002	13.5	4	10.282	11.183	7.683	-2.317	4	10	Secor, 2003	--	--	--
2	S-148	MW-D	Destroyed	223268.88	2683306.83	Monitoring Well	Unconfined	Y	Y	1/15/2002	9	4	8.43	9.04	7.04	0.04	2	7	Aquaterra 2003	--	--	--
2	S-149	MW-E	Unable to Locate	223223.065	2683284.292	Monitoring Well	Unconfined	Y	Y	1/15/2002	13	4	9.506	9.857	6.857	-3.143	3	10	Secor, 2003	--	--	--
2	S-150	MW-F	--	223189.281	2683393.409	Monitoring Well	Unconfined	Y	Y	1/16/2002	21.5	4	20.831	20.908	9.908	-0.092	11	10	Aquaterra 2003	0.7677	S-110	--
2	S-151	MW-G	Destroyed	223240.61	2683456.79	Monitoring Well	Unconfined	Y	Y	1/17/2002	35	4	22.38	22.88	10.88	-9.12	12	20	Aquaterra 2003	--	--	--
2	S-152	MW-H	Unable to Locate	223246.89	2683336.81	Monitoring Well	Unconfined	Y	Y	1/22/2002	22	4	10.49	11.1	9.1	-10.9	2	20	Secor, 2003	--	--	--
2	S-153	MW-I	--	223236.568	2683288.563	Monitoring Well	Unconfined	Y	Y	1/23/2002	26	4	9.813	9.955	-6.045	-16.045	16	10	Secor, 2003	--	--	--
2	S-154	MW-J	--	223235.541	2683290.309	Monitoring Well	Unconfined	Y	Y	1/24/2002	15	4	10.621	10.138	5.138	-4.862	5	10	Secor, 2003	--	--	--
2	S-155	MW-K	Unable to Locate	223179.57	2683445.72	Monitoring Well	Unconfined	Y	Y	1/24/2002	28	4	21.72	22.49	14.49	-5.51	8	20	Secor, 2003	--	--	--
2	S-156	RW-1	--	222281.293	2684179.799	Monitoring Well	Unconfined	Y	Y	--	28	4	20.84	21.18	13.18	-6.82	8	20	Handex, 2004	0.8623	S-130	Condensate 100% (Extreme)
2	S-157	RW-2	--	222285.03	2684106.77	Monitoring Well	Unconfined	Y	Y	--	28	6	19.94	20.29	12.29	-7.71	8	20	Handex, 2004	0.8623	S-130	Condensate 100% (Extreme)
2	S-158	--	Unable to Locate	222368.9	2683265.5	Monitoring Well	Unconfined	N	--	--	--	--	--	--	--	--	--	--	--	0.8692	S-158	Residual Oil 90% (Extreme), Naphtha1 10% (Extreme)
2	S-159	--	--	222304.318	2683729.837	Monitoring Well	Unconfined	Y	Y	5/14/2003	20	2	18.867	19.167	14.167	-0.833	5	15	Handex, 2004	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	S-165	--	--	222154.023	2684907.277	Monitoring Well	Unconfined	Y	Y	5/16/2003	19.5	2	18.105	18.3	13.8	-1.2	5	15	Aquaterra, 2003	--	--	--
2	S-166	--	--	222169.749	2684909.112	Monitoring Well	Unconfined	Y	Y	5/16/2003	20	2	18.229	18.217	13.217	-6.783	5	20	Aquaterra, 2003	--	--	--
2	S-167	--	Unable to Locate	222193.782	2684770.687	Monitoring Well	Unconfined	Y	Y	5/16/2003	22	2	19.41	19.619	14.619	-2.381	5	17	Aquaterra, 2003	--	--	--
2	S-168	--	Unable to Locate	222194.56	2684770.85	Monitoring Well	Unconfined	Y	Y	5/27/2003	25	4	19.62	19.85	14.85	-5.15	5	20	Aquaterra, 2003	--	--	--
2	S-169	--	Unable to Locate	222177.51	2684733.86	Monitoring Well	Unconfined	Y	Y	5/16/2003	20	2	19.29	19.81	14.81	-5.19	5	20	Aquaterra, 2003	--	--	--
2	S-174	--	--	222200.505	2684537.925	Monitoring Well	Unconfined	Y	Y	5/27/2003	22	2	19.62	19.75	14.75	-2.25	5	17	Aquaterra, 2003	0.8623	S-130	Condensate 100% (Extreme)
2	S-175	--	--	222225.601	2684499.744	Monitoring Well	Unconfined	Y	Y	5/20/2003	22	2	20.036	20.401	15.401	-3.599	5	19	Aquaterra, 2003	0.8623	S-130	Condensate 100% (Extreme)
2	S-176	--	Destroyed	222207.41	2684496.02	Monitoring Well	Unconfined	Y	Y	--	20	2	20.13	20.25	17.25	0.25	3	17	Aquaterra, 2003	--	--	--
2	S-177	--	--	222203.514	2684661.306	Monitoring Well	Unconfined	Y	Y	5/27/2003	21	2	19.555	19.685	15.685	-1.315	4	17	Aquaterra, 2003	--	--	--
2	S-178	--	--	222187.956	2684660.879	Monitoring Well	Unconfined	Y	Y	5/27/2003	22	2	19.536	19.712	14.712	-2.288	5	17	Aquaterra, 2003	0.8623	S-130	Condensate 100% (Extreme)
2	S-246A	S-246	--	222348.398	2682915.427	Monitoring Well	--	N	--	--	--	--	11.764	9.374	--	--	--	--	--	--	--	--
2	S-247	--	--	222381.399	2682920.978	Monitoring Well	--	N	--	--	--	--	12.094	9.642	--	--	--	--	--	--	--	--
2	S-248	--	--	222393.743	2682933.258	Monitoring Well	--	N	--	--	--	--	10.799	8.477	--	--	--	--	--	--	--	--
2	S-249	--	--	222443.654	2682939.25	Monitoring Well	--	N	--	--	--	--	12.613	--	--	--	--	--	--	--	--	--
2	S-251	--	--	222361.746	2683286.034	Recovery Well	Unconfined	N	N	--	30	4	19.27	20.61	15.61	-4.39	5	20	Sunoco, 2012	--	--	--
2	S-252	--	--	222357.389	2683256.711	Recovery Well	Unconfined	N	N	--	30	4	19.29	20.36	15.36	-4.64	5	20	Sunoco, 2012	--	--	--
2	S-253	--	--	222420.278	2683301.006	Recovery Well	Unconfined	N	N	--	30	4	20.83	22.11	17.11	-2.89	5	20	Sunoco, 2012	0.8694	S-313	Middle Distillate 60% (Extreme), Unknown Light Material 20% (Extreme), Heavier Material 20%
2	S-254	--	--	222413.634	2683168.068	Recovery Well	Unconfined	N	N	--	30	4	20.88	21.91	16.91	-3.09	5	20	Sunoco, 2012	0.865	S-315	NA (NA)
2	S-292	--	--	223718.469	2683561.768	Monitoring Well	Unconfined	Y	Y	6/16/2010	20	4	28.773	29.386	19.386	9.386	10	10	Aquaterra, 2010	--	--	--
2	S-294	--	--	224162.262	2684672.756	Monitoring Well	Unconfined	Y	Y	5/26/2010	40	4	34.466	35.118	10.118	-4.882	25	15	Aquaterra, 2010	--	--	--
2,11	S-294D	--	--	224164.508	2684682.46	Monitoring Well	Lower Aquifer	Y	Y	6/10/2010	99	4	34.679	35.067	-48.933	-63.933	84	15	Aquaterra, 2010	--	--	--
2	S-295	--	--	223800.51	2684379.192	Monitoring Well	Unconfined	Y	Y	6/8/2010	24	4	32.735	33.125	24.125	9.125	9	15	Aquaterra, 2010	--	--	--
2	S-297	--	Damaged	223494.72	2683613.394	Monitoring Well	Unconfined	Y	Y	5/6/2010	36	4	30.008	28.219	7.219	-7.781	21	15	Aquaterra, 2010	0.8229	S-297	Middle Distillate 75% (Extreme), Aviation Gasoline 15% (Extreme), Heavier Material 10% (Extreme)
2	S-298	--	--	223263.415	2683858.759	Monitoring Well	Unconfined	Y	Y	5/25/2010	20	4	26.996	25.483	20.483	5.483	5	15	Aquaterra, 2010	0.7677	S-110	--
2	S-299	--	--	222978.196	2683545.486	Monitoring Well	Unconfined	Y	Y	6/8/2010	28	4	24.003	21.773	8.773	-6.227	13	15	Aquaterra, 2010	--	--	--
2	S-300	--	--	222829.549	2684308.401	Monitoring Well	Unconfined	Y	Y	5/20/2010	30	4	25.279	23.985	8.985	-6.015	15	15	Aquaterra, 2010	--	--	--
2	S-301	--	--	222550.546	2684441.696	Monitoring Well	Unconfined	Y	Y	6/8/2010	28	4	20.4058	21.058	12.9218	-6.942	8	15	Aquaterra, 2010	--	--	--
2	S-302	--	--	222612.708	2683250.986	Monitoring Well	Unconfined	Y	Y	5/12/2010	30	4	23.953	22.141	7.141	-7.859	15	15	Aquaterra, 2010	0.865	S-315	NA (NA)
2,11	S-302D	--	--	222606.828	2683247.675	Monitoring Well	Lower Aquifer	Y	Y	5/10/2010	92	4	24.602	22.051	-54.949	-69.949	77	15	Aquaterra, 2010	--	--	--
2	S-302S	--	--	222612.708	2683250.986	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	S-303	--	--	222409.188	2683678.208	Monitoring Well	Unconfined	Y	Y	5/24/2010	26	4	22.587	20.707	9.707	-5.293	11	15	Aquaterra, 2010	--	--	--

Table 2
Existing Well Summary
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

AOI #	Well ID	Former Well ID[1]	Well Status/ Description	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]								References	Product Characterization		
											Well Completion Depth (feet below ground surface)	Well Diameter (inches)	Top of Inner Casing Elevation (feet above mean sea level)[4]	Ground Surface Elevation (feet above mean sea level)	Top of Screen Elevation (feet above mean sea level)	Bottom of Screen Elevation (feet above mean sea level)	Depth to Screen (feet below ground surface)	Screen Length (feet)		Specific Gravity[5]	Source[6]	Percentage and Product Type(s)
2	S-304	--	Damaged	222276.478	2684506.104	Monitoring Well	Unconfined	Y	Y	6/9/2010	18	4	24.18	20.7	12.7	2.7	8	10	Aquaterra, 2010	0.8623	S-130	Condensate 100% (Extreme)
2	S-305	--	--	221997.384	2684882.6	Monitoring Well	Unconfined	Y	Y	5/19/2010	29	4	19.728	18.213	4.213	-10.787	14	15	Aquaterra, 2010	--	--	--
2,11	S-305D	--	--	221989.608	2684881.879	Monitoring Well	Lower Aquifer	Y	Y	6/1/2010	82	4	20.475	17.9	-49.1	-64.1	67	15	Aquaterra, 2010	--	--	--
2	S-306	--	--	222297.333	2683117.453	Monitoring Well	Unconfined	Y	Y	5/19/2010	30	4	22.466	20.084	5.084	-9.916	15	15	Aquaterra, 2010	--	--	--
2	S-307	--	--	221764.243	2683507.725	Monitoring Well	Unconfined	Y	Y	6/10/2010	26	4	18.571	16.451	5.451	-9.549	11	15	Aquaterra, 2010	--	--	--
2	S-308	--	--	221383.028	2682915.492	Monitoring Well	Unconfined	Y	Y	4/30/2010	20	4	28.109	25.39	20.39	5.39	5	15	Aquaterra, 2010	--	--	--
2	S-309	--	--	221511.876	2683391.028	Monitoring Well	Unconfined	Y	Y	4/29/2010	20	4	19.733	17.022	12.022	-2.978	5	15	Aquaterra, 2010	--	--	--
2	S-310	--	Damaged	221511.424	2683799.788	Monitoring Well	Unconfined	Y	Y	4/30/2010	20	4	18.06	14.87	9.87	-5.13	5	15	Aquaterra, 2010	--	--	--
2	S-311	--	--	221517.843	2684447.587	Monitoring Well	Unconfined	Y	Y	5/18/2010	33	4	26.177	24.515	6.515	-8.485	18	15	Aquaterra, 2010	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-313	--	--	222420.484	2683327.237	Monitoring Well	Unconfined	Y	Y	5/7/2010	30	4	20.9	22.14	7.14	-7.86	15	15	Aquaterra, 2010	0.8694	S-313	Middle Distillate 60% (Extreme), Unknown Light Material 20% (Extreme), Heavier Material2 20% (Extreme)
2	S-314	--	--	222411.244	2683250.321	Recovery Well	Unconfined	Y	Y	5/11/2010	30	4	20.7	22.1	7.1	-7.9	15	15	Aquaterra, 2010	--	--	--
2	S-315	--	--	222405.894	2683224.603	Monitoring Well	Unconfined	Y	Y	5/11/2010	30	4	20.47	21.78	6.78	-8.22	15	15	Aquaterra, 2010	0.865	S-315	NA (NA)
2	S-316	--	Active	222403.913	2683194.137	Recovery Well - Active	Unconfined	Y	Y	5/10/2010	30	4	20.9	21.84	6.84	-8.16	15	15	Aquaterra, 2010	0.865	S-315	NA (NA)
2	S-317	--	--	222440.309	2683227.236	Recovery Well	Unconfined	Y	Y	5/7/2010	30	4	20.19	21.37	6.37	-8.63	15	15	Aquaterra, 2010	--	--	--
2	S-318	--	--	222515.986	2683216.416	Monitoring Well	Unconfined	Y	Y	5/12/2010	30	4	23.754	21.808	6.808	-8.192	15	15	Aquaterra, 2010	0.865	S-315	NA (NA)
2	S-328	--	--	222582.161	2683641.906	Monitoring Well	Unconfined	Y	Y	6/11/2010	26	4	21.965	22.472	11.472	-3.528	11	15	Aquaterra, 2010	0.8957	S-138	Lube Oil 90% (Extreme), Gasoline1 10% (Extreme)
2	S-333	B-2	--	222372.334	2682919.938	Monitoring Well	Unconfined	Y	Y	--	--	--	13.73	10.79	--	--	--	--	URS, 2011	--	--	--
2	S-335	B-5	Damaged	222842.77	2683112.75	Monitoring Well	Unconfined	Y	Y	--	--	--	10.1	9.8	--	--	--	--	URS, 2011	0.8957	S-138	Lube Oil 90% (Extreme), Gasoline1 10% (Extreme)
2	S-336	B-6	--	222812.899	2683167.223	Monitoring Well	Unconfined	Y	Y	--	--	--	11.52	9.16	--	--	--	--	URS, 2011	--	--	--
2	S-337	B-8	--	223172.037	2683259.93	Monitoring Well	Unconfined	Y	Y	--	--	--	12.21	9.68	--	--	--	--	URS, 2011	0.8236	S-109	--
2	S-338	B-9	--	223144.77	2683320.421	Monitoring Well	Unconfined	Y	Y	--	--	--	15.54	13.09	--	--	--	--	URS, 2011	0.7677	S-110	--
2	S-346	--	--	222199.505	2684760.449	Monitoring Well	Unconfined	Y	Y	7/31/2012	35	4	19.488	19.75	4.75	-15.25	15	20	Aquaterra, 2012	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-347	--	--	222199.392	2684711.583	Monitoring Well	Unconfined	Y	Y	8/1/2012	35	4	19.129	19.76	4.76	-15.24	15	20	Aquaterra, 2012	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-348	--	--	222330.373	2683866.498	Monitoring Well	Unconfined	Y	Y	8/2/2012	30	4	19.582	20.11	10.11	-9.89	10	20	Aquaterra, 2012	0.881	--	--
2	S-349	--	--	222323.864	2683818.805	Monitoring Well	Unconfined	Y	Y	8/3/2012	30	4	18.611	19.27	9.27	-10.73	10	20	Aquaterra, 2012	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	S-350	--	--	224223.281	2684656.274	Monitoring Well	Unconfined	Y	Y	4/18/2013	35	4	31.477	56.378	20	--	36	15	Langan, 2013,/ Aquaterra, 2013	--	--	--
2	S-351	--	--	224112.18	2684319.365	Monitoring Well	Unconfined	Y	Y	4/16/2013	38	4	35.235	32.985	23	--	10	15	Langan, 2013,/ Aquaterra, 2013	--	--	--
2	S-354	--	--	223704.848	2683498.635	Monitoring Well	Unconfined	Y	Y	4/11/2013	35	4	28.026	28.354	20	--	8	15	Langan, 2013,/ Aquaterra, 2013	--	--	--
2	S-355	--	--	223590.143	2683594.097	Monitoring Well	Unconfined	Y	Y	4/10/2013	35	4	30.822	28.164	20	--	8	15	Langan, 2013,/ Aquaterra, 2013	0.8229	S-297	Middle Distillate 75% (Extreme), Aviation Gasoline 15% (Extreme), Heavier Material2 10% (Extreme)
2	S-356	--	--	223545.881	2683443.028	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	S-357	--	--	223381.818	2683532.524	Monitoring Well	Unconfined	Y	Y	4/13/2013	32	4	28.0986	--	--	--	9	15	Langan, 2013,/ Aquaterra, 2013	0.8229	S-297	Middle Distillate 75% (Extreme), Aviation Gasoline 15% (Extreme), Heavier Material2 10% (Extreme)
2	S-359	--	--	222117.485	2683809.141	Monitoring Well	Unconfined	Y	Y	4/5/2013	28	4	20.276	17.563	13	--	5	15	Langan, 2013,/ Aquaterra, 2013	0.8623	S-130	Condensate 100% (Extreme)
2	S-360	--	--	221892.867	2684418.606	Monitoring Well	Unconfined	Y	Y	3/29/2013	30	4	23.798	21.287	15	--	6	15	Langan, 2013,/ Aquaterra, 2013	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-361	--	--	221778.747	2684108.605	Monitoring Well	Unconfined	Y	Y	4/3/2013	32	4	26.366	23.885	17	--	7	15	Langan, 2013,/ Aquaterra, 2013	--	--	--
2	S-362	--	Damaged	221670.524	2684097.728	Monitoring Well	Unconfined	Y	Y	4/3/2013	32	4	23.799	21.423	17	--	4	15	Langan, 2013,/ Aquaterra, 2013	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-363	--	--	221643.085	2684409.844	Monitoring Well	Unconfined	Y	Y	3/28/2013	30	4	25.858	23.186	15	--	8	15	Langan, 2013,/ Aquaterra, 2013	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-406	S-382 (AOI 2), Warehouse MW-2, AOI2-WAREHOUSE#2	--	222568.712	2683061.89	Monitoring Well	--	--	--	--	--	--	12.196	9.726	--	--	--	--	Langan, 2013	0.865	S-315	NA (NA)
2	S-420	S-383 (AOI 2)	--	222511.9	2682996.09	Monitoring Well	--	N	N	6/15/2012	--	4	9.26	8.6	--	--	--	5	Stantec, 2012	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-422	--	--	221879.847	2682860.754	Monitoring Well	Unconfined	Yes	Yes	7/22/2016	25	4	16.57	14.16	9.16	-10.84	5	--	AQUATERRA, 2016	--	--	--
2	S-423	--	--	223536.493	2683543.006	Monitoring Well	Unconfined	Yes	Yes	7/27/2016	35	4	31.46	29.4	14.4	-5.6	15	--	AQUATERRA, 2016	--	--	--
2	S-424	--	Reserved	223971.125	2683706.537	Monitoring Well	--	--	--	--	--	--	--	--	--	--	--	--	AQUATERRA, 2016	--	--	--
2	S-48	SM-11	Damaged	222220.541	2684871.017	Monitoring Well	Unconfined	Y	N	12/18/1984	24.75	--	21.2714	18.711	--	--	--	--	Sun, 1993	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-53	AS-10A	--	222278.925	2684179.402	Monitoring Well	Unconfined	Y	Y	2/12/1982	27	2	21.68	21.04	3.54	-7.96	18	11.5	Sun, 1993	0.8623	S-130	Condensate 100% (Extreme)
2	S-54	SM-14	--	221765.723	2684412.265	Monitoring Well	Unconfined	Y	N	12/20/1984	30.5	--	22.972	21.541	--	--	--	--	Sun, 1993	0.803	S-201	Middle Distillate 60% (Slight), Gasoline 40% (Slight)
2	S-61	SM-13, 61	--	221700.585	2683868.702	Monitoring Well	Unconfined*	Y	N	12/17/1984	25	--	18.302	16.315	--	--	--	--	Sun, 1993	0.8623	S-130	Condensate 100% (Extreme)
2	S-62	65	--	222318.88	2683629.517	Monitoring Well	Unconfined	Y	Y	12/12/1986	31	2	21.377	18.888	4.888	-9.112	14	14	Sun, 1993	0.879	S-142	Heavier Material2 90% (Extreme), Gasoline 10% (Extreme)
2	S-63	SM-12	--	222268.512	2683223.195	Monitoring Well	Unconfined	Y	N	12/19/1984	22.1	2	21.27	18.15	18.15	18.15	0	--	Sun, 1993	0.8692	S-158	Residual Oil 90% (Extreme), Naphtha1 10% (Extreme)
2	S-64	S-77	--	222212.294	2682948.788	Monitoring Well	Unconfined	Y	Y	8/3/1988	24	4	10.558	8.901	4.901	-15.099	4	20	Sun, 1993	0.9211	S-64	Gasoline Trace% (Extreme), Lube Oil 50% (Extreme), Middle Distillate 50% (Extreme)
2	S-65	S-78	--	222451.716	2682948.18	Monitoring Well	Unconfined	Y	Y	8/4/1988	24	4	10.618	10.127	6.127	-13.873	4	20	Sun, 1993	0.875	RW-117	NA (NA)
2	S-70	SM-6	Damaged	223133.013	2683462.983	Monitoring Well	Unconfined	Y	N	12/21/1984	25	--	22.1	22.101	--	--	--	--	Sun, 1993	--	--	--
2	S-71	SM-5	--	223177.687	2683535.027	Monitoring Well	Unconfined	Y	N	12/20/1984	12.5	--	24.038	22.025	--	--	--	--	Sun, 1993	--	--	--
2	S-72	SM-37	--	223835.53	2683824.552	Monitoring Well	Unconfined	Y	N	3/19/1984	31	--	31.057	31.576	--	--	--	--	Sun, 1993/Aquaterra 2010	0.8229	S-297	Middle Distillate 75% (Extreme), Aviation Gasoline 15% (Extreme), Heavier Material2 10% (Extreme)
2,11	S-72D	--	--	223838.1	2683833.766	Monitoring Well	Lower Aquifer	N	N	3/7/1994	100	2	34.508	32.075	-56.925	-66.925	89	10	ENSR, 1994	--	--	--
2	S-73	SM-35	Destroyed	224159.26	2684618.08	Monitoring Well	Unconfined	Y	N	3/19/1985	35	--	38.54	35.31	--	--	--	--	Sun, 1993	--	--	--
2	S-91	--	--	222271.265	2684187.983	Monitoring Well	Unconfined	Y	Y	8/11/1993	30	4	23.133	21.302	11.302	-8.698	10	20	GES, 1993	0.8623	S-130	Condensate 100% (Extreme)
2	S-92	--	--	222194.103	2684428.327	Monitoring Well	Unconfined	Y	Y	8/9/1993	30	4	20.07	20.41	10.41	-9.59	10	20	GES, 1993	0.8623	S-130	Condensate 100% (Extreme)
2	S-93	--	Active	222338.436	2683259.117	Recovery Well - Active	Unconfined	Y	Y	8/9/1993	30	4	18.25	19.43	9.43	-10.57	10	20	GES, 1993	0.8692	S-158	Residual Oil 90% (Extreme), Naphtha1 10% (Extreme)
2	SB-1	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-10	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-11	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-12	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-13	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-14	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-15	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-16	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-17	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-18	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-19	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-2	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-20	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-21	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-22	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-23	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/18/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-3	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-4	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-5	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-6	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-7	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-8	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SB-9	--	Destroyed	--	--	Temporary Well Point	--	Y	Y	3/15/2001	20	2	--	--	--	--	5	15	Handex, 2001	--	--	--
2	SD-1	--	--	223203.56	2683362.912	Monitoring Well	--	--	--	--	--	--	19.503	17.311	--	--	--	--	Aquaterra 2003	--	--	--
PGW	PGW-MW-13	--	--	--	--	--	Unconfined	--	--	--	--	--	--	--	--	--	--	--	PGW, 2003, Survey Data from 6-1-12 Gauging	--	--	--
PGW	PGW-MW-15	--	--	--	--	--	Unconfined	--	--	--	--	--	--	--	--	--	--	--	PGW RIR, 2003, Survey Data From 6-1-12 Gauging	--	--	--
PGW	PGW-MW-23	--	--	--	--	--	Unconfined	--	--	--	--	--	--	--	--	--	--	--	PGW, 2003, Survey Data from 6-1-12 Gauging	--	--	--
PGW	PGW-MW-2A	--	--	--	--	--	Unconfined	--	--	--	--	--	--	--	--	--	--	--	PGW RIR, 2003, Survey Data From 6-1-12 Gauging	--	--	--

NOTES:
1. Former well IDs were derived from handwritten notes on the logs themselves or the referenced report.
2. Well classification was based on the formation in which the well was screened in.
3. Well construction details were taken directly from well boring logs provided by Handex, Stantec (formerly Secor), Aquaterra, or collected from available historic reports. Where no well boring logs exist, no well construction data is listed.
4. Elevation datum for wells within AOI 2 were surveyed to NAVD 88 as a part of this report.
5. Specific gravity (S.G.) values were determined from LNAPL samples collected by Aquaterra/Stantec as part of the CCR, SCR/RIR, and/or RIR.
6. For wells with no direct LNAPL density values, the density value in the nearest well with LNAPL data was used.
7. LNAPL - Light Non-Aqueous Phase Liquid
8. Philadelphia Gas Works (PGW) wells were gauged by Environmental Alliance, Inc. on October 20, 2016.
* - Bottom of well screen appears to extend into the Middle Sand (top of lower aquifer).
-- - Data could not be located or determined based on available reports
NA - Data not available
Destroyed or abandoned wells

Table 3a
Groundwater Elevation Measurements - August 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc)		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water [3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
C-HEADER	2	Unconfined Aquifer	0.8623	S-130	21	NP	NM			NM	NM	20.61
HW-1 (end)	2	–	–	–	–	NP	NM			NM	NM	–
HW-1 (start)	2	–	–	–	–	NP	NM			NM	NM	–
HW-2 (end)	2	–	–	–	–	NP	NM			NM	NM	–
HW-2 (start)	2	–	–	–	–	NP	NM			NM	NM	–
HW-3 (end)	2	–	–	–	–	NP	NM			NM	NM	–
HW-3 (start)	2	–	–	–	–	NP	NM			NM	NM	–
PGW-MW-8S	2	Unconfined Aquifer	–	–	39.5	NP	NM			NM	NM	35.08
PH-71	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	–
PH-72	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	–
PZ-100	2	Unconfined Aquifer	–	–	–	NP	15.96			2.11	2.11	18.07
PZ-101	2	Unconfined Aquifer	–	–	–	NP	7.54			9.63	9.63	17.17
RW-100	2	Unconfined Aquifer	0.8692	S-158	31	NP	NM			NM	NM	20.73
RW-101	2	Unconfined Aquifer	0.879	S-142	30.5	NP	NM			NM	NM	19.77
RW-102	2	Unconfined Aquifer	0.879	S-142	29	NP	NM			NM	NM	17.47
RW-103	2	Unconfined Aquifer	0.879	S-142	31	NP	NM			NM	NM	20.01
RW-104	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM			NM	NM	8.96
RW-105	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM			NM	NM	8.68
RW-106	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM			NM	NM	9.30
RW-107	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	10.55
RW-108	2	Unconfined Aquifer	–	–	20	NP	NM			NM	NM	9.90
RW-109	2	Unconfined Aquifer	0.9211	N-68	–	NP	NM			NM	NM	9.85
RW-113	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	10.23
RW-114	2	Unconfined Aquifer	0.856	–	30	NP	NM			NM	NM	13.01
RW-115	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	10.20
RW-116	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	10.81
RW-117	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	9.78
RW-118	2	Unconfined Aquifer	0.875	RW-118	30	NP	NM			NM	NM	11.82
RW-119	2	Unconfined Aquifer	0.856	–	30	NP	NM			NM	NM	12.85
RW-120	2	Unconfined Aquifer	0.856	–	19	NP	NM			NM	NM	13.58
RW-121	2	Unconfined Aquifer	0.856	–	30	NP	NM			NM	NM	15.30
RW-122	2	Unconfined Aquifer	0.8417	RW-122	30	NP	NM			NM	NM	10.24
RW-123	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	9.97
RW-124	2	Unconfined Aquifer	0.8412	–	30	NP	NM			NM	NM	9.16
RW-125	2	Unconfined Aquifer	0.856	–	30	NP	NM			NM	NM	14.27
RW-126	2	Unconfined Aquifer	0.8412	–	30	NP	NM			NM	NM	9.23
RW-127	2	Unconfined Aquifer	0.856	–	30	NP	NM			NM	NM	13.90
RW-128	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	8.43
RW-129	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM			NM	NM	9.83
RW-600	2	Unconfined Aquifer	–	–	24.83	NP	NM			NM	NM	9.05
RW-601	2	Unconfined Aquifer	0.7677	S-110	24.58	NP	NM			NM	NM	11.68
RW-602	2	Unconfined Aquifer	0.8229	S-297	24.92	NP	NM			NM	NM	8.13
RW-603	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	–
S-105	2	Unconfined Aquifer	–	–	10	NP	11.21			1.32	1.32	12.53
S-106	2	Unconfined Aquifer	–	–	19.59	NP	NM			NM	NM	11.36
S-107	2	Unconfined Aquifer	0.7677	S-110	18.41	NP	NM			NM	NM	12.31
S-108	2	Unconfined Aquifer	0.8236	S-109	17.09	NP	6.79			3.93	3.93	10.72
S-109	2	Unconfined Aquifer	0.8236	S-109	10.08	NP	NM			NM	NM	10.13
S-110	2	Unconfined Aquifer	0.7677	S-110	27.16	NP	15.34			10.33	10.33	25.67
S-128	2	Unconfined Aquifer	–	–	30	NP	NM			NM	NM	20.72
S-129	2	Unconfined Aquifer	–	–	30	NP	NM			NM	NM	21.03
S-130	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM			NM	NM	22.48
S-131	2	Unconfined Aquifer	0.8623	S-130	26	NP	15.43			3.33	3.33	18.76
S-132	2	Unconfined Aquifer	–	–	30	NP	18.38			2.65	2.65	21.03
S-133	2	Unconfined Aquifer	–	–	28	NP	18.72			3.30	3.30	22.02
S-134	2	Unconfined Aquifer	–	–	28	NP	19.91			2.12	2.12	22.03
S-135	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM			NM	NM	23.19
S-136	2	Unconfined Aquifer	0.8623	S-130	28	NP	17.98			2.61	2.61	20.59
S-137	2	Unconfined Aquifer	–	–	28	NP	17.34			2.70	2.70	20.04
S-138	2	Unconfined Aquifer	0.8957	S-138	28	NP	NM			NM	NM	22.89
S-139	2	Unconfined Aquifer	–	–	28	NP	18.63			2.83	2.83	21.46
S-140	2	Unconfined Aquifer	–	–	28	NP	18.70			3.33	3.33	22.03
S-141	2	Unconfined Aquifer	0.8692	S-158	28	19.48	19.89	0.41	2.44	2.03	2.39	21.92
S-142	2	Unconfined Aquifer	0.879	S-142	28	NP	NM			NM	NM	19.84
S-143	2	Unconfined Aquifer	0.8957	S-138	28	NP	NM			NM	NM	22.72
S-144	2	Unconfined Aquifer	–	–	28	NP	NM			NM	NM	21.71
S-145	2	Unconfined Aquifer	–	–	14	NP	NM			NM	NM	10.38
S-146	2	Unconfined Aquifer	–	–	9.5	NP	NM			NM	NM	8.80
S-147	2	Unconfined Aquifer	–	–	13.5	NP	NM			NM	NM	10.28
S-148	2	Unconfined Aquifer	–	–	9	NP	NM			NM	NM	8.43
S-149	2	Unconfined Aquifer	–	–	13	NP	NM			NM	NM	9.51
S-150	2	Unconfined Aquifer	0.7677	S-110	21.5	NP	17.23			3.60	3.60	20.83

Table 3a
Groundwater Elevation Measurements - August 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc)		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water [3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
S-151	2	Unconfined Aquifer	–	–	35	NP	NM			NM	NM	22.38
S-152	2	Unconfined Aquifer	–	–	22	NP	NM			NM	NM	10.49
S-153	2	Unconfined Aquifer	–	–	26	NP	8.90			0.91	0.91	9.81
S-154	2	Unconfined Aquifer	–	–	15	NP	11.07			-0.45	-0.45	10.62
S-155	2	Unconfined Aquifer	–	–	28	NP	NM			NM	NM	21.72
S-156	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM			NM	NM	20.84
S-157	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM			NM	NM	19.94
S-158	2	Unconfined Aquifer	0.8692	S-158	–	NP	NM			NM	NM	–
S-159	2	Unconfined Aquifer	0.879	S-142	20	16.35	16.50	0.15	2.52	2.37	2.50	18.87
S-165	2	Unconfined Aquifer	–	–	19.5	NP	16.72			1.39	1.39	18.11
S-166	2	Unconfined Aquifer	–	–	20	NP	16.24			1.99	1.99	18.23
S-167	2	Unconfined Aquifer	–	–	22	NP	NM			NM	NM	19.41
S-168	2	Unconfined Aquifer	–	–	25	NP	NM			NM	NM	19.62
S-169	2	Unconfined Aquifer	–	–	20	NP	NM			NM	NM	19.29
S-174	2	Unconfined Aquifer	0.8623	S-130	22	10.13	11.20	1.07	9.49	8.42	9.34	19.62
S-175	2	Unconfined Aquifer	0.8623	S-130	22	NP	NM			NM	NM	20.04
S-176	2	Unconfined Aquifer	–	–	20	NP	NM			NM	NM	20.13
S-177	2	Unconfined Aquifer	–	–	21	NP	18.02			1.54	1.54	19.56
S-178	2	Unconfined Aquifer	0.8623	S-130	22	NP	14.60			4.94	4.94	19.54
S-246A	2	Unconfined Aquifer	–	–	–	NP	10.84			0.92	0.92	11.76
S-247	2	Unconfined Aquifer	–	–	–	NP	11.28			0.81	0.81	12.09
S-248	2	Unconfined Aquifer	–	–	–	NP	10.12			0.68	0.68	10.80
S-249	2	Unconfined Aquifer	–	–	–	NP	12.57			0.04	0.04	12.61
S-251	2	Unconfined Aquifer	–	–	30	NP	18.05			1.22	1.22	19.27
S-252	2	Unconfined Aquifer	–	–	30	NP	18.32			0.97	0.97	19.29
S-253	2	Unconfined Aquifer	0.8694	S-313	30	NP	18.19			2.64	2.64	20.83
S-254	2	Unconfined Aquifer	0.865	S-315	30	NP	18.75			2.13	2.13	20.88
S-292	2	Unconfined Aquifer	–	–	20	NP	NM			NM	NM	28.77
S-294	2	Unconfined Aquifer	–	–	40	NP	29.85			4.62	4.62	34.47
S-294D	2,11	Lower Aquifer	–	–	99	NP	32.58			2.10	2.10	34.68
S-295	2	Unconfined Aquifer	–	–	24	NP	23.64			9.10	9.10	32.74
S-297	2	Unconfined Aquifer	0.8229	S-297	36	NP	NM			NM	NM	30.01
S-298	2	Unconfined Aquifer	0.7677	S-110	20	15.84	16.49	0.65	11.16	10.51	11.01	27.00
S-299	2	Unconfined Aquifer	–	–	28	NP	20.13			3.87	3.87	24.00
S-300	2	Unconfined Aquifer	–	–	30	NP	19.77			5.51	5.51	25.28
S-301	2	Unconfined Aquifer	–	–	28	NP	16.14			4.27	4.27	20.41
S-302	2	Unconfined Aquifer	0.865	S-315	30	21.21	21.41	0.20	2.74	2.54	2.72	23.95
S-302D	2,11	Lower Aquifer	–	–	92	NP	23.15			1.45	1.45	24.60
S-302S	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	–
S-303	2	Unconfined Aquifer	–	–	26	NP	19.25			3.34	3.34	22.59
S-304	2	Unconfined Aquifer	0.8623	S-130	18	NP	14.67			9.51	9.51	24.18
S-305	2	Unconfined Aquifer	–	–	29	NP	18.45			1.28	1.28	19.73
S-305D	2,11	Lower Aquifer	–	–	82	NP	20.09			0.39	0.39	20.48
S-306	2	Unconfined Aquifer	–	–	30	NP	22.62			-0.15	-0.15	22.47
S-307	2	Unconfined Aquifer	–	–	26	NP	16.22			2.35	2.35	18.57
S-308	2	Unconfined Aquifer	–	–	20	NP	24.24			3.87	3.87	28.11
S-309	2	Unconfined Aquifer	–	–	20	NP	17.90			1.83	1.83	19.73
S-310	2	Unconfined Aquifer	–	–	20	NP	8.91			9.15	9.15	18.06
S-311	2	Unconfined Aquifer	0.803	S-201	33	NP	NM			NM	NM	26.18
S-313	2	Unconfined Aquifer	0.8694	S-313	30	NP	18.20			2.70	2.70	20.90
S-314	2	Unconfined Aquifer	–	–	30	NP	18.43			2.27	2.27	20.70
S-315	2	Unconfined Aquifer	0.865	S-315	30	NP	NM			NM	NM	20.47
S-316	2	Unconfined Aquifer	0.865	S-315	30	NP	16.48			4.42	4.42	20.90
S-317	2	Unconfined Aquifer	–	–	30	NP	17.82			2.37	2.37	20.19
S-318	2	Unconfined Aquifer	0.865	S-315	30	NP	21.61			2.14	2.14	23.75
S-328	2	Unconfined Aquifer	0.8957	S-138	26	18.25	18.33	0.08	3.72	3.64	3.71	21.97
S-333	2	Unconfined Aquifer	–	–	–	NP	12.71			1.02	1.02	13.73
S-335	2	Unconfined Aquifer	0.8957	S-138	–	NP	11.00			-0.90	-0.90	10.10
S-336	2	Unconfined Aquifer	–	–	–	NP	9.26			2.26	2.26	11.52
S-337	2	Unconfined Aquifer	0.8236	S-109	–	NP	11.71			0.50	0.50	12.21
S-338	2	Unconfined Aquifer	0.7677	S-110	–	12.58	12.80	0.22	2.96	2.74	2.91	15.54
S-346	2	Unconfined Aquifer	0.803	S-201	35	18.04	18.05	0.01	1.45	1.44	1.45	19.49
S-347	2	Unconfined Aquifer	0.803	S-201	35	NP	NM			NM	NM	19.13
S-348	2	Unconfined Aquifer	0.881	–	30	NP	NM			NM	NM	19.58
S-349	2	Unconfined Aquifer	0.879	S-142	30	NP	NM			NM	NM	18.61
S-350	2	Unconfined Aquifer	–	–	35	NP	26.99			4.49	4.49	31.48
S-351	2	Unconfined Aquifer	–	–	38	NP	30.76			4.48	4.48	35.24
S-354	2	Unconfined Aquifer	–	–	35	NP	27.12			0.91	0.91	28.03
S-355	2	Unconfined Aquifer	0.8229	S-297	35	NP	26.91			3.91	3.91	30.82
S-356	2	Unconfined Aquifer	–	–	–	NP	NM			NM	NM	–
S-357	2	Unconfined Aquifer	0.8229	S-297	32	NP	NM			NM	NM	28.10
S-359	2	Unconfined Aquifer	0.8623	S-130	28	NP	17.35			2.93	2.93	20.28

Table 3a
Groundwater Elevation Measurements - August 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc)		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water [3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
S-360	2	Unconfined Aquifer	0.803	S-201	30	NP	NM			NM	NM	23.80
S-361	2	Unconfined Aquifer	–	–	32	NP	23.79			2.58	2.58	26.37
S-362	2	Unconfined Aquifer	0.803	S-201	32	NP	NM			NM	NM	23.80
S-363	2	Unconfined Aquifer	0.803	S-201	30	NP	NM			NM	NM	25.86
S-406	2	Unconfined Aquifer	0.865	S-315	–	NP	9.81			2.39	2.39	12.20
S-420	2	Unconfined Aquifer	0.803	S-201	–	6.68	6.68	0.00	2.58	2.58	2.58	9.26
S-422	2	Unconfined Aquifer	–	–	25	NP	14.43			2.14	2.14	16.57
S-423	2	Unconfined Aquifer	–	–	35	NP	26.42			5.04	5.04	31.46
S-48	2	Unconfined Aquifer	0.803	S-201	24.75	19.73	19.95	0.22	1.54	1.32	1.50	21.27
S-53	2	Unconfined Aquifer	0.8623	S-130	27	NP	NM			NM	NM	21.68
S-54	2	Unconfined Aquifer	0.803	S-201	30.5	NP	NM			NM	NM	22.97
S-61	2	Unconfined Aquifer	0.8623	S-130	25	16.48	16.92	0.44	1.82	1.38	1.76	18.30
S-62	2	Unconfined Aquifer	0.879	S-142	31	NP	NM			NM	NM	21.38
S-63	2	Unconfined Aquifer	0.8692	S-158	22.1	NP	NM			NM	NM	21.27
S-64	2	Unconfined Aquifer	0.9211	S-64	24	NP	8.92			1.64	1.64	10.56
S-65	2	Unconfined Aquifer	0.875	RW-117	24	9.57	9.67	0.10	1.05	0.95	1.04	10.62
S-70	2	Unconfined Aquifer	–	–	25	NP	NM			NM	NM	22.10
S-71	2	Unconfined Aquifer	–	–	12.5	NP	20.12			3.92	3.92	24.04
S-72	2	Unconfined Aquifer	0.8229	S-297	31	NP	26.72			4.34	4.34	31.06
S-72D	2,11	Lower Aquifer	–	–	100	NP	33.38			1.13	1.13	34.51
S-73	2	Unconfined Aquifer	–	–	35	NP	NM			NM	NM	38.54
S-91	2	Unconfined Aquifer	0.8623	S-130	30	NP	NM			NM	NM	23.13
S-92	2	Unconfined Aquifer	0.8623	S-130	30	NP	NM			NM	NM	20.07
S-93	2	Unconfined Aquifer	0.8692	S-158	30	NP	17.11			1.14	1.14	18.25
SB-1	2	–	–	–	20	NP	NM			NM	NM	–
SB-10	2	–	–	–	20	NP	NM			NM	NM	–
SB-11	2	–	–	–	20	NP	NM			NM	NM	–
SB-12	2	–	–	–	20	NP	NM			NM	NM	–
SB-13	2	–	–	–	20	NP	NM			NM	NM	–
SB-14	2	–	–	–	20	NP	NM			NM	NM	–
SB-15	2	–	–	–	20	NP	NM			NM	NM	–
SB-16	2	–	–	–	20	NP	NM			NM	NM	–
SB-17	2	–	–	–	20	NP	NM			NM	NM	–
SB-18	2	–	–	–	20	NP	NM			NM	NM	–
SB-19	2	–	–	–	20	NP	NM			NM	NM	–
SB-2	2	–	–	–	20	NP	NM			NM	NM	–
SB-20	2	–	–	–	20	NP	NM			NM	NM	–
SB-21	2	–	–	–	20	NP	NM			NM	NM	–
SB-22	2	–	–	–	20	NP	NM			NM	NM	–
SB-23	2	–	–	–	20	NP	NM			NM	NM	–
SB-3	2	–	–	–	20	NP	NM			NM	NM	–
SB-4	2	–	–	–	20	NP	NM			NM	NM	–
SB-5	2	–	–	–	20	NP	NM			NM	NM	–
SB-6	2	–	–	–	20	NP	NM			NM	NM	–
SB-7	2	–	–	–	20	NP	NM			NM	NM	–
SB-8	2	–	–	–	20	NP	NM			NM	NM	–
SB-9	2	–	–	–	20	NP	NM			NM	NM	–
SD-1	2	Unconfined Aquifer	–	–	–	NP	7.88			11.62	11.62	19.50

Notes:
1. Specific Gravity (S.G.) values were determined from LNAPL samples taken by Aquaterra/Stantec as part of CCR and/or SCR/RIR. Values for S-360 and S-363 were determined form LNAPL samples taken by Aquaterra in June 2013.
2. For wells with no direct S.G. measurements, the S.G. value in the nearest well with a direct S.G was used.
3. Depth to Water and Depth to Product provided by Aquaterra .

AOI - area of interest
g/cc - Grams per cubic centimeter
ft bgs - Feet below ground surface
ft btic - Feet below top of inner casing
ft - Feet
ft amsl - Feet above mean sea level
btic- below top of inner casing
LNAPL - Light non aqueous phase liquid
NG - Not gauged
0.00 LNAPL thickness indicates sheen
Well is destroyed/damaged/unable to be located

Table 3b
Groundwater Elevation Measurements - October 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc) Used		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water [3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
C-HEADER	2	Unconfined Aquifer	0.8623	S-130	21	NP	NM	–	–	NM	NM	20.61
HW-1 (end)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
HW-1 (start)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
HW-2 (end)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
HW-2 (start)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
HW-3 (end)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
HW-3 (start)	2	–	–	–	–	NP	NM	–	–	NM	NM	–
PGW-MW-8S	2	Unconfined Aquifer	–	–	39.5	NP	NM	–	–	NM	NM	35.08
PH-71	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	–
PH-72	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	–
PZ-100	2	Unconfined Aquifer	0.879	S-142	–	18.42	18.60	0.18	-0.35	-0.53	-0.37	18.07
PZ-101	2	Unconfined Aquifer	–	–	–	NP	6.31	–	–	10.86	10.86	17.17
RW-100	2	Unconfined Aquifer	0.8692	S-158	31	NP	NM	–	–	NM	NM	20.73
RW-101	2	Unconfined Aquifer	0.879	S-142	30.5	NP	NM	–	–	NM	NM	19.77
RW-102	2	Unconfined Aquifer	0.879	S-142	29	NP	NM	–	–	NM	NM	17.47
RW-103	2	Unconfined Aquifer	0.879	S-142	31	NP	NM	–	–	NM	NM	20.01
RW-104	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM	–	–	NM	NM	8.96
RW-105	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM	–	–	NM	NM	8.68
RW-106	2	Unconfined Aquifer	0.875	RW-117	20	NP	NM	–	–	NM	NM	9.30
RW-107	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	10.55
RW-108	2	Unconfined Aquifer	–	–	20	NP	NM	–	–	NM	NM	9.90
RW-109	2	Unconfined Aquifer	0.9211	N-68	–	NP	NM	–	–	NM	NM	9.85
RW-113	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	10.23
RW-114	2	Unconfined Aquifer	0.856	–	30	NP	NM	–	–	NM	NM	13.01
RW-115	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	10.20
RW-116	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	10.81
RW-117	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	9.78
RW-118	2	Unconfined Aquifer	0.875	RW-118	30	NP	NM	–	–	NM	NM	11.82
RW-119	2	Unconfined Aquifer	0.856	–	30	NP	NM	–	–	NM	NM	12.85
RW-120	2	Unconfined Aquifer	0.856	–	19	NP	NM	–	–	NM	NM	13.58
RW-121	2	Unconfined Aquifer	0.856	–	30	NP	NM	–	–	NM	NM	15.30
RW-122	2	Unconfined Aquifer	0.8417	RW-122	30	NP	NM	–	–	NM	NM	10.24
RW-123	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	9.97
RW-124	2	Unconfined Aquifer	0.8412	–	30	NP	NM	–	–	NM	NM	9.16
RW-125	2	Unconfined Aquifer	0.856	–	30	NP	NM	–	–	NM	NM	14.27
RW-126	2	Unconfined Aquifer	0.8412	–	30	NP	NM	–	–	NM	NM	9.23
RW-127	2	Unconfined Aquifer	0.856	–	30	NP	NM	–	–	NM	NM	13.90
RW-128	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	8.43
RW-129	2	Unconfined Aquifer	0.875	RW-117	30	NP	NM	–	–	NM	NM	9.83
RW-600	2	Unconfined Aquifer	–	–	24.83	NP	NM	–	–	NM	NM	9.05
RW-601	2	Unconfined Aquifer	0.7677	S-110	24.58	NP	NM	–	–	NM	NM	11.68
RW-602	2	Unconfined Aquifer	0.8229	S-297	24.92	NP	NM	–	–	NM	NM	8.13
RW-603	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	–
S-105	2	Unconfined Aquifer	–	–	10	NP	10.93	–	–	1.60	1.60	12.53
S-106	2	Unconfined Aquifer	–	–	19.59	NP	NM	–	–	NM	NM	11.36
S-107	2	Unconfined Aquifer	0.7677	S-110	18.41	NP	NM	–	–	NM	NM	12.31
S-108	2	Unconfined Aquifer	0.8236	S-109	17.09	NP	6.52	–	–	4.20	4.20	10.72
S-109	2	Unconfined Aquifer	0.8236	S-109	10.08	NP	NM	–	–	NM	NM	10.13
S-110	2	Unconfined Aquifer	0.7677	S-110	27.16	NP	15.45	–	–	10.22	10.22	25.67
S-128	2	Unconfined Aquifer	–	–	30	NP	NM	–	–	NM	NM	20.72
S-129	2	Unconfined Aquifer	–	–	30	NP	NM	–	–	NM	NM	21.03
S-130	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM	–	–	NM	NM	22.48
S-131	2	Unconfined Aquifer	0.8623	S-130	26	NP	15.14	–	–	3.62	3.62	18.76
S-132	2	Unconfined Aquifer	–	–	30	NP	18.18	–	–	2.85	2.85	21.03
S-133	2	Unconfined Aquifer	–	–	28	NP	NM	–	–	NM	NM	22.02
S-134	2	Unconfined Aquifer	–	–	28	NP	20.67	–	–	1.36	1.36	22.03
S-135	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM	–	–	NM	NM	23.19
S-136	2	Unconfined Aquifer	0.8623	S-130	28	NP	17.79	–	–	2.80	2.80	20.59
S-137	2	Unconfined Aquifer	–	–	28	NP	16.63	–	–	3.41	3.41	20.04
S-138	2	Unconfined Aquifer	0.8957	S-138	28	NP	NM	–	–	NM	NM	22.89
S-139	2	Unconfined Aquifer	–	–	28	NP	19.01	–	–	2.45	2.45	21.46
S-140	2	Unconfined Aquifer	–	–	28	NP	18.75	–	–	3.28	3.28	22.03
S-141	2	Unconfined Aquifer	0.8692	S-158	28	19.45	19.80	0.35	2.47	2.12	2.43	21.92
S-142	2	Unconfined Aquifer	0.879	S-142	28	NP	NM	–	–	NM	NM	19.84
S-143	2	Unconfined Aquifer	0.8957	S-138	28	NP	NM	–	–	NM	NM	22.72
S-144	2	Unconfined Aquifer	–	–	28	NP	NM	–	–	NM	NM	21.71
S-145	2	Unconfined Aquifer	–	–	14	NP	NM	–	–	NM	NM	10.38
S-146	2	Unconfined Aquifer	–	–	9.5	NP	NM	–	–	NM	NM	8.80
S-147	2	Unconfined Aquifer	–	–	13.5	NP	NM	–	–	NM	NM	10.28
S-148	2	Unconfined Aquifer	–	–	9	NP	NM	–	–	NM	NM	8.43
S-149	2	Unconfined Aquifer	–	–	13	NP	NM	–	–	NM	NM	9.51
S-150	2	Unconfined Aquifer	0.7677	S-110	21.5	NP	17.18	–	–	3.65	3.65	20.83

Table 3b
Groundwater Elevation Measurements - October 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc) Used		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water[3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
S-151	2	Unconfined Aquifer	–	–	35	NP	NM	–	–	NM	NM	22.38
S-152	2	Unconfined Aquifer	–	–	22	NP	NM	–	–	NM	NM	10.49
S-153	2	Unconfined Aquifer	–	–	26	NP	8.55	–	–	1.26	1.26	9.81
S-154	2	Unconfined Aquifer	–	–	15	NP	11.00	–	–	-0.38	-0.38	10.62
S-155	2	Unconfined Aquifer	–	–	28	NP	NM	–	–	NM	NM	21.72
S-156	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM	–	–	NM	NM	20.84
S-157	2	Unconfined Aquifer	0.8623	S-130	28	NP	NM	–	–	NM	NM	19.94
S-158	2	Unconfined Aquifer	0.8692	S-158	–	NP	NM	–	–	NM	NM	–
S-159	2	Unconfined Aquifer	0.879	S-142	20	16.17	16.51	0.34	2.70	2.36	2.66	18.87
S-165	2	Unconfined Aquifer	–	–	19.5	NP	16.94	–	–	1.17	1.17	18.11
S-166	2	Unconfined Aquifer	–	–	20	NP	16.90	–	–	1.33	1.33	18.23
S-167	2	Unconfined Aquifer	–	–	22	NP	NM	–	–	NM	NM	19.41
S-168	2	Unconfined Aquifer	–	–	25	NP	NM	–	–	NM	NM	19.62
S-169	2	Unconfined Aquifer	–	–	20	NP	NM	–	–	NM	NM	19.29
S-174	2	Unconfined Aquifer	0.8623	S-130	22	10.25	12.00	1.75	9.37	7.62	9.13	19.62
S-175	2	Unconfined Aquifer	0.8623	S-130	22	NP	NM	–	–	NM	NM	20.04
S-176	2	Unconfined Aquifer	–	–	20	NP	NM	–	–	NM	NM	20.13
S-177	2	Unconfined Aquifer	–	–	21	NP	NM	–	–	NM	NM	19.56
S-178	2	Unconfined Aquifer	0.8623	S-130	22	NP	NM	–	–	NM	NM	19.54
S-246A	2	Unconfined Aquifer	–	–	–	NP	10.23	–	–	1.53	1.53	11.76
S-247	2	Unconfined Aquifer	–	–	–	NP	10.93	–	–	1.16	1.16	12.09
S-248	2	Unconfined Aquifer	–	–	–	NP	9.73	–	–	1.07	1.07	10.80
S-249	2	Unconfined Aquifer	–	–	–	NP	12.01	–	–	0.60	0.60	12.61
S-251	2	Unconfined Aquifer	–	–	30	NP	17.11	–	–	2.16	2.16	19.27
S-252	2	Unconfined Aquifer	–	–	30	NP	17.22	–	–	2.07	2.07	19.29
S-253	2	Unconfined Aquifer	0.8694	S-313	30	NP	17.98	–	–	2.85	2.85	20.83
S-254	2	Unconfined Aquifer	0.865	S-315	30	NP	18.32	–	–	2.56	2.56	20.88
S-292	2	Unconfined Aquifer	–	–	20	NP	NM	–	–	NM	NM	28.77
S-294	2	Unconfined Aquifer	–	–	40	NP	29.80	–	–	4.67	4.67	34.47
S-294D	2,11	Lower Aquifer	–	–	99	NP	32.26	–	–	2.42	2.42	34.68
S-295	2	Unconfined Aquifer	–	–	24	NP	23.53	–	–	9.21	9.21	32.74
S-297	2	Unconfined Aquifer	0.8229	S-297	36	NP	NM	–	–	NM	NM	30.01
S-298	2	Unconfined Aquifer	0.7677	S-110	20	17.40	18.40	1.00	9.60	8.60	9.36	27.00
S-299	2	Unconfined Aquifer	–	–	28	NP	20.30	–	–	3.70	3.70	24.00
S-300	2	Unconfined Aquifer	–	–	30	NP	20.55	–	–	4.73	4.73	25.28
S-301	2	Unconfined Aquifer	–	–	28	NP	16.64	–	–	3.77	3.77	20.41
S-302	2	Unconfined Aquifer	0.865	S-315	30	21.11	21.21	0.10	2.84	2.74	2.83	23.95
S-302D	2,11	Lower Aquifer	–	–	92	NP	25.00	–	–	-0.40	-0.40	24.60
S-302S	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	–
S-303	2	Unconfined Aquifer	–	–	26	NP	19.52	–	–	3.07	3.07	22.59
S-304	2	Unconfined Aquifer	0.8623	S-130	18	NP	14.90	–	–	9.28	9.28	24.18
S-305	2	Unconfined Aquifer	–	–	29	NP	18.68	–	–	1.05	1.05	19.73
S-305D	2,11	Lower Aquifer	–	–	82	NP	20.22	–	–	0.26	0.26	20.48
S-306	2	Unconfined Aquifer	–	–	30	NP	20.79	–	–	1.68	1.68	22.47
S-307	2	Unconfined Aquifer	–	–	26	NP	16.32	–	–	2.25	2.25	18.57
S-308	2	Unconfined Aquifer	–	–	20	NP	NM	–	–	NM	NM	28.11
S-309	2	Unconfined Aquifer	–	–	20	NP	17.99	–	–	1.74	1.74	19.73
S-310	2	Unconfined Aquifer	–	–	20	NP	10.93	–	–	7.13	7.13	18.06
S-311	2	Unconfined Aquifer	0.803	S-201	33	NP	NM	–	–	NM	NM	26.18
S-313	2	Unconfined Aquifer	0.8694	S-313	30	NP	18.00	–	–	2.90	2.90	20.90
S-314	2	Unconfined Aquifer	–	–	30	NP	18.10	–	–	2.60	2.60	20.70
S-315	2	Unconfined Aquifer	0.865	S-315	30	NP	NM	–	–	NM	NM	20.47
S-316	2	Unconfined Aquifer	0.865	S-315	30	NP	15.53	–	–	5.37	5.37	20.90
S-317	2	Unconfined Aquifer	–	–	30	NP	17.58	–	–	2.61	2.61	20.19
S-318	2	Unconfined Aquifer	0.865	S-315	30	NP	21.40	–	–	2.35	2.35	23.75
S-328	2	Unconfined Aquifer	0.8957	S-138	26	NP	18.47	–	–	3.50	3.50	21.97
S-333	2	Unconfined Aquifer	–	–	–	NP	12.40	–	–	1.33	1.33	13.73
S-335	2	Unconfined Aquifer	0.8957	S-138	–	NP	NM	–	–	NM	NM	10.10
S-336	2	Unconfined Aquifer	–	–	–	NP	9.14	–	–	2.38	2.38	11.52
S-337	2	Unconfined Aquifer	0.8236	S-109	–	NP	11.46	–	–	0.75	0.75	12.21
S-338	2	Unconfined Aquifer	0.7677	S-110	–	NP	NM	–	–	NM	NM	15.54
S-346	2	Unconfined Aquifer	0.803	S-201	35	18.22	18.70	0.48	1.27	0.79	1.17	19.49
S-347	2	Unconfined Aquifer	0.803	S-201	35	NP	NM	–	–	NM	NM	19.13
S-348	2	Unconfined Aquifer	0.881	–	30	NP	NM	–	–	NM	NM	19.58
S-349	2	Unconfined Aquifer	0.879	S-142	30	NP	NM	–	–	NM	NM	18.61
S-350	2	Unconfined Aquifer	–	–	35	NP	27.05	–	–	4.43	4.43	31.48
S-351	2	Unconfined Aquifer	–	–	38	NP	30.79	–	–	4.45	4.45	35.24
S-354	2	Unconfined Aquifer	–	–	35	NP	24.50	–	–	3.53	3.53	28.03
S-355	2	Unconfined Aquifer	0.8229	S-297	35	26.90	27.10	0.20	3.92	3.72	3.89	30.82
S-356	2	Unconfined Aquifer	–	–	–	NP	NM	–	–	NM	NM	–
S-357	2	Unconfined Aquifer	0.8229	S-297	32	22.40	23.55	1.15	5.70	4.55	5.49	28.10
S-359	2	Unconfined Aquifer	0.8623	S-130	28	NP	17.24	–	–	3.04	3.04	20.28

Table 3b
Groundwater Elevation Measurements - October 2016
AOI 2 Remedial Investigation Report
PES Refining Complex
Philadelphia, Pennsylvania

Monitoring Point ID	AOI	Hydrostratigraphic Unit	Specific Gravity (g/cc) Used		Well Completion Depth (ft bgs)	Depth to Product [3] (ft btic)	Depth to Water[3] (ft btic)	LNAPL Thickness (ft)	LNAPL Elevation (ft amsl)	Groundwater Elevation (ft amsl)	Corrected Groundwater Elevation (ft amsl)	Top of Inner Casing (ft amsl)
			S.G.[1]	Source[2]								
S-360	2	Unconfined Aquifer	0.803	S-201	30	NP	NM	–	–	NM	NM	23.80
S-361	2	Unconfined Aquifer	–	–	32	NP	24.13	–	–	2.24	2.24	26.37
S-362	2	Unconfined Aquifer	0.803	S-201	32	NP	NM	–	–	NM	NM	23.80
S-363	2	Unconfined Aquifer	0.803	S-201	30	NP	NM	–	–	NM	NM	25.86
S-406	2	Unconfined Aquifer	0.865	S-315	–	NP	9.45	–	–	2.75	2.75	12.20
S-420	2	Unconfined Aquifer	0.803	S-201	–	NP	6.35	–	–	2.91	2.91	9.26
S-422	2	Unconfined Aquifer	–	–	25	NP	14.15	–	–	2.42	2.42	16.57
S-423	2	Unconfined Aquifer	–	–	35	NP	26.39	–	–	5.07	5.07	31.46
S-48	2	Unconfined Aquifer	0.803	S-201	24.75	19.95	20.20	0.25	1.32	1.07	1.27	21.27
S-53	2	Unconfined Aquifer	0.8623	S-130	27	NP	NM	–	–	NM	NM	21.68
S-54	2	Unconfined Aquifer	0.803	S-201	30.5	NP	NM	–	–	NM	NM	22.97
S-61	2	Unconfined Aquifer	0.8623	S-130	25	12.65	NM	–	5.65	NM	NM	18.30
S-62	2	Unconfined Aquifer	0.879	S-142	31	NP	NM	–	–	NM	NM	21.38
S-63	2	Unconfined Aquifer	0.8692	S-158	22.1	19.29	19.31	0.02	1.98	1.96	1.98	21.27
S-64	2	Unconfined Aquifer	0.9211	S-64	24	NP	6.86	–	–	3.70	3.70	10.56
S-65	2	Unconfined Aquifer	0.875	RW-117	24	NP	NM	–	–	NM	NM	10.62
S-70	2	Unconfined Aquifer	–	–	25	NP	NM	–	–	NM	NM	22.10
S-71	2	Unconfined Aquifer	–	–	12.5	NP	20.08	–	–	3.96	3.96	24.04
S-72	2	Unconfined Aquifer	0.8229	S-297	31	NP	26.65	–	–	4.41	4.41	31.06
S-72D	2,11	Lower Aquifer	–	–	100	NP	32.17	–	–	2.34	2.34	34.51
S-73	2	Unconfined Aquifer	–	–	35	NP	NM	–	–	NM	NM	38.54
S-91	2	Unconfined Aquifer	0.8623	S-130	30	NP	NM	–	–	NM	NM	23.13
S-92	2	Unconfined Aquifer	0.8623	S-130	30	NP	NM	–	–	NM	NM	20.07
S-93	2	Unconfined Aquifer	0.8692	S-158	30	NP	16.16	–	–	2.09	2.09	18.25
SB-1	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-10	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-11	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-12	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-13	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-14	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-15	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-16	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-17	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-18	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-19	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-2	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-20	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-21	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-22	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-23	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-3	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-4	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-5	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-6	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-7	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-8	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SB-9	2	–	–	–	20	NP	NM	–	–	NM	NM	–
SD-1	2	Unconfined Aquifer	–	–	–	NP	7.80	–	–	11.70	11.70	19.50
PGW-MW-13	PGW	Unconfined Aquifer	–	–	–	–	–	–	–	–	–	–
PGW-MW-15	PGW	Unconfined Aquifer	–	–	–	–	–	–	–	–	–	–
PGW-MW-23	PGW	Unconfined Aquifer	–	–	–	–	–	–	–	–	–	–
PGW-MW-2A	PGW	Unconfined Aquifer	–	–	–	–	–	–	–	–	–	–

Notes:
1. Specific Gravity (S.G.) values were determined from LNAPL samples taken by Aquaterra/Stantec as part of CCR and/or SCR/RIR. Values for S-360 and S-363 were determined form LNAPL samples taken by Aquaterra in June 2013.
2. For wells with no direct S.G. measurements, the S.G. value in the nearest well with a direct S.G was used.
3. Depth to Water and Depth to Product provided by Aquaterra .
4. Philadelphia Gas Works (PGW) wells were gauged by Environmental Alliance, Inc. on October 20, 2016.

AOI - area of interest
g/cc - Grams per cubic centimeter
ft bgs - Feet below ground surface
ft btic - Feet below top of inner casing
ft - Feet
ft amsl - Feet above mean sea level
btic- below top of inner casing
LNAPL - Light non aqueous phase liquid
NG - Not gauged
0.00 LNAPL thickness indicates sheen
Well is destroyed/damaged/unable to be located

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI-2_BH-13-52					AOI2-BH-13-54					AOI-2_BH-13-62					AOI-2_BH-13-64				
				Sample Name	AOI-2_BH-13-52_0-2'					AOI2-BH-13-54_1.5-2_032013					AOI-2_BH-13-62_0-1_31313					AOI-2_BH-13-64_0-2'				
				Sample Date	3/14/2013					3/20/2013					3/13/2013					3/13/2013				
				Sample Depth (ft bgs)	0-2					1.5-2					0-1					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	0.0935	J	0.021	0.5	1	0.432	J	0.025	0.59	1	ND	U	0.0002	0.0047	1	0.0004	J	0.00023	0.0054	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.013	0.1	1	ND	U	0.015	0.12	1	ND	U	0.00012	0.00094	1	ND	U	0.00014	0.0011	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.013	0.1	1	ND	U	0.016	0.12	1	ND	U	0.00013	0.00094	1	ND	U	0.00015	0.0011	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	0.0308	J	0.016	0.5	1	0.0789	J	0.019	0.59	1	ND	U	0.00015	0.0047	1	ND	U	0.00017	0.0054	1
Benzene	71-43-2	290	0.5	mg/kg	0.217		0.012	0.1	1	**1.6**		0.014	0.12	1	ND	U	0.00011	0.00094	1	0.0062		0.00013	0.0011	1
Ethylbenzene	100-41-4	890	70	mg/kg	0.0837	J	0.026	0.1	1	0.952		0.031	0.12	1	ND	U	0.00025	0.00094	1	0.00033	J	0.00029	0.0011	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.0486	J	0.0074	0.5	1	1.03		0.0088	0.59	1	ND	U	0.00007	0.0047	1	0.00025	J	0.000081	0.0054	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.023	0.1	1	ND	U	0.028	0.12	1	ND	U	0.00022	0.00094	1	ND	U	0.00026	0.0011	1
Toluene	108-88-3	10,000	100	mg/kg	0.125		0.01	0.1	1	1.19		0.012	0.12	1	ND	U	0.000098	0.00094	1	0.00065	J	0.00011	0.0011	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	0.31		0.014	0.1	1	2.09		0.016	0.12	1	ND	U	0.00013	0.00094	1	0.00075	J	0.00015	0.0011	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.128		0.014	0.039	1	7.28		0.068	0.2	5	0.224		0.011	0.032	1	0.368		0.013	0.038	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.366		0.012	0.039	1	2.44		0.06	0.2	5	0.643		0.01	0.032	1	0.606		0.012	0.038	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.351		0.013	0.039	1	5.25		0.064	0.2	5	0.656		0.0098	0.032	1	0.856		0.012	0.038	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.363		0.014	0.039	1	0.691		0.073	0.2	5	0.765		0.011	0.032	1	0.479		0.014	0.038	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.32		0.013	0.039	1	2.56		0.065	0.2	5	0.461		0.012	0.032	1	0.619		0.013	0.038	1
Chrysene	218-01-9	760	230	mg/kg	0.373		0.013	0.039	1	5.89		0.066	0.2	5	0.663		0.011	0.032	1	0.914		0.013	0.038	1
Fluorene	86-73-7	130,000	3,800	mg/kg	0.114		0.013	0.039	1	7.4		0.064	0.2	5	0.0796		0.011	0.032	1	0.145		0.012	0.038	1
Naphthalene	91-20-3	760	25	mg/kg	0.0382	J	0.011	0.039	1	4.14		0.053	0.2	5	0.0285	J	0.0087	0.032	1	0.0279	J	0.01	0.038	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.58		0.018	0.039	1	12.4		0.089	0.2	5	0.744		0.015	0.032	1	1.23		0.017	0.038	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.511		0.015	0.039	1	18.9		0.075	0.2	5	0.957		0.012	0.032	1	1.12		0.015	0.038	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	**455**		0.14	2.5	1	38.1		0.12	2.1	1	410		0.36	6.4	3	**3,540**		0.13	2.3	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2_BH-13-68					AOI2_BH-13-69					AOI2_BH-13-71					AOI2-BH-13-77				
				Sample Name	AOI2_BH-13-68_1-1.5_31213					AOI2_BH-13-69_0-1_31213					AOI2_BH-13-71_0-1_30813					AOI2-BH-13-77_1.5-2_032013				
				Sample Date	3/12/2013					3/12/2013					3/8/2013					3/20/2013				
				Sample Depth (ft bgs)	1-1.5					0-1					0-1					1.5-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0054	0.0054	1	0.81		0.69	0.69	1	ND	U	0.0055	0.0055	1	0.514	J	0.09	2.2	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.14	0.14	1	ND	U	0.0011	0.0011	1	ND	U	0.055	0.43	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.14	0.14	1	ND	U	0.0011	0.0011	1	ND	U	0.058	0.43	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0054	0.0054	1	ND	U	0.69	0.69	1	ND	U	0.0055	0.0055	1	ND	U	0.069	2.2	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0011	0.0011	1	0.248		0.14	0.14	1	ND	U	0.0011	0.0011	1	**1.88**		0.051	0.43	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.0011	0.0011	1	1.56		0.14	0.14	1	ND	U	0.0011	0.0011	1	0.898		0.11	0.43	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0054	0.0054	1	ND	U	0.69	0.69	1	ND	U	0.0055	0.0055	1	6.12		0.032	2.2	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.14	0.14	1	ND	U	0.0011	0.0011	1	ND	U	0.1	0.43	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0011	0.0011	1	0.931		0.14	0.14	1	ND	U	0.0011	0.0011	1	0.455		0.045	0.43	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.0011	0.0011	1	2.78		0.14	0.14	1	ND	U	0.0011	0.0011	1	1.24		0.06	0.43	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.029	0.029	1	ND	U	0.032	0.032	1	0.125		0.036	0.036	1	16.1		0.074	0.21	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	ND	U	0.029	0.029	1	0.111		0.032	0.032	1	0.801		0.036	0.036	1	3.11		0.064	0.21	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.029	0.029	1	0.165		0.032	0.032	1	0.921		0.036	0.036	1	7.02		0.069	0.21	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.0311		0.029	0.029	1	0.152		0.032	0.032	1	1.18		0.036	0.036	1	1.18		0.079	0.21	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U	0.029	0.029	1	0.332		0.032	0.032	1	0.692		0.036	0.036	1	4.08		0.071	0.21	1
Chrysene	218-01-9	760	230	mg/kg	0.0292		0.029	0.029	1	0.168		0.032	0.032	1	0.956		0.036	0.036	1	6.5		0.071	0.21	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.029	0.029	1	ND	U	0.032	0.032	1	ND	U	0.036	0.036	1	13.2		0.069	0.21	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.029	0.029	1	0.136		0.032	0.032	1	ND	U	0.036	0.036	1	3.68		0.058	0.21	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.029	0.029	1	0.142		0.032	0.032	1	0.753		0.036	0.036	1	32.9		0.38	0.84	4
Pyrene	129-00-0	96,000	2,200	mg/kg	0.032		0.029	0.029	1	0.073		0.032	0.032	1	1.47		0.036	0.036	1	18.1		0.081	0.21	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	6.2		2.2	2.2	1	433		2.2	2.2	1	162		2.2	2.2	1	34.8		0.11	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI-2_BH-13-79					AOI2_BH-13-80					AOI2-BH-13-57					AOI2-BH-13-58				
				Sample Name	AOI-2_BH-13-79_0-2'					AOI2_BH-13-80_0-1_31113					AOI2-BH-13-57_0-0.5_032013					AOI2-BH-13-58_1-1.5_032013				
				Sample Date	3/13/2013					3/11/2013					3/20/2013					3/20/2013				
				Sample Depth (ft bgs)	0-2					0-1					0-0.5					1-1.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	1.14		0.018	0.43	1	2.29		0.62	0.62	1	ND	U	0.0002	0.0049	1	0.0353	J	0.019	0.46	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.011	0.086	1	ND	U	0.12	0.12	1	ND	U	0.00012	0.00097	1	ND	U	0.012	0.093	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.012	0.086	1	ND	U	0.12	0.12	1	ND	U	0.00013	0.00097	1	ND	U	0.012	0.093	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	0.173	J	0.014	0.43	1	ND	U	0.62	0.62	1	ND	U	0.00016	0.0049	1	ND	U	0.015	0.46	1
Benzene	71-43-2	290	0.5	mg/kg	**2.82**		0.01	0.086	1	**11.7**		0.12	0.12	1	ND	U	0.00012	0.00097	1	ND	U	0.011	0.093	1
Ethylbenzene	100-41-4	890	70	mg/kg	0.79		0.023	0.086	1	1.59		0.12	0.12	1	ND	U	0.00026	0.00097	1	ND	U	0.024	0.093	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.32	J	0.0064	0.43	1	1.26		0.62	0.62	1	ND	U	7.2E-05	0.0049	1	ND	U	0.0069	0.46	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.02	0.086	1	ND	U	0.12	0.12	1	ND	U	0.00023	0.00097	1	ND	U	0.022	0.093	1
Toluene	108-88-3	10,000	100	mg/kg	1.26		0.009	0.086	1	4.18		0.12	0.12	1	ND	U	0.0001	0.00097	1	ND	U	0.0097	0.093	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	1.73		0.012	0.086	1	3.05		0.12	0.12	1	ND	U	0.00014	0.00097	1	ND	U	0.013	0.093	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.011	0.031	1	ND	U	0.035	0.035	1	ND	U	0.015	0.042	1	ND	U	0.013	0.037	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.0585		0.0095	0.031	1	0.0742		0.035	0.035	1	ND	U	0.014	0.042	1	0.286		0.012	0.037	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.0605		0.01	0.031	1	0.0644		0.035	0.035	1	ND	U	0.013	0.042	1	0.317		0.011	0.037	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.0456		0.012	0.031	1	0.131		0.035	0.035	1	ND	U	0.014	0.042	1	0.301		0.013	0.037	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.0788		0.01	0.031	1	0.12		0.035	0.035	1	ND	U	0.016	0.042	1	0.261		0.014	0.037	1
Chrysene	218-01-9	760	230	mg/kg	0.0615		0.011	0.031	1	0.172		0.035	0.035	1	ND	U	0.014	0.042	1	0.435		0.013	0.037	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.01	0.031	1	0.215		0.035	0.035	1	ND	U	0.014	0.042	1	ND	U	0.012	0.037	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.0085	0.031	1	0.917		0.035	0.035	1	0.0313	J	0.011	0.042	1	0.0166	J	0.01	0.037	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.0171	J	0.014	0.031	1	0.351		0.035	0.035	1	ND	U	0.019	0.042	1	ND	U	0.017	0.037	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.0586		0.012	0.031	1	0.152		0.035	0.035	1	ND	U	0.016	0.042	1	0.754		0.014	0.037	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	12		0.12	2.1	1	119		2.2	2.2	1						44		0.13	2.3	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-13-78					AOI2-BH-16-001					AOI2-BH-16-002					AOI2-BH-16-003				
				Sample Name	AOI2-BH-13-78_1-1.5_032013					AOI2-BH-16-01-0-2-20160718					AOI2-BH-16-02-0-2-20160718					AOI2-BH-16-03-0-2-20160718				
				Sample Date	3/20/2013					7/18/2016					7/18/2016					7/18/2016				
				Sample Depth (ft bgs)	1-1.5					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.025	0.59	1	ND	U	0.0016	0.0058	1	ND	U	0.0017	0.0058	1	ND	U	0.002	0.0071	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.015	0.12	1	ND	U	0.0015	0.0058	1	ND	U	0.0015	0.0058	1	ND	U	0.0018	0.0071	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.016	0.12	1	ND	U	0.0012	0.0058	1	ND	U	0.0012	0.0058	1	ND	U	0.0015	0.0071	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.019	0.59	1	ND	U	0.0019	0.0058	1	ND	U	0.002	0.0058	1	ND	U	0.0024	0.0071	1
Benzene	71-43-2	290	0.5	mg/kg	0.0346	J	0.014	0.12	1	ND	U	0.0016	0.0058	1	0.094		0.0016	0.0058	1	0.007	J	0.0019	0.0071	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.031	0.12	1	ND	U	0.0012	0.0058	1	ND	U	0.0012	0.0058	1	ND	U	0.0014	0.0071	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.0325	J	0.0088	0.59	1	ND	U	0.002	0.0058	1	ND	U	0.002	0.0058	1	ND	U	0.0025	0.0071	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.028	0.12	1	ND	U	0.0028	0.0058	1	0.0075		0.0028	0.0058	1	ND	U	0.0035	0.0071	1
Toluene	108-88-3	10,000	100	mg/kg	0.0479	J	0.012	0.12	1	ND	U	0.0018	0.0058	1	0.011		0.0018	0.0058	1	ND	U	0.0022	0.0071	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	0.112	J	0.016	0.12	1	ND	U	0.0033	0.017	1	ND	U	0.0033	0.017	1	ND	U	0.004	0.021	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.0191	J	0.016	0.045	1	ND	U	0.00082	0.0084	1	0.012		0.00079	0.0081	1	0.055		0.00076	0.0079	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.119		0.015	0.045	1	0.0029	J	0.00081	0.0084	1	0.32		0.00078	0.0081	1	0.16		0.00075	0.0079	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.014	0.045	1	0.0035	J	0.0022	0.0084	1	1.5		0.0021	0.0081	1	0.16		0.002	0.0079	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	ND	U	0.015	0.045	1	ND	U	0.0013	0.0084	1	0.074		0.0012	0.0081	1	0.047		0.0012	0.0079	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U	0.017	0.045	1	0.0061	J	0.00074	0.0084	1	0.2		0.00072	0.0081	1	0.41		0.00069	0.0079	1
Chrysene	218-01-9	760	230	mg/kg	0.258		0.015	0.045	1	0.0025	J	0.00055	0.0084	1	1.7		0.011	0.16	20	0.17		0.00052	0.0079	1
Fluorene	86-73-7	130,000	3,800	mg/kg	0.0552		0.015	0.045	1	0.00085	J	0.00073	0.0084	1	0.012		0.0007	0.0081	1	0.099		0.00068	0.0079	1
Naphthalene	91-20-3	760	25	mg/kg	0.0491		0.012	0.045	1	0.0012	J	0.0012	0.0084	1	0.002	J	0.0011	0.0081	1	0.024		0.0011	0.0079	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.157		0.02	0.045	1	0.0033	J	0.00084	0.0084	1	0.021		0.00081	0.0081	1	0.37		0.00079	0.0079	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.0957		0.017	0.045	1	0.0023	J	0.00068	0.0084	1	0.21		0.00065	0.0081	1	0.25		0.00063	0.0079	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	32.8		0.11	2	1	12.5		0.38	0.4	1	9.5		0.38	0.39	1	32.5		0.36	0.38	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-004					AOI2-BH-16-005					AOI2-BH-16-006					AOI2-BH-16-007				
				Sample Name	AOI2-BH-16-04-0-2-20160906					AOI2-BH-16-05-0-2-20160906					AOI2-BH-16-06-0-2-20160906					AOI2-BH-16-07-0-2-20160720				
				Sample Date	9/6/2016					9/6/2016					9/6/2016					7/20/2016				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	NA					NA					NA					ND	UJ	0.0021	0.0072	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	NA					NA					NA					ND	U	0.0018	0.0072	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	NA					NA					NA					ND	U	0.0015	0.0072	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					ND	UJ	0.0024	0.0072	1
Benzene	71-43-2	290	0.5	mg/kg	NA					NA					NA					ND	U	0.002	0.0072	1
Ethylbenzene	100-41-4	890	70	mg/kg	NA					NA					NA					ND	U	0.0015	0.0072	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	NA					NA					NA					ND	U	0.0025	0.0072	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	NA					NA					NA					ND	U	0.0035	0.0072	1
Toluene	108-88-3	10,000	100	mg/kg	NA					NA					NA					ND	U	0.0022	0.0072	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	NA					NA					NA					ND	U	0.0041	0.022	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	NA					NA					NA					0.032	J	0.0083	0.086	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	1.1		0.0092	0.081	10	24.1		0.094	0.83	100	0.36		0.0091	0.08	10	0.24		0.0082	0.086	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	NA					NA					NA					0.15		0.022	0.086	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	NA					NA					NA					0.15		0.013	0.086	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	NA					NA					NA					0.32		0.0076	0.086	10
Chrysene	218-01-9	760	230	mg/kg	NA					NA					NA					0.18		0.0056	0.086	10
Fluorene	86-73-7	130,000	3,800	mg/kg	NA					NA					NA					0.022	J	0.0074	0.086	10
Naphthalene	91-20-3	760	25	mg/kg	NA					NA					NA					0.3		0.012	0.086	10
Phenanthrene	85-01-8	190,000	10,000	mg/kg	NA					NA					NA					0.26		0.0086	0.086	10
Pyrene	129-00-0	96,000	2,200	mg/kg	NA					NA					NA					0.1		0.0069	0.086	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	NA					NA					NA					**452**		0.57	0.6	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-008					AOI2-BH-16-009					AOI2-BH-16-010					AOI2-BH-16-011				
				Sample Name	AOI2-BH-16-08-0-2-20160721					AOI2-BH-16-09-0-2-20160720					AOI2-BH-16-10-0-2-20160721					AOI2-BH-16-11-0-2-20160721				
				Sample Date	7/20/2016					7/20/2016					7/21/2016					7/20/2016				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	0.3	J	0.09	0.31	50	ND	UJ	0.0016	0.0057	1	ND	UJ	0.0017	0.0059	1	ND	U	0.0013	0.0046	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.08	0.31	50	ND	U	0.0014	0.0057	1	ND	U	0.0015	0.0059	1	ND	U	0.0012	0.0046	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.066	0.31	50	ND	U	0.0012	0.0057	1	ND	U	0.0012	0.0059	1	ND	U	0.00097	0.0046	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.11	0.31	50	ND	UJ	0.0019	0.0057	1	ND	U	0.002	0.0059	1	ND	U	0.0015	0.0046	1
Benzene	71-43-2	290	0.5	mg/kg	**0.59**		0.085	0.31	50	ND	U	0.0015	0.0057	1	ND	U	0.0016	0.0059	1	ND	U	0.0012	0.0046	1
Ethylbenzene	100-41-4	890	70	mg/kg	0.66		0.063	0.31	50	ND	U	0.0011	0.0057	1	ND	U	0.0012	0.0059	1	ND	U	0.00092	0.0046	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.16	J	0.11	0.31	50	ND	U	0.002	0.0057	1	ND	U	0.002	0.0059	1	ND	U	0.0016	0.0046	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.15	0.31	50	ND	U	0.0028	0.0057	1	ND	U	0.0028	0.0059	1	ND	U	0.0022	0.0046	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.098	0.31	50	ND	U	0.0018	0.0057	1	ND	U	0.0018	0.0059	1	ND	U	0.0014	0.0046	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	0.89	J	0.18	0.94	50	ND	U	0.0032	0.017	1	ND	U	0.0033	0.018	1	ND	U	0.0026	0.014	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	5.7		0.017	0.18	20	0.033	J	0.0085	0.088	10	0.62		0.0073	0.076	10	0.056	J	0.0079	0.081	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	9.2		0.017	0.18	20	0.5		0.0084	0.088	10	5.2		0.0072	0.076	10	0.31		0.0078	0.081	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	9.2		0.045	0.18	20	0.13		0.022	0.088	10	4.3		0.019	0.076	10	0.31		0.021	0.081	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	4		0.027	0.18	20	0.56		0.014	0.088	10	1.1		0.012	0.076	10	0.12		0.012	0.081	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	13.1		0.015	0.18	20	0.32		0.0078	0.088	10	8.7		0.0067	0.076	10	0.53		0.0072	0.081	10
Chrysene	218-01-9	760	230	mg/kg	13.6		0.012	0.18	20	0.64		0.0058	0.088	10	3.8		0.005	0.076	10	0.32		0.0053	0.081	10
Fluorene	86-73-7	130,000	3,800	mg/kg	4.6		0.015	0.18	20	0.018	J	0.0076	0.088	10	0.35		0.0066	0.076	10	0.015	J	0.007	0.081	10
Naphthalene	91-20-3	760	25	mg/kg	9.3		0.025	0.18	20	0.11		0.012	0.088	10	0.26		0.011	0.076	10	0.13		0.011	0.081	10
Phenanthrene	85-01-8	190,000	10,000	mg/kg	6.4		0.018	0.18	20	0.15		0.0088	0.088	10	1.2		0.0076	0.076	10	0.18		0.0081	0.081	10
Pyrene	129-00-0	96,000	2,200	mg/kg	17.6		0.014	0.18	20	0.25		0.0071	0.088	10	2.7		0.0061	0.076	10	0.31		0.0065	0.081	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	240		0.59	0.62	1	**2,500**		0.6	0.63	1	**538**		0.43	0.45	1	241		0.51	0.53	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-012					AOI2-BH-16-013					AOI2-BH-16-014					AOI2-BH-16-015				
				Sample Name	AOI2-BH-16-12-0-2-20160721					AOI2-BH-16-13-0-2-20160720					AOI2-BH-16-14-0-2-20160720					AOI2-BH-16-15-0-2-20160720				
				Sample Date	7/20/2016					7/20/2016					7/20/2016					7/20/2016				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.092	0.32	50	ND	UJ	0.0017	0.0058	1	ND	U	0.0021	0.0072	1	ND	UJ	0.0014	0.0048	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.081	0.32	50	ND	U	0.0015	0.0058	1	ND	U	0.0018	0.0072	1	ND	U	0.0012	0.0048	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.068	0.32	50	ND	U	0.0012	0.0058	1	ND	U	0.0015	0.0072	1	ND	U	0.001	0.0048	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.11	0.32	50	ND	UJ	0.0019	0.0058	1	ND	U	0.0024	0.0072	1	ND	UJ	0.0016	0.0048	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.087	0.32	50	ND	U	0.0016	0.0058	1	ND	U	0.002	0.0072	1	ND	U	0.0013	0.0048	1
Ethylbenzene	100-41-4	890	70	mg/kg	0.16	J	0.065	0.32	50	ND	U	0.0012	0.0058	1	ND	U	0.0015	0.0072	1	ND	U	0.00098	0.0048	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.11	0.32	50	ND	U	0.002	0.0058	1	ND	U	0.0025	0.0072	1	ND	U	0.0017	0.0048	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.16	0.32	50	ND	U	0.0028	0.0058	1	ND	U	0.0035	0.0072	1	ND	U	0.0024	0.0048	1
Toluene	108-88-3	10,000	100	mg/kg	0.3	J	0.1	0.32	50	ND	U	0.0018	0.0058	1	ND	U	0.0022	0.0072	1	ND	U	0.0015	0.0048	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	0.28	J	0.18	0.96	50	ND	U	0.0033	0.017	1	ND	U	0.0041	0.022	1	ND	U	0.0027	0.015	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	1.6		0.0074	0.076	10	0.078	J	0.0078	0.081	10	0.14		0.0083	0.086	10	2.4		0.016	0.16	20
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	2.2		0.0072	0.076	10	0.41		0.0077	0.081	10	0.98		0.0082	0.086	10	3.3		0.015	0.16	20
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	2.5		0.019	0.076	10	0.39		0.021	0.081	10	0.5		0.022	0.086	10	4		0.041	0.16	20
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.79		0.012	0.076	10	0.21		0.012	0.081	10	0.61		0.013	0.086	10	0.58		0.0012	0.008	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	4.1		0.0067	0.076	10	0.72		0.0071	0.081	10	1.2		0.0075	0.086	10	5.6		0.014	0.16	20
Chrysene	218-01-9	760	230	mg/kg	3		0.005	0.076	10	0.6		0.0053	0.081	10	0.66		0.0056	0.086	10	3.9		0.01	0.16	20
Fluorene	86-73-7	130,000	3,800	mg/kg	1.6		0.0066	0.076	10	0.018	J	0.007	0.081	10	0.096		0.0074	0.086	10	1		0.00069	0.008	1
Naphthalene	91-20-3	760	25	mg/kg	0.73		0.011	0.076	10	0.1		0.011	0.081	10	0.69		0.012	0.086	10	0.15		0.0011	0.008	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	5.2		0.0076	0.076	10	0.34		0.0081	0.081	10	0.57		0.0086	0.086	10	7.1		0.016	0.16	20
Pyrene	129-00-0	96,000	2,200	mg/kg	4.8		0.0061	0.076	10	0.52		0.0065	0.081	10	0.23		0.0069	0.086	10	6.7		0.013	0.16	20
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	73		0.32	0.33	1	90.3		0.46	0.48	1	47.2		0.59	0.62	1	17.8		0.37	0.39	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-016					AOI2-BH-16-017					AOI2-BH-16-018					AOI2-BH-16-019				
				Sample Name	AOI2-BH-16-16-0-2-20160727					AOI2-BH-16-17-0-2-20160728					AOI2-BH-16-18-0-2-20160727					AOI2-BH-16-19-0-2-20160725				
				Sample Date	7/27/2016					7/28/2016					7/27/2016					7/25/2016				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0013	0.0045	1	ND	U	0.11	0.4	50	ND	U	0.0015	0.0052	1	ND	U	0.0015	0.0051	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0011	0.0045	1	ND	U	0.1	0.4	50	ND	U	0.0013	0.0052	1	ND	U	0.0013	0.0051	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.00095	0.0045	1	ND	U	0.085	0.4	50	ND	U	0.0011	0.0052	1	ND	U	0.0011	0.0051	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0015	0.0045	1	ND	U	0.13	0.4	50	ND	U	0.0018	0.0052	1	ND	U	0.0017	0.0051	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0012	0.0045	1	ND	U	0.11	0.4	50	ND	U	0.0014	0.0052	1	ND	U	0.0014	0.0051	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.00091	0.0045	1	ND	U	0.081	0.4	50	ND	U	0.0011	0.0052	1	ND	U	0.001	0.0051	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.002	J	0.0016	0.0045	1	ND	U	0.14	0.4	50	ND	U	0.0018	0.0052	1	ND	U	0.0018	0.0051	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0022	0.0045	1	ND	U	0.19	0.4	50	ND	U	0.0025	0.0052	1	ND	U	0.0025	0.0051	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0014	0.0045	1	ND	U	0.12	0.4	50	ND	U	0.0016	0.0052	1	ND	U	0.0016	0.0051	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.0025	0.013	1	ND	U	0.23	1.2	50	ND	U	0.003	0.016	1	ND	U	0.0029	0.015	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.18		0.0071	0.073	10	0.12		0.00079	0.0081	1	ND	U	0.00073	0.0075	1	ND	U	0.00076	0.0078	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.62		0.007	0.073	10	0.021		0.00078	0.0081	1	0.0069	J	0.00072	0.0075	1	0.0034	J	0.00075	0.0078	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.019	0.073	10	0.024		0.0021	0.0081	1	0.0062	J	0.0019	0.0075	1	ND	U	0.002	0.0078	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.19		0.011	0.073	10	0.011		0.0012	0.0081	1	0.0053	J	0.0012	0.0075	1	0.0022	J	0.0012	0.0078	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.61		0.0065	0.073	10	0.059		0.00072	0.0081	1	0.017	J	0.00066	0.0075	1	0.002	J	0.00069	0.0078	1
Chrysene	218-01-9	760	230	mg/kg	1.3		0.0048	0.073	10	0.079		0.00053	0.0081	1	0.027	J	0.0005	0.0075	1	0.0059	J	0.00051	0.0078	1
Fluorene	86-73-7	130,000	3,800	mg/kg	0.22	J	0.0063	0.073	10	0.24		0.0007	0.0081	1	ND	UJ	0.00065	0.0075	1	ND	U	0.00068	0.0078	1
Naphthalene	91-20-3	760	25	mg/kg	0.14	J	0.01	0.073	10	0.059		0.0011	0.0081	1	0.0063	J	0.0011	0.0075	1	ND	U	0.0011	0.0078	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.16		0.0073	0.073	10	0.4		0.00081	0.0081	1	ND	UJ	0.00075	0.0075	1	ND	U	0.00078	0.0078	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.53		0.0059	0.073	10	0.088		0.00065	0.0081	1	0.032	J	0.00061	0.0075	1	0.0032	J	0.00063	0.0078	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	76.7	J	0.45	0.47	1	24.1		0.46	0.48	1	9.5	J	0.4	0.42	1	7.5		0.37	0.39	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-020					AOI2-BH-16-021					AOI2-BH-16-022					AOI2-BH-16-023				
				Sample Name	AOI2-BH-16-20-0-2-20160722					AOI2-BH-16-21-0-2-20160725					AOI2-BH-16-22-0-2-20160728					AOI2-BH-16-23-0-2-20160920				
				Sample Date	7/22/2016					7/25/2016					7/28/2016					9/20/2016				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0015	0.0052	1	ND	U	0.0014	0.0049	1	7.3		0.081	0.28	50	3.3		0.11	0.4	50
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0013	0.0052	1	ND	U	0.0012	0.0049	1	ND	U	0.072	0.28	50	ND	U	0.1	0.4	50
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.0011	0.0052	1	ND	U	0.001	0.0049	1	ND	U	0.06	0.28	50	ND	U	0.085	0.4	50
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0017	0.0052	1	ND	U	0.0016	0.0049	1	ND	U	0.095	0.28	50	0.35	J	0.13	0.4	50
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0014	0.0052	1	ND	U	0.0013	0.0049	1	ND	U	0.077	0.28	50	0.27	J	0.11	0.4	50
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.0011	0.0052	1	ND	U	0.00099	0.0049	1	ND	U	0.057	0.28	50	ND	U	0.081	0.4	50
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.0028	J	0.0018	0.0052	1	ND	U	0.0017	0.0049	1	3		0.098	0.28	50	0.43		0.14	0.4	50
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0025	0.0052	1	ND	U	0.0024	0.0049	1	ND	U	0.14	0.28	50	ND	U	0.2	0.4	50
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0016	0.0052	1	ND	U	0.0015	0.0049	1	ND	U	0.088	0.28	50	0.54		0.13	0.4	50
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.003	0.016	1	ND	U	0.0028	0.015	1	ND	U	0.16	0.85	50	0.5	J	0.23	1.2	50
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.3		0.0077	0.079	10	ND	U	0.00068	0.007	1	0.72		0.0078	0.081	10	0.34	J	0.01	0.075	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.028	J	0.0075	0.079	10	0.0023	J	0.00067	0.007	1	ND	U	0.0077	0.081	10	0.45	J	0.0085	0.075	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.037	J	0.02	0.079	10	0.0018	J	0.0018	0.007	1	ND	U	0.021	0.081	10	0.29	J	0.011	0.075	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	ND	U	0.012	0.079	10	0.0052	J	0.0011	0.007	1	ND	U	0.012	0.081	10	0.21	J	0.0052	0.075	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.056	J	0.007	0.079	10	0.0025	J	0.00061	0.007	1	0.13		0.0071	0.081	10	0.6	J	0.021	0.075	10
Chrysene	218-01-9	760	230	mg/kg	0.12		0.0052	0.079	10	0.0032	J	0.00046	0.007	1	0.78		0.0053	0.081	10	0.88	J	0.0059	0.075	10
Fluorene	86-73-7	130,000	3,800	mg/kg	0.69		0.0068	0.079	10	ND	U	0.0006	0.007	1	2.1		0.007	0.081	10	1.3	J	0.0053	0.075	10
Naphthalene	91-20-3	760	25	mg/kg	0.13		0.011	0.079	10	ND	U	0.00098	0.007	1	0.72		0.011	0.081	10	0.62	J	0.018	0.075	10
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.93		0.0079	0.079	10	0.0026	J	0.0007	0.007	1	4.1		0.0081	0.081	10	3.7	J	0.012	0.075	10
Pyrene	129-00-0	96,000	2,200	mg/kg	0.15		0.0064	0.079	10	0.0023	J	0.00056	0.007	1	0.28		0.0065	0.081	10	1.9	J	0.011	0.075	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	8.7		0.31	0.33	1	ND	U	2	2.1	5	6.7		0.46	0.48	1	47.6		0.44	0.47	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-024					AOI2-WAREHOUSE #1					AOI2-WAREHOUSE #3					AOI2-WAREHOUSE#5				
				Sample Name	AOI2-BH-16-24-0-2-20160920					AOI2-WAREHOUSE #1_1.5-2_032113					AOI2-WAREHOUSE #3_1.5-2_032113					AOI2 WAREHOUSE #5_0-.5_31913				
				Sample Date	9/20/2016					3/21/2013					3/21/2013					3/19/2013				
				Sample Depth (ft bgs)	0-2					1.5-2					1.5-2					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0015	0.0051	1	ND	U	0.00018	0.0043	1	ND	U	0.0002	0.0047	1	ND	U	0.0054	0.0054	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0013	0.0051	1	ND	U	0.00011	0.00086	1	ND	U	0.00012	0.00093	1	ND	U	0.0011	0.0011	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.0011	0.0051	1	ND	U	0.00012	0.00086	1	ND	U	0.00013	0.00093	1	ND	U	0.0011	0.0011	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0017	0.0051	1	ND	U	0.00014	0.0043	1	ND	U	0.00015	0.0047	1	ND	U	0.0054	0.0054	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0014	0.0051	1	0.0007	J	0.0001	0.00086	1	ND	U	0.00011	0.00093	1	ND	U	0.0011	0.0011	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.0051	1	ND	U	0.00023	0.00086	1	ND	U	0.00025	0.00093	1	ND	U	0.0011	0.0011	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0018	0.0051	1	ND	U	6.4E-05	0.0043	1	ND	U	6.9E-05	0.0047	1	ND	U	0.0054	0.0054	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0025	0.0051	1	ND	U	0.0002	0.00086	1	ND	U	0.00022	0.00093	1	ND	U	0.0011	0.0011	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0016	0.0051	1	ND	U	0.00009	0.00086	1	ND	U	9.8E-05	0.00093	1	ND	U	0.0011	0.0011	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.0029	0.015	1	ND	U	0.00012	0.00086	1	ND	U	0.00013	0.00093	1	ND	U	0.0011	0.0011	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.0017	J	0.0011	0.0083	1	ND	U	0.012	0.034	1	ND	U	0.013	0.036	1	ND	U	0.035	0.035	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.0089		0.00094	0.0083	1	ND	U	0.01	0.034	1	ND	U	0.011	0.036	1	ND	U	0.035	0.035	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.0096		0.0013	0.0083	1	ND	U	0.011	0.034	1	ND	U	0.012	0.036	1	ND	U	0.035	0.035	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.0062	J	0.00058	0.0083	1	ND	U	0.013	0.034	1	ND	U	0.013	0.036	1	ND	U	0.035	0.035	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.02		0.0024	0.0083	1	ND	U	0.011	0.034	1	ND	U	0.012	0.036	1	ND	U	0.035	0.035	1
Chrysene	218-01-9	760	230	mg/kg	0.014		0.00066	0.0083	1	ND	U	0.011	0.034	1	ND	U	0.012	0.036	1	ND	U	0.035	0.035	1
Fluorene	86-73-7	130,000	3,800	mg/kg	0.002	J	0.00059	0.0083	1	ND	U	0.011	0.034	1	ND	U	0.012	0.036	1	ND	U	0.035	0.035	1
Naphthalene	91-20-3	760	25	mg/kg	0.0074	J	0.002	0.0083	1	0.0146	J	0.0093	0.034	1	ND	U	0.0098	0.036	1	ND	U	0.035	0.035	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.0092		0.0013	0.0083	1	ND	U	0.015	0.034	1	ND	U	0.016	0.036	1	ND	U	0.035	0.035	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.0099		0.0012	0.0083	1	ND	U	0.013	0.034	1	ND	U	0.014	0.036	1	ND	U	0.035	0.035	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	15.4		0.47	0.49	1	8.9		0.12	2.1	1	3.4		0.12	2.1	1	3.1		2	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
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ND - Not detected
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*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-140-1					PB-140-2					PB-140-3					PB-140-4				
				Sample Name	140-1					140-2					140-3					140-4				
				Sample Date	10/26/2005					10/26/2005					10/26/2005					10/26/2005				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	NA					NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	NA					NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	NA					NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					NA				
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0005	0.024	43.03	ND	U	0.0005	0.025	46.04	0.053	J	0.0005	0.023	42.44	ND	U	0.0005	0.026	46.64
Ethylbenzene	100-41-4	890	70	mg/kg	0.34		0.001	0.047	43.03	0.051	J	0.001	0.051	46.04	ND	U	0.001	0.047	42.44	ND	U	0.001	0.052	46.64
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.051	J	0.001	0.047	43.03	ND	U	0.001	0.051	46.04	ND	U	0.001	0.047	42.44	ND	U	0.001	0.052	46.64
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	NA					NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	0.33		0.001	0.047	43.03	0.096	J	0.001	0.051	46.04	ND	U	0.001	0.047	42.44	ND	U	0.001	0.052	46.64
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	NA					NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	NA					NA					NA					NA				
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	NA					NA					NA					NA				
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	NA					NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	NA					NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	NA					NA					NA					NA				
Chrysene	218-01-9	760	230	mg/kg	NA					NA					NA					NA				
Fluorene	86-73-7	130,000	3,800	mg/kg	3.7		0.033	0.037	1	13		0.033	0.37	10	0.18	J	0.033	0.037	1	ND	U	0.033	0.037	1
Naphthalene	91-20-3	760	25	mg/kg	2.1		0.001	0.047	43.03	4.7		0.001	0.051	46.04	1.3		0.001	0.047	42.44	0.12	J	0.001	0.052	46.64
Phenanthrene	85-01-8	190,000	10,000	mg/kg	12		0.033	0.37	10	39		0.033	0.37	10	2		0.033	0.037	1	0.15	J	0.033	0.037	1
Pyrene	129-00-0	96,000	2,200	mg/kg	NA					NA					NA					NA				
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	NA					NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
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Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-140-5					PB-140NE					PB-140NW					PB-140SE				
				Sample Name	140-5					140NE(1.0)					140NW(1.0)					140SE(1.0)				
				Sample Date	10/26/2005					4/22/2010					4/22/2010					4/22/2010				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	NA					ND	U	0.001	0.001	0.97	0.008	J	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	NA					ND	U	0.001	0.001	0.97	ND	U	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	NA					ND	U	0.001	0.001	0.97	ND	U	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					ND	U	0.001	0.001	0.97	0.009	J	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0005	0.023	41.05	0.0007	J	0.0005	0.0006	0.97	0.004	J	0.0005	0.001	2.3	ND	U	0.0005	0.0005	0.9
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.046	41.05	ND	U	0.001	0.001	0.97	ND	U	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.046	41.05	ND	U	0.001	0.001	0.97	ND	U	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	NA					ND	U	0.0005	0.0006	0.97	ND	U	0.0005	0.001	2.3	ND	U	0.0005	0.0005	0.9
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.046	41.05	ND	U	0.001	0.001	0.97	0.005	J	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	NA					ND	U	0.001	0.001	0.97	0.004	J	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	NA					ND	U	0.00067	0.35	20	ND	U	0.00067	3.8	20	0.012	J	0.00067	0.004	5
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	NA					1.1		0.00033	0.018	20	15		0.00033	0.063	20	0.026		0.00033	0.002	5
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	NA					0.32		0.00033	0.018	20	11		0.00033	0.063	20	0.012		0.00033	0.002	5
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	NA					1.6		0.00027	0.014	20	21		0.00027	0.13	50	0.0099		0.00027	0.0016	5
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	NA					2.1		0.002	0.11	20	21		0.002	0.38	20	0.12		0.002	0.012	5
Chrysene	218-01-9	760	230	mg/kg	NA					2.1		0.002	0.11	20	50		0.002	0.38	20	ND	U	0.002	0.039	5
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.033	0.037	1	0.99		0.0033	0.18	20	4.1		0.0033	0.63	20	0.043	J	0.0033	0.02	5
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.046	41.05	ND	U	0.001	0.001	0.97	0.004	J	0.001	0.003	2.3	ND	U	0.001	0.001	0.9
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.099	J	0.033	0.037	1	1		0.0013	0.071	20	24		0.0013	0.25	20	0.13		0.0013	0.008	5
Pyrene	129-00-0	96,000	2,200	mg/kg	NA					1.8		0.0033	0.18	20	41		0.0033	0.63	20	0.04	J	0.0033	0.02	5
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	NA					**459**		0.591	0.798	1	**616**		0.591	0.689	1	231		0.591	0.716	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

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ND - Not detected
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ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
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Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

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Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-140SW					PB-141 NE					PB-141 NW					PB-141 SE				
				Sample Name	140SW(1.0)					141 NE (1.0)					141 NW (1.0)					141 SE (1.0)				
				Sample Date	4/22/2010					4/8/2010					4/8/2010					4/8/2010				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.0009	0.86	0.26	J	0.001	0.086	61.04	0.005	J	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.0009	0.86	ND	U	0.001	0.001	1.04	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.0009	0.86	ND	U	0.001	0.001	1.04	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.0009	0.86	0.26		0.001	0.001	1.04	0.003	J	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0005	0.0005	0.86	0.002	J	0.0005	0.0007	1.04	ND	U	0.0005	0.0005	0.86	0.003	J	0.0005	0.0005	0.78
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.0009	0.86	0.005	J	0.001	0.001	1.04	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.0009	0.86	0.002	J	0.001	0.001	1.04	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.0005	0.86	ND	U	0.0005	0.0007	1.04	ND	U	0.0005	0.0005	0.86	ND	U	0.0005	0.0005	0.78
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.0009	0.86	0.004	J	0.001	0.001	1.04	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.0009	0.86	0.051		0.001	0.001	1.04	0.001	J	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.00067	0.58	10	50		0.00067	0.38	20	0.2	J	0.00067	0.16	10	ND	U	0.00067	0.17	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	5.8		0.00033	0.07	50	45		0.00033	0.19	20	1.6		0.00033	0.078	10	0.71		0.00033	0.084	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.36		0.00033	0.014	10	**49**		0.00033	0.19	20	0.83		0.00033	0.078	10	0.59		0.00033	0.084	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	7.3		0.00027	0.056	50	58		0.00027	0.15	20	2.1		0.00027	0.062	10	0.6		0.00027	0.068	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	20		0.002	0.084	10	71		0.002	1.1	20	6.6		0.002	0.47	10	3.2		0.002	0.51	10
Chrysene	218-01-9	760	230	mg/kg	8.4		0.002	0.084	10	180		0.002	1.1	20	ND	U	0.002	2.9	10	0.58	J	0.002	0.51	10
Fluorene	86-73-7	130,000	3,800	mg/kg	3.8		0.0033	0.14	10	63		0.0033	1.9	20	ND	U	0.0033	0.78	10	ND	U	0.0033	0.84	10
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.0009	0.86	0.14		0.001	0.001	1.04	0.002	J	0.001	0.001	0.86	ND	U	0.001	0.001	0.78
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.0013	0.43	10	250		0.0013	0.75	20	0.65	J	0.0013	0.31	10	0.48	J	0.0013	0.34	10
Pyrene	129-00-0	96,000	2,200	mg/kg	11		0.0033	0.14	10	ND	U	0.0033	230	20	3.9		0.0033	0.78	10	1.2	J	0.0033	0.84	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	**2,740**		0.591	3.1	5	**1,940**		0.591	4.16	5	425		0.591	0.694	1	**1,200**		0.591	0.746	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

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[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
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Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
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Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-141 SW					PB-150 CV-1					PB-150-JOINT 1					PB-150-JOINT 2				
				Sample Name	141 SW (1.0)					150 CV-1					150-Joint 1					150-Joint 2				
				Sample Date	4/8/2010					5/10/2006					5/9/2006					5/9/2006				
				Sample Depth (ft bgs)	0.5-1					0-0.5					0-0.5					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.001	0.97	NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.001	0.97	NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.001	0.97	NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.001	0.97	NA					NA					NA				
Benzene	71-43-2	290	0.5	mg/kg	0.0008	J	0.0005	0.0006	0.97	ND	U	0.0005	0.011	22.07	ND	U	0.0005	0.013	22.98	ND	U	0.0005	0.017	30.83
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.001	0.97	ND	U	0.001	0.023	22.07	ND	U	0.001	0.025	22.98	ND	U	0.001	0.035	30.83
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.001	0.97	ND	U	0.001	0.023	22.07	ND	U	0.001	0.025	22.98	ND	U	0.001	0.035	30.83
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.0006	0.97	NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.001	0.97	ND	U	0.001	0.023	22.07	ND	U	0.001	0.025	22.98	ND	U	0.001	0.035	30.83
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.001	0.97	NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.59	J	0.00067	0.16	10	ND	U	0.033	0.034	1	0.41	J	0.033	0.18	1	ND	U	0.033	0.19	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	2.9		0.00033	0.079	10	ND	U	0.033	0.034	1	ND	U	0.033	0.18	1	ND	U	0.033	0.19	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.61		0.00033	0.079	10	ND	U	0.033	0.034	1	0.19	J	0.033	0.18	1	ND	U	0.033	0.19	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	2.6		0.00027	0.063	10	ND	U	0.033	0.034	1	ND	U	0.033	0.18	1	ND	U	0.033	0.19	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	4		0.002	0.47	10	ND	U	0.033	0.034	1	ND	U	0.033	0.18	1	ND	U	0.033	0.19	1
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.002	1.9	10	ND	U	0.033	0.034	1	0.34	J	0.033	0.18	1	ND	U	0.033	0.19	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.0033	0.79	10	ND	U	0.033	0.034	1	ND	U	0.033	0.18	1	ND	U	0.033	0.19	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.001	0.97	ND	U	0.001	0.023	22.07	ND	U	0.001	0.025	22.98	ND	U	0.001	0.035	30.83
Phenanthrene	85-01-8	190,000	10,000	mg/kg	1.4		0.0013	0.32	10	ND	U	0.033	0.034	1	0.32	J	0.033	0.18	1	ND	U	0.033	0.19	1
Pyrene	129-00-0	96,000	2,200	mg/kg	7		0.0033	0.79	10	ND	U	0.033	0.034	1	2.2		0.033	0.18	1	ND	U	0.033	0.19	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	288		0.591	0.682	1	NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-150-JOINT 3					PB-201-LINE-1					PB-201-LINE-2					PB-201-LINE-3				
				Sample Name	150-Joint 3					PB-201-LINE-1					PB-201-LINE-2					PB-201-LINE-3				
				Sample Date	5/10/2006					9/4/2007					9/4/2007					9/4/2007				
				Sample Depth (ft bgs)	0-0.5					0-0.5					0-0.5					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	NA					NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	NA					NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	NA					NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					NA				
Benzene	71-43-2	290	0.5	mg/kg	0.023	J	0.0005	0.014	27.87	ND	U		0.0058	1	0.13			0.0061	1	0.087			0.0063	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.029	27.87	ND	U		0.0058	1	ND	U		0.0061	1	ND	U		0.0063	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.029	27.87	ND	U		0.0058	1	ND	U		0.0061	1	ND	U		0.0063	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	NA					NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	0.039	J	0.001	0.029	27.87	ND	U		0.0058	1	0.012			0.0061	1	0.0089			0.0063	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	NA					NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.45	J	0.033	0.17	1	ND	U		0.37	1	ND	U		0.4	1	ND	U		0.42	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.52	J	0.033	0.17	1	ND	U		0.37	1	1.4			0.4	1	ND	U		0.42	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.37	J	0.033	0.17	1	ND	U		0.37	1	1.4			0.4	1	ND	U		0.42	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.46	J	0.033	0.17	1	0.54			0.37	1	2.5			0.4	1	0.64			0.42	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.4	J	0.033	0.17	1	ND	U		0.37	1	ND	U		0.4	1	ND	U		0.42	1
Chrysene	218-01-9	760	230	mg/kg	2.1		0.033	0.17	1	ND	U		0.37	1	1.6			0.4	1	ND	U		0.42	1
Fluorene	86-73-7	130,000	3,800	mg/kg	2.4		0.033	0.17	1	ND	U		0.37	1	ND	U		0.4	1	ND	U		0.42	1
Naphthalene	91-20-3	760	25	mg/kg	0.77		0.001	0.029	27.87	0.0034	J		0.0058	1	0.0042	J		0.0061	1	0.0032	J		0.0063	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	3.1		0.033	0.17	1	ND	U		0.37	1	1.5			0.4	1	ND	U		0.42	1
Pyrene	129-00-0	96,000	2,200	mg/kg	1.7		0.033	0.17	1	ND	U		0.37	1	2.7			0.4	1	0.71			0.42	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	NA					NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-201-LINE-4					PB-201-LINE-5					PB-237NE					PB-237NW				
				Sample Name	PB-201-LINE-4					PB-201-LINE-5					237NE(1.0)					237NW(1.0)				
				Sample Date	9/4/2007					9/4/2007					4/22/2010					4/22/2010				
				Sample Depth (ft bgs)	0-0.5					0-0.5					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	NA					NA					ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	NA					NA					ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	NA					NA					ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
Benzene	71-43-2	290	0.5	mg/kg	0.23			0.0063	1	0.031			0.0068	1	0.002	J	0.0005	0.0005	0.86	ND	U	0.0005	0.0006	0.91
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U		0.0063	1	ND	U		0.0068	1	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U		0.0063	1	ND	U		0.0068	1	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	NA					NA					ND	U	0.0005	0.0005	0.86	ND	U	0.0005	0.0006	0.91
Toluene	108-88-3	10,000	100	mg/kg	0.01			0.0063	1	0.0058	J		0.0068	1	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	NA					NA					ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U		0.42	1	0.64			0.45	1	ND	U	0.00067	0.016	20	ND	U	0.00067	0.0082	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.45			0.42	1	3.3			0.45	1	0.037		0.00033	0.0081	20	0.024		0.00033	0.0041	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.53			0.42	1	3.2			0.45	1	0.022	J	0.00033	0.0081	20	0.016	J	0.00033	0.0041	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.9			0.42	1	6.7			0.45	1	0.036		0.00027	0.0065	20	0.021		0.00027	0.0033	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U		0.42	1	0.95			0.45	1	0.21		0.002	0.049	20	0.083	J	0.002	0.024	10
Chrysene	218-01-9	760	230	mg/kg	0.68			0.42	1	3.6			0.45	1	ND	U	0.002	0.049	20	ND	U	0.002	0.024	10
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U		0.42	1	ND	U		0.45	1	ND	U	0.0033	0.081	20	ND	U	0.0033	0.041	10
Naphthalene	91-20-3	760	25	mg/kg	0.0029	J		0.0063	1	0.0026	J		0.0068	1	ND	U	0.001	0.001	0.86	ND	U	0.001	0.001	0.91
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U		0.42	1	3.6			0.45	1	ND	U	0.0013	0.033	20	0.026	J	0.0013	0.016	10
Pyrene	129-00-0	96,000	2,200	mg/kg	1.1			0.42	1	7.1			0.45	1	0.085	J	0.0033	0.081	20	0.047	J	0.0033	0.041	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	NA					NA					185		0.591	0.719	1	293		0.591	0.713	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-237SE					PB-237SW					PB-279 NE					PB-279 NW				
				Sample Name	237SE(1.0)					237SW(1.0)					279 NE (1.0)					279 NW (1.0)				
				Sample Date	4/22/2010					4/22/2010					4/8/2010					4/8/2010				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
Benzene	71-43-2	290	0.5	mg/kg	0.002	J	0.0005	0.0005	0.91	ND	U	0.0005	0.0006	0.96	0.012		0.0005	0.0005	0.78	0.001	J	0.0005	0.0006	0.95
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.0005	0.91	ND	U	0.0005	0.0006	0.96	ND	U	0.0005	0.0005	0.78	ND	U	0.0005	0.0006	0.95
Toluene	108-88-3	10,000	100	mg/kg	0.001	J	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	0.004	J	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	0.002	J	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.00067	0.016	20	ND	U	0.00067	0.016	20	ND	U	0.00067	0.017	1	1.4		0.00067	0.17	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.18		0.00033	0.0081	20	0.027	J	0.00033	0.008	20	0.21		0.00033	0.0084	1	4.9		0.00033	0.087	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.03	J	0.00033	0.0081	20	0.012	J	0.00033	0.008	20	0.093		0.00033	0.0084	1	5		0.00033	0.087	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.11		0.00027	0.0064	20	0.018	J	0.00027	0.0064	20	0.13		0.00027	0.0067	1	4.5		0.00027	0.07	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	1.1		0.002	0.048	20	0.11	J	0.002	0.048	20	0.78		0.002	0.05	1	10		0.002	0.52	10
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.002	0.093	20	ND	U	0.002	0.048	20	ND	U	0.002	0.08	1	4		0.002	0.52	10
Fluorene	86-73-7	130,000	3,800	mg/kg	0.11	J	0.0033	0.081	20	ND	U	0.0033	0.08	20	ND	U	0.0033	0.084	1	ND	U	0.0033	0.87	10
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	0.96	ND	U	0.001	0.001	0.78	ND	U	0.001	0.001	0.95
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.061	J	0.0013	0.032	20	0.1	J	0.0013	0.032	20	0.11	J	0.0013	0.033	1	6.5		0.0013	0.35	10
Pyrene	129-00-0	96,000	2,200	mg/kg	0.42		0.0033	0.081	20	0.096	J	0.0033	0.08	20	ND	U	0.0033	0.2	1	10		0.0033	0.87	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	195		0.591	0.725	1	207		0.591	0.712	1	338		0.591	0.745	1	**1,470**		0.591	3.9	5
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-279 SE					PB-279 SW					PB-298NE					PB-298NW				
				Sample Name	279 SE (1.0)					279 SW (1.0)					298NE(1.0)					298NW(1.0)				
				Sample Date	4/8/2010					4/8/2010					4/22/2010					4/22/2010				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0.5-1					0.5-1				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
Benzene	71-43-2	290	0.5	mg/kg	0.018		0.0005	0.0005	0.83	0.004	J	0.0005	0.0005	0.91	ND	U	0.0005	0.0006	1	ND	U	0.0005	0.0005	0.91
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.0005	0.83	ND	U	0.0005	0.0005	0.91	ND	U	0.0005	0.0006	1	ND	U	0.0005	0.0005	0.91
Toluene	108-88-3	10,000	100	mg/kg	0.001	J	0.001	0.001	0.83	0.002	J	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	2		0.00067	0.16	10	ND	U	0.00067	0.15	10	ND	U	0.00067	0.17	20	ND	U	0.00067	0.016	20
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	4.1		0.00033	0.078	10	0.41		0.00033	0.074	10	1.4		0.00033	0.031	20	0.032		0.00033	0.02	20
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	4.7		0.00033	0.078	10	0.31		0.00033	0.074	10	ND	U	0.00033	0.031	20	ND	U	0.00033	0.0079	20
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	3.3		0.00027	0.062	10	0.41		0.00027	0.059	10	0.66		0.00027	0.024	20	0.024	J	0.00027	0.0063	20
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	6.2		0.002	0.47	10	1.5	J	0.002	0.44	10	5.6		0.002	0.18	20	0.56		0.002	0.047	20
Chrysene	218-01-9	760	230	mg/kg	4.3		0.002	0.47	10	ND	U	0.002	0.44	10	ND	U	0.002	0.18	20	ND	U	0.002	0.047	20
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.0033	0.78	10	ND	U	0.0033	0.74	10	0.87	J	0.0033	0.31	20	0.096	J	0.0033	0.079	20
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.001	0.83	ND	U	0.001	0.001	0.91	ND	U	0.001	0.001	1	ND	U	0.001	0.001	0.91
Phenanthrene	85-01-8	190,000	10,000	mg/kg	8.4		0.0013	0.31	10	0.42	J	0.0013	0.3	10	0.2	J	0.0013	0.12	20	0.038	J	0.0013	0.032	20
Pyrene	129-00-0	96,000	2,200	mg/kg	9.9		0.0033	0.78	10	0.96	J	0.0033	0.74	10	2.6		0.0033	0.31	20	0.45		0.0033	0.079	20
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	**592**		0.591	0.678	1	**3,080**		0.591	3.3	5	448		0.591	0.661	1	193		0.591	0.697	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-298SE					PB-298SW					S-135					S-297				
				Sample Name	298SE(1.0)					298SW(1.0)					S-135_0-2					S-297_0-2				
				Sample Date	4/22/2010					4/22/2010					6/10/2010					5/4/2010				
				Sample Depth (ft bgs)	0.5-1					0.5-1					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
Benzene	71-43-2	290	0.5	mg/kg	0.008		0.0005	0.0008	1.06	ND	U	0.0005	0.0005	0.88	ND	U	0.0005	0.005	0.88	ND	U	0.0005	0.005	0.92
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.0008	1.06	ND	U	0.0005	0.0005	0.88	ND	U	0.0005	0.005	0.88	ND	U	0.0005	0.005	0.92
Toluene	108-88-3	10,000	100	mg/kg	0.003	J	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.001	0.005	0.88	ND	U	0.001	0.005	0.92
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.00067	0.055	20	ND	U	0.00067	0.008	10	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.27		0.00033	0.019	20	0.021		0.00033	0.004	10	ND	U	0.033	0.17	1	0.18		0.033	0.17	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.076		0.00033	0.019	20	0.014	J	0.00033	0.004	10	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.15		0.00027	0.015	20	0.018		0.00027	0.0032	10	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.93		0.002	0.11	20	0.07	J	0.002	0.024	10	ND	U	0.033	0.17	1	0.24		0.033	0.17	1
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.002	0.11	20	ND	U	0.002	0.024	10	ND	U	0.033	0.17	1	0.17		0.033	0.17	1
Fluorene	86-73-7	130,000	3,800	mg/kg	0.6	J	0.0033	0.19	20	ND	U	0.0033	0.04	10	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.001	0.002	1.06	ND	U	0.001	0.001	0.88	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.25	J	0.0013	0.075	20	0.025	J	0.0013	0.016	10	ND	U	0.033	0.17	1	ND	U	0.033	0.17	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.68	J	0.0033	0.19	20	0.048	J	0.0033	0.04	10	ND	U	0.033	0.17	1	0.28		0.033	0.17	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	**1,240**		0.591	4.08	5	274		0.591	0.717	1	4.31		0.005	0.202	2	58.7		0.02	0.206	2
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-298					S-299					S-300					S-302S				
				Sample Name	S-298_1-2					S-299_0-2					S-300_0-2					S-302S_1-2				
				Sample Date	5/25/2010					6/8/2010					5/19/2010					5/12/2010				
				Sample Depth (ft bgs)	1-2					0-2					0-2					1-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	0.08	J	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	ND	U	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	ND	U	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	ND	U	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
Benzene	71-43-2	290	0.5	mg/kg	**1.2**	J	0.0005	0.53	952.62	ND	U	0.0005	0.005	0.9	0.13	J	0.0005	0.033	57.6	ND	U	0.0005	0.005	0.87
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	0.11	J	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	ND	U	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.53	952.62	ND	U	0.0005	0.005	0.9	ND	U	0.0005	0.033	57.6	ND	U	0.0005	0.005	0.87
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	0.099	J	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	1.1	952.62	ND	U	0.001	0.005	0.9	0.14	J	0.001	0.065	57.6	ND	U	0.001	0.005	0.87
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	1.6		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	1.5		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	2.5		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.66		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	2.1		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Chrysene	218-01-9	760	230	mg/kg	2.7		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Fluorene	86-73-7	130,000	3,800	mg/kg	3.3		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Naphthalene	91-20-3	760	25	mg/kg	1.4		0.033	0.037	1	ND	U	0.033	0.17	1	ND	U	0.033	0.38	10	ND	U	0.033	0.19	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	6.9		0.033	0.37	10	ND	U	0.033	0.17	1	0.55	J	0.033	0.38	10	ND	U	0.033	0.19	1
Pyrene	129-00-0	96,000	2,200	mg/kg	5.5		0.033	0.37	10	ND	U	0.033	0.17	1	0.5	J	0.033	0.38	10	ND	U	0.033	0.19	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	96		0.02	0.0336	2	12.2		0.005	0.202	2	168		0.02	0.0849	5	47.7		0.02	0.226	2
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
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NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-303					S-305					S-306					S-307				
				Sample Name	S-303_0-2					S-305S_0-2					S-306_0-2					S-307_0-2				
				Sample Date	5/21/2010					5/19/2010					5/20/2010					6/10/2010				
				Sample Depth (ft bgs)	0-2					0-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	0.67		0.001	0.12	104.84	0.063	J	0.001	0.057	49.26	0.19	J	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.12	104.84	ND	U	0.001	0.057	49.26	ND	U	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.12	104.84	ND	U	0.001	0.057	49.26	ND	U	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.12	104.84	ND	U	0.001	0.057	49.26	0.063	J	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
Benzene	71-43-2	290	0.5	mg/kg	0.14	J	0.0005	0.06	104.84	ND	U	0.0005	0.029	49.26	0.16	J	0.0005	0.029	49.78	ND	U	0.0005	0.005	0.88
Ethylbenzene	100-41-4	890	70	mg/kg	0.22	J	0.001	0.12	104.84	ND	U	0.001	0.057	49.26	0.092	J	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	3.6		0.001	0.12	104.84	ND	U	0.001	0.057	49.26	ND	U	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.06	104.84	ND	U	0.0005	0.029	49.26	ND	U	0.0005	0.029	49.78	ND	U	0.0005	0.005	0.88
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.12	104.84	ND	U	0.001	0.057	49.26	0.14	J	0.001	0.058	49.78	ND	U	0.001	0.005	0.88
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	0.52	J	0.001	0.12	104.84	0.092	J	0.001	0.057	49.26	0.36		0.001	0.058	49.78	ND	U	0.001	0.005	0.88
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.54	J	0.033	0.38	10	ND	U	0.033	0.039	1	0.71		0.033	0.039	1	ND	U	0.033	0.18	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	1.8	J	0.033	0.38	10	ND	U	0.033	0.039	1	1.3		0.033	0.039	1	0.29		0.033	0.18	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	2.1		0.033	0.38	10	ND	U	0.033	0.039	1	1.6		0.033	0.039	1	0.32		0.033	0.18	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	1.4	J	0.033	0.38	10	ND	U	0.033	0.039	1	0.82		0.033	0.039	1	ND	U	0.033	0.18	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	1.3	J	0.033	0.38	10	ND	U	0.033	0.039	1	1.7		0.033	0.039	1	0.34		0.033	0.18	1
Chrysene	218-01-9	760	230	mg/kg	6.9		0.033	0.38	10	ND	U	0.033	0.039	1	1.4		0.033	0.039	1	0.3		0.033	0.18	1
Fluorene	86-73-7	130,000	3,800	mg/kg	1.1	J	0.033	0.38	10	ND	U	0.033	0.039	1	0.39		0.033	0.039	1	ND	U	0.033	0.18	1
Naphthalene	91-20-3	760	25	mg/kg	2.2		0.033	0.38	10	ND	U	0.033	0.039	1	0.33		0.033	0.039	1	ND	U	0.033	0.18	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	2.4		0.033	0.38	10	ND	U	0.033	0.039	1	2.8		0.033	0.039	1	0.57		0.033	0.18	1
Pyrene	129-00-0	96,000	2,200	mg/kg	1.7	J	0.033	0.38	10	ND	U	0.033	0.039	1	3		0.033	0.039	1	0.56		0.033	0.18	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	121		0.02	0.0848	5	161		0.02	0.0837	5	145		0.02	0.0842	5	48.4		0.005	0.211	2
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-308					S-309					S-310					S-311				
				Sample Name	S-308_1-2					S-309_1-2					S-310_1-2					S-311_1-2				
				Sample Date	4/30/2010					4/29/2010					4/29/2010					4/29/2010				
				Sample Depth (ft bgs)	1-2					1-2					1-2					1-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	0.045		0.001	0.005	0.8
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	0.039		0.001	0.005	0.8
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0005	0.004	0.78	0.024		0.0005	0.005	0.8	ND	U	0.0005	0.004	0.78	0.052		0.0005	0.005	0.8
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.004	0.78	ND	U	0.0005	0.005	0.8	ND	U	0.0005	0.004	0.78	ND	U	0.0005	0.005	0.8
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.004	0.78	ND	U	0.001	0.005	0.8	ND	U	0.001	0.004	0.78	0.044		0.001	0.005	0.8
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.033	0.19	1	0.39		0.033	0.19	1	ND	U	0.033	0.18	1	ND	U	0.033	0.2	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	ND	U	0.033	0.19	1	0.47		0.033	0.19	1	ND	U	0.033	0.18	1	0.24		0.033	0.2	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.033	0.19	1	0.86		0.033	0.19	1	ND	U	0.033	0.18	1	0.33		0.033	0.2	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	ND	U	0.033	0.19	1	0.28		0.033	0.19	1	ND	U	0.033	0.18	1	ND	U	0.033	0.2	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U	0.033	0.19	1	0.58		0.033	0.19	1	ND	U	0.033	0.18	1	0.31		0.033	0.2	1
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.033	0.19	1	0.86		0.033	0.19	1	0.19		0.033	0.18	1	0.36		0.033	0.2	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.033	0.19	1	ND	U	0.033	0.19	1	ND	U	0.033	0.18	1	ND	U	0.033	0.2	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.033	0.19	1	ND	U	0.033	0.19	1	ND	U	0.033	0.18	1	ND	U	0.033	0.2	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.033	0.19	1	1.8		0.033	0.19	1	ND	U	0.033	0.18	1	0.48		0.033	0.2	1
Pyrene	129-00-0	96,000	2,200	mg/kg	ND	U	0.033	0.19	1	1.6		0.033	0.19	1	0.24		0.033	0.18	1	0.58		0.033	0.2	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	18.9		0.02	0.222	2	64.7		0.02	0.222	2	40.8		0.02	0.216	2	166		0.02	0.586	5
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
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MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
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NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-313					S-314					S-315					S-316				
				Sample Name	S-313_0-2					S-314_1-2					S-315_1-2					S-316_1-2				
				Sample Date	5/6/2010					5/11/2010					5/11/2010					5/10/2010				
				Sample Depth (ft bgs)	0-2					1-2					1-2					1-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	7.4		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	5.7		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
Benzene	71-43-2	290	0.5	mg/kg	**0.62**		0.0005	0.032	58.35	ND	U	0.0005	0.005	0.84	0.19	J	0.0005	0.033	59.42	ND	U	0.0005	0.059	93.46
Ethylbenzene	100-41-4	890	70	mg/kg	2.1		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	3.3		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.032	58.35	ND	U	0.0005	0.005	0.84	ND	U	0.0005	0.033	59.42	ND	U	0.0005	0.059	93.46
Toluene	108-88-3	10,000	100	mg/kg	0.69		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	ND	U	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	29		0.001	0.064	58.35	ND	U	0.001	0.005	0.84	0.075	J	0.001	0.067	59.42	ND	U	0.001	0.12	93.46
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	2.3		0.033	0.36	1	4.1		0.033	1.9	5	ND	U	0.033	0.94	5	ND	U	0.033	1.1	5
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	2.5		0.033	0.36	1	6.3		0.033	1.9	5	ND	U	0.033	0.94	5	ND	U	0.033	1.1	5
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	3.4		0.033	0.36	1	9.6		0.033	1.9	5	ND	U	0.033	0.94	5	1.2	J	0.033	1.1	5
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	1.7	J	0.033	0.36	1	2.6		0.033	1.9	5	ND	U	0.033	0.94	5	ND	U	0.033	1.1	5
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	3.8		0.033	0.36	1	8.1		0.033	1.9	5	ND	U	0.033	0.94	5	1.2	J	0.033	1.1	5
Chrysene	218-01-9	760	230	mg/kg	4.7		0.033	0.36	1	8.5		0.033	1.9	5	2	J	0.033	0.94	5	2.5	J	0.033	1.1	5
Fluorene	86-73-7	130,000	3,800	mg/kg	1.6	J	0.033	0.36	1	ND	U	0.033	1.9	5	ND	U	0.033	0.94	5	ND	U	0.033	1.1	5
Naphthalene	91-20-3	760	25	mg/kg	1.6	J	0.033	0.36	1	ND	U	0.033	1.9	5	ND	U	0.033	0.94	5	2.3	J	0.033	1.1	5
Phenanthrene	85-01-8	190,000	10,000	mg/kg	7		0.033	0.36	1	11		0.033	1.9	5	ND	U	0.033	0.94	5	1.3	J	0.033	1.1	5
Pyrene	129-00-0	96,000	2,200	mg/kg	7.4		0.033	0.36	1	13		0.033	1.9	5	2.1	J	0.033	0.94	5	3.7	J	0.033	1.1	5
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	335		0.02	0.164	10	227		0.02	0.562	5	79.8		0.02	0.0331	2	384		0.02	0.186	10
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
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mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-317					S-318					S-350					S-351				
				Sample Name	S-317_0-2					S-318_1-2					S-350_0-2'					S-351_0-2'				
				Sample Date	5/7/2010					5/12/2010					3/7/2013					3/7/2013				
				Sample Depth (ft bgs)	0-2					1-2					0-2					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.0028	0.0028	1	ND	U	0.0033	0.0033	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.0028	0.0028	1	ND	U	0.0033	0.0033	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0005	0.005	0.81	0.006		0.0005	0.005	0.89	ND	U	0.00055	0.00055	1	0.001		0.00065	0.00065	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.0028	0.0028	1	0.0037		0.0033	0.0033	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0005	0.005	0.81	ND	U	0.0005	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.005	0.81	ND	U	0.001	0.005	0.89	ND	U	0.00055	0.00055	1	ND	U	0.00065	0.00065	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.0442		0.035	0.035	1	0.0576		0.036	0.036	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.194		0.035	0.035	1	0.217		0.036	0.036	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.196		0.035	0.035	1	0.195		0.036	0.036	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.181		0.035	0.035	1	0.179		0.036	0.036	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.195		0.035	0.035	1	0.242		0.036	0.036	1
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	0.203		0.035	0.035	1	0.252		0.036	0.036	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	ND	U	0.035	0.035	1	ND	U	0.036	0.036	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.033	0.2	1	ND	U	0.033	0.19	1	ND	U	0.035	0.035	1	0.0425		0.036	0.036	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.033	0.2	1	0.28		0.033	0.19	1	0.121		0.035	0.035	1	0.209		0.036	0.036	1
Pyrene	129-00-0	96,000	2,200	mg/kg	ND	U	0.033	0.2	1	0.2		0.033	0.19	1	0.317		0.035	0.035	1	0.354		0.036	0.036	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	19.8		0.02	0.24	2	**860**		0.02	5.51	50	223		2	2	1	222		2	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-354					S-355					S-356					S-357				
				Sample Name	S-354_0-2'					S-355_0-2					AOI2_S-356_0-1_30613					AOI2_S-357_0-.5_30613				
				Sample Date	3/6/2013					3/6/2013					3/6/2013					3/6/2013				
				Sample Depth (ft bgs)	0-2					0-2					0-1					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0042	0.0042	1	ND	U	0.0029	0.0029	1	ND	U	0.0055	0.0055	1	ND	U	0.005	0.005	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0042	0.0042	1	ND	U	0.0029	0.0029	1	ND	U	0.0055	0.0055	1	ND	U	0.005	0.005	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0042	0.0042	1	ND	U	0.0029	0.0029	1	ND	U	0.0055	0.0055	1	ND	U	0.005	0.005	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.00085	0.00085	1	ND	U	0.00059	0.00059	1	ND	U	0.0011	0.0011	1	ND	U	0.001	0.001	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.122		0.071	0.071	2	ND	U	0.039	0.039	1	ND	U	0.037	0.037	1	0.0407		0.033	0.033	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	ND	U	0.071	0.071	2	0.185		0.039	0.039	1	0.0681		0.037	0.037	1	0.13		0.033	0.033	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	ND	U	0.071	0.071	2	0.119		0.039	0.039	1	0.0837		0.037	0.037	1	0.134		0.033	0.033	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	ND	U	0.071	0.071	2	0.234		0.039	0.039	1	0.0789		0.037	0.037	1	0.177		0.033	0.033	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	ND	U	0.071	0.071	2	0.174		0.039	0.039	1	0.0723		0.037	0.037	1	0.132		0.033	0.033	1
Chrysene	218-01-9	760	230	mg/kg	ND	U	0.071	0.071	2	0.147		0.039	0.039	1	0.0809		0.037	0.037	1	0.139		0.033	0.033	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.071	0.071	2	ND	U	0.039	0.039	1	ND	U	0.037	0.037	1	ND	U	0.033	0.033	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.071	0.071	2	ND	U	0.039	0.039	1	ND	U	0.037	0.037	1	ND	U	0.033	0.033	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.359		0.071	0.071	2	0.135		0.039	0.039	1	0.0552		0.037	0.037	1	0.126		0.033	0.033	1
Pyrene	129-00-0	96,000	2,200	mg/kg	ND	U	0.071	0.071	2	0.204		0.039	0.039	1	0.0876		0.037	0.037	1	0.175		0.033	0.033	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	**1,070**		2.1	2.1	1	69.6		2.5	2.5	1	339		2.2	2.2	1	**726**		23	23	10
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-358					S-359					S-360					S-361				
				Sample Name	S-358_0-2_30713					S-359_0-2'					AOI2_S-360_0-1_30813					AOI2_S-361_0-.5_30813				
				Sample Date	3/7/2013					3/8/2013					3/8/2013					3/8/2013				
				Sample Depth (ft bgs)	0-2					0-2					0-1					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0056	0.0056	1	0.7		0.51	0.51	1	ND	U	0.0056	0.0056	1	ND	U	0.0046	0.0046	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.1	0.1	1	ND	U	0.0011	0.0011	1	ND	U	0.00092	0.00092	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.1	0.1	1	ND	U	0.0011	0.0011	1	ND	U	0.00092	0.00092	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0056	0.0056	1	ND	U	0.51	0.51	1	ND	U	0.0056	0.0056	1	ND	U	0.0046	0.0046	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.0011	0.0011	1	**4.29**		0.1	0.1	1	0.0033		0.0011	0.0011	1	ND	U	0.00092	0.00092	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.0011	0.0011	1	1.34		0.1	0.1	1	0.0012		0.0011	0.0011	1	ND	U	0.00092	0.00092	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0056	0.0056	1	ND	U	0.51	0.51	1	ND	U	0.0056	0.0056	1	ND	U	0.0046	0.0046	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0011	0.0011	1	ND	U	0.1	0.1	1	ND	U	0.0011	0.0011	1	ND	U	0.00092	0.00092	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0011	0.0011	1	1.02		0.1	0.1	1	ND	U	0.0011	0.0011	1	ND	U	0.00092	0.00092	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.0011	0.0011	1	3.3		0.1	0.1	1	ND	U	0.0011	0.0011	1	ND	U	0.00092	0.00092	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.036	0.036	1	ND	U	0.035	0.035	1	ND	U	0.036	0.036	1	ND	U	0.033	0.033	1
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.143		0.036	0.036	1	ND	U	0.035	0.035	1	0.0575		0.036	0.036	1	0.0481		0.033	0.033	1
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.134		0.036	0.036	1	ND	U	0.035	0.035	1	0.0759		0.036	0.036	1	0.0484		0.033	0.033	1
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.116		0.036	0.036	1	ND	U	0.035	0.035	1	0.0884		0.036	0.036	1	0.0575		0.033	0.033	1
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.193		0.036	0.036	1	ND	U	0.035	0.035	1	0.0807		0.036	0.036	1	0.0472		0.033	0.033	1
Chrysene	218-01-9	760	230	mg/kg	0.151		0.036	0.036	1	0.518		0.035	0.035	1	0.0624		0.036	0.036	1	0.0507		0.033	0.033	1
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.036	0.036	1	ND	U	0.035	0.035	1	ND	U	0.036	0.036	1	ND	U	0.033	0.033	1
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.036	0.036	1	ND	U	0.035	0.035	1	ND	U	0.036	0.036	1	ND	U	0.033	0.033	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.0831		0.036	0.036	1	ND	U	0.035	0.035	1	0.0376		0.036	0.036	1	0.0371		0.033	0.033	1
Pyrene	129-00-0	96,000	2,200	mg/kg	0.161		0.036	0.036	1	ND	U	0.035	0.035	1	0.0712		0.036	0.036	1	0.0609		0.033	0.033	1
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	300		2.1	2.1	1	99.5		2.1	2.1	1	75.7		2.2	2.2	1	104		2.1	2.1	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 4
Summary of Surface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-362					S-363					S-406					S-422				
				Sample Name	S-362_0-1_30713					S-363_0-2'					AOI2-WAREHOUSE#2_0-1_32013					AOI2-S-422-0-2-20160719				
				Sample Date	3/7/2013					3/8/2013					3/20/2013					7/19/2016				
				Sample Depth (ft bgs)	0-1					0-2					0-1					0-2				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0052	0.0052	1	ND	U	0.003	0.003	1	ND	U	0.00021	0.0049	1	ND	U	0.0012	0.0043	1
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.001	0.001	1	ND	U	0.0006	0.0006	1	ND	U	0.00013	0.00099	1	ND	U	0.0011	0.0043	1
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.001	0.001	1	ND	U	0.0006	0.0006	1	ND	U	0.00013	0.00099	1	ND	U	0.00092	0.0043	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0052	0.0052	1	ND	U	0.003	0.003	1	ND	U	0.00016	0.0049	1	ND	U	0.0015	0.0043	1
Benzene	71-43-2	290	0.5	mg/kg	ND	U	0.001	0.001	1	0.00077		0.0006	0.0006	1	ND	U	0.00012	0.00099	1	ND	U	0.0012	0.0043	1
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.001	0.001	1	ND	U	0.0006	0.0006	1	ND	U	0.00026	0.00099	1	ND	U	0.00088	0.0043	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0052	0.0052	1	ND	U	0.003	0.003	1	ND	U	7.4E-05	0.0049	1	ND	U	0.0015	0.0043	1
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.001	0.001	1	0.0013		0.0006	0.0006	1	ND	U	0.00023	0.00099	1	ND	U	0.0021	0.0043	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.001	1	ND	U	0.0006	0.0006	1	ND	U	0.0001	0.00099	1	ND	U	0.0014	0.0043	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.001	0.001	1	ND	U	0.0006	0.0006	1	ND	U	0.00014	0.00099	1	ND	U	0.0025	0.013	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.035	0.035	1	0.0479		0.04	0.04	1	ND	U	0.012	0.033	1	0.4		0.0077	0.079	10
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	0.111		0.035	0.035	1	0.208		0.04	0.04	1	ND	U	0.011	0.033	1	0.75		0.0076	0.079	10
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	0.102		0.035	0.035	1	0.193		0.04	0.04	1	ND	U	0.01	0.033	1	0.81		0.02	0.079	10
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	0.0918		0.035	0.035	1	0.138		0.04	0.04	1	ND	U	0.011	0.033	1	0.28		0.012	0.079	10
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	0.088		0.035	0.035	1	0.234		0.04	0.04	1	ND	U	0.012	0.033	1	1.9		0.007	0.079	10
Chrysene	218-01-9	760	230	mg/kg	0.113		0.035	0.035	1	0.206		0.04	0.04	1	ND	U	0.011	0.033	1	1.2		0.0052	0.079	10
Fluorene	86-73-7	130,000	3,800	mg/kg	ND	U	0.035	0.035	1	ND	U	0.04	0.04	1	ND	U	0.011	0.033	1	1.1		0.0069	0.079	10
Naphthalene	91-20-3	760	25	mg/kg	ND	U	0.035	0.035	1	ND	U	0.04	0.04	1	ND	U	0.009	0.033	1	0.52		0.011	0.079	10
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.0959		0.035	0.035	1	0.221		0.04	0.04	1	ND	U	0.015	0.033	1	2.9		0.0079	0.079	10
Pyrene	129-00-0	96,000	2,200	mg/kg	0.208		0.035	0.035	1	0.296		0.04	0.04	1	ND	U	0.013	0.033	1	1.6		0.0064	0.079	10
METALS																								
Lead*	7439-92-1	2,240	450	mg/kg	216		1.8	1.8	1	180		2.3	2.3	1	6.5	J	0.58	10	5	93		0.49	0.51	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
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ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-Residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-423					PB-3V-7-LINE-1				
				Sample Name	AOI2-S-423-0-2-20160719					PB-3V-7-LINE-1				
				Sample Date	7/19/2016					2/12/2008				
				Sample Depth (ft bgs)	0-2					0-0.5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS														
1,2,4-Trimethylbenzene	95-63-6	560	35	mg/kg	ND	U	0.0012	0.0043	1	NA				
1,2-Dibromoethane (EDB)	106-93-4	3.7	0.005	mg/kg	ND	U	0.0011	0.0043	1	NA				
1,2-Dichloroethane (EDC)	107-06-2	86	0.5	mg/kg	ND	U	0.0009	0.0043	1	NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0014	0.0043	1	NA				
Benzene	71-43-2	290	0.5	mg/kg	0.0088		0.0012	0.0043	1	NA				
Ethylbenzene	100-41-4	890	70	mg/kg	ND	U	0.00086	0.0043	1	NA				
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0015	0.0043	1	NA				
Methyl Tertiary Butyl Ether	1634-04-4	8,600	2	mg/kg	ND	U	0.0021	0.0043	1	NA				
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0013	0.0043	1	NA				
Xylenes, Total (Dimethylbenzene)	1330-20-7	8,000	1,000	mg/kg	ND	U	0.0024	0.013	1	NA				
SEMI-VOLATILE ORGANIC COMPOUNDS														
Anthracene	120-12-7	190,000	350	mg/kg	1.7		0.0073	0.075	10	NA				
Benzo(A)Pyrene	50-32-8	12	430	mg/kg	5.1		0.0072	0.075	10	NA				
Benzo(A)Anthracene	56-55-3	130	46	mg/kg	5.8		0.019	0.075	10	NA				
Benzo(B)Fluoranthene	205-99-2	76	170	mg/kg	1.3		0.012	0.075	10	NA				
Benzo(G,H,I)Perylene	191-24-2	190,000	180	mg/kg	9.8		0.0066	0.075	10	NA				
Chrysene	218-01-9	760	230	mg/kg	5.6		0.0049	0.075	10	NA				
Fluorene	86-73-7	130,000	3,800	mg/kg	0.45		0.0065	0.075	10	NA				
Naphthalene	91-20-3	760	25	mg/kg	0.21		0.011	0.075	10	NA				
Phenanthrene	85-01-8	190,000	10,000	mg/kg	6.8		0.0075	0.075	10	NA				
Pyrene	129-00-0	96,000	2,200	mg/kg	8.8		0.006	0.075	10	NA				
METALS														
Lead*	7439-92-1	2,240	450	mg/kg	**635**		0.36	0.38	1	NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					343		3.31	3.26	1

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentration
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

*Site Specific Standard for lead is 2,240 mg/kg
[1]PADEP Non-Residential Direct Contact MSC for surface soils (0-2 feet below ground surface) (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds either PADEP Non-residential surface soil direct contact MSC or the site-specific standard for lead.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI-2_BH-13-52					AOI2_BH-13-53					AOI-2_BH-13-59					AOI2_BH-13-61				
				Sample Name	AOI-2_BH-13-52_4-6'					BH-13-53_8-10'					AOI-2_BH-13-59_2-3_31313					AOI2_BH-13-61_8.5-9_31213				
				Sample Date	3/14/2013					3/12/2013					3/13/2013					3/12/2013				
				Sample Depth (ft bgs)	4-6					8-10					2-3					8.5-9				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.022	0.54	1	ND	U	0.19	0.19	1	ND	U	0.046	1.1	1	ND	U	0.0043	0.0043	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.014	0.11	1	ND	U	0.038	0.038	1	ND	U	0.028	0.22	1	ND	U	0.00085	0.00085	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.015	0.11	1	ND	U	0.038	0.038	1	ND	U	0.03	0.22	1	ND	U	0.00085	0.00085	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	0.0567	J	0.017	0.54	1	ND	U	0.19	0.19	1	ND	U	0.036	1.1	1	ND	U	0.0043	0.0043	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.013	0.11	1	ND	U	0.038	0.038	1	**0.851**		0.026	0.22	1	ND	U	0.00085	0.00085	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.028	0.11	1	ND	U	0.038	0.038	1	0.183	J	0.058	0.22	1	ND	U	0.00085	0.00085	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	1.74		0.008	0.54	1	0.861		0.19	0.19	1	1.74		0.017	1.1	1	ND	U	0.0043	0.0043	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.025	0.11	1	ND	U	0.038	0.038	1	ND	U	0.052	0.22	1	ND	U	0.00085	0.00085	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.011	0.11	1	ND	U	0.038	0.038	1	0.443		0.023	0.22	1	ND	U	0.00085	0.00085	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	0.707		0.015	0.11	1	ND	U	0.038	0.038	1	0.237		0.031	0.22	1	ND	U	0.00085	0.00085	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.013	0.038	1	ND	U	0.033	0.033	1	ND	U	0.06	0.17	4	ND	U	0.033	0.033	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.012	0.038	1	ND	U	0.033	0.033	1	0.517		0.052	0.17	4	ND	U	0.033	0.033	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.0158	J	0.013	0.038	1	0.0535		0.033	0.033	1	0.479		0.056	0.17	4	ND	U	0.033	0.033	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.014	0.038	1	ND	U	0.033	0.033	1	0.469		0.064	0.17	4	ND	U	0.033	0.033	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.013	0.038	1	ND	U	0.033	0.033	1	0.383		0.057	0.17	4	ND	U	0.033	0.033	1
Chrysene	218-01-9	190,000	230	mg/kg	0.0133	J	0.013	0.038	1	0.0473		0.033	0.033	1	1.05		0.058	0.17	4	ND	U	0.033	0.033	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.0586		0.013	0.038	1	0.22		0.033	0.033	1	3.45		0.056	0.17	4	ND	U	0.033	0.033	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.01	0.038	1	ND	U	0.033	0.033	1	ND	U	0.047	0.17	4	ND	U	0.033	0.033	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.077		0.017	0.038	1	0.602		0.033	0.033	1	6		0.078	0.17	4	ND	U	0.033	0.033	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.0278	J	0.015	0.038	1	0.132		0.033	0.033	1	2.66		0.066	0.17	4	ND	U	0.033	0.033	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	9.6		0.14	2.4	1	7.9		2.3	2.3	1	8		0.11	2	1	8.3		2.4	2.4	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface
[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).
[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI-2_BH-13-62					AOI2_BH-13-63					AOI-2_BH-13-64					AOI-2_BH-13-65				
				Sample Name	AOI-2_BH-13-62_4.5-5.5_31313					AOI2_BH-13-63_4-5_31213					AOI-2_BH-13-64_2-4'					AOI-2_BH-13-65_8-10				
				Sample Date	3/13/2013					3/12/2013					3/13/2013					3/13/2013				
				Sample Depth (ft bgs)	4.5-5.5					4-5					2-4					8-10				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.00033	J	0.00018	0.0043	1	ND	U	0.45	0.45	1	0.112	J	0.025	0.59	1	1.93		0.019	0.46	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.00011	0.00086	1	ND	U	0.091	0.091	1	ND	U	0.015	0.12	1	ND	U	0.012	0.091	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.00012	0.00086	1	ND	U	0.091	0.091	1	ND	U	0.016	0.12	1	ND	U	0.012	0.091	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.00014	0.0043	1	ND	U	0.45	0.45	1	0.0673	J	0.019	0.59	1	0.0399	J	0.015	0.46	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.0001	0.00086	1	ND	U	0.091	0.091	1	ND	U	0.014	0.12	1	ND	U	0.011	0.091	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.00023	0.00086	1	ND	U	0.091	0.091	1	0.0832	J	0.031	0.12	1	0.28		0.024	0.091	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.00074	J	0.000064	0.0043	1	ND	U	0.45	0.45	1	0.0821	J	0.0087	0.59	1	1.22		0.0068	0.46	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.0002	0.00086	1	ND	U	0.091	0.091	1	ND	U	0.028	0.12	1	ND	U	0.022	0.091	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.00009	0.00086	1	ND	U	0.091	0.091	1	ND	U	0.012	0.12	1	ND	U	0.0096	0.091	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.00012	0.00086	1	ND	U	0.091	0.091	1	0.164		0.016	0.12	1	ND	U	0.013	0.091	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.0323	J	0.013	0.038	1	1.29		0.032	0.032	1	0.0463		0.013	0.038	1	ND	U	0.013	0.036	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.011	0.038	1	1.11		0.032	0.032	1	ND	U	0.012	0.038	1	ND	U	0.011	0.036	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.132		0.012	0.038	1	1.62		0.032	0.032	1	1.17		0.012	0.038	1	ND	U	0.012	0.036	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.014	0.038	1	0.468		0.032	0.032	1	ND	U	0.014	0.038	1	ND	U	0.013	0.036	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.013	0.038	1	1.2		0.032	0.032	1	ND	U	0.013	0.038	1	ND	U	0.012	0.036	1
Chrysene	218-01-9	190,000	230	mg/kg	0.345		0.013	0.038	1	1.64		0.032	0.032	1	2.39		0.013	0.038	1	ND	U	0.012	0.036	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.0338	J	0.012	0.038	1	0.777		0.032	0.032	1	0.0267	J	0.012	0.038	1	0.18		0.012	0.036	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.01	0.038	1	0.077		0.032	0.032	1	0.0176	J	0.01	0.038	1	ND	U	0.0098	0.036	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.206		0.017	0.038	1	3.64		0.065	0.065	2	0.129		0.017	0.038	1	1.6		0.016	0.036	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.149		0.014	0.038	1	2.26		0.032	0.032	1	ND	U	0.015	0.038	1	ND	U	0.014	0.036	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	202		0.14	2.4	1	10.9		2.2	2.2	1	12.6		0.13	2.4	1	20.7		0.13	2.3	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI-2_BH-13-66					AOI-2_BH-13-67					AOI2_BH-13-68					AOI2_BH-13-70				
				Sample Name	AOI-2_BH-13-66_6-7_31313					AOI-2_BH-13-67_6-8'					AOI2_BH-13-68_8-9_31213					AOI2_BH-13-70_7-8_31113				
				Sample Date	3/13/2013					3/13/2013					3/12/2013					3/11/2013				
				Sample Depth (ft bgs)	6-7					6-8					8-9					7-8				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0002	0.0048	1	0.198	J	0.02	0.47	1	ND	U	0.53	0.53	1	ND	U	0.6	0.6	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.00012	0.00097	1	ND	U	0.012	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.00013	0.00097	1	ND	U	0.013	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.00016	0.0048	1	0.0244	J	0.015	0.47	1	ND	U	0.53	0.53	1	ND	U	0.6	0.6	1
Benzene	71-43-2	330	0.5	mg/kg	0.0177		0.00012	0.00097	1	0.197		0.011	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	0.00055	J	0.00025	0.00097	1	0.198		0.025	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.00028	J	0.000072	0.0048	1	0.504		0.007	0.47	1	ND	U	0.53	0.53	1	ND	U	0.6	0.6	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.00023	0.00097	1	ND	U	0.022	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0001	0.00097	1	0.152		0.0099	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	0.00031	J	0.00013	0.00097	1	0.301		0.013	0.094	1	ND	U	0.11	0.11	1	ND	U	0.12	0.12	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.012	0.035	1	ND	U	0.055	0.16	4	0.0627		0.038	0.038	1	ND	U	0.039	0.039	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.011	0.035	1	ND	U	0.048	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.012	0.035	1	0.125	J	0.051	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.013	0.035	1	0.177		0.058	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.012	0.035	1	ND	U	0.052	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.012	0.035	1	0.269		0.053	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.012	0.035	1	1.42		0.051	0.16	4	0.332		0.038	0.038	1	0.311		0.039	0.039	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.0097	0.035	1	ND	U	0.043	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.016	0.035	1	3.33		0.071	0.16	4	0.414		0.038	0.038	1	0.321		0.039	0.039	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.014	0.035	1	0.528		0.06	0.16	4	ND	U	0.038	0.038	1	ND	U	0.039	0.039	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	7.9		0.13	2.3	1	25.4		0.14	2.5	1	9.3		2.4	2.4	1	22.7		2	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2_BH-13-71					AOI2_BH-13-71					AOI2_BH-13-72					AOI2_BH-13-72				
				Sample Name	AOI2_BH-13-71_5-6_30813					AOI2_BH-13-71_9-10_30813					BH-13-72_2-4'					BH-13-72_8-10'				
				Sample Date	3/8/2013					3/8/2013					3/11/2013					3/11/2013				
				Sample Depth (ft bgs)	5-6					9-10					2-4					8-10				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.61	0.61	1	ND	U	0.51	0.51	1	ND	U	0.0033	0.0033	1	ND	U	0.002	0.002	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.61	0.61	1	ND	U	0.51	0.51	1	ND	U	0.0033	0.0033	1	ND	U	0.002	0.002	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.61	0.61	1	0.864		0.51	0.51	1	ND	U	0.0033	0.0033	1	ND	U	0.002	0.002	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	0.139		0.12	0.12	1	ND	U	0.1	0.1	1	ND	U	0.00066	0.00066	1	ND	U	0.00041	0.00041	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.0598		0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.0627		0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.0496		0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.0714		0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Chrysene	218-01-9	190,000	230	mg/kg	0.082		0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.38		0.038	0.038	1	0.466		0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.038	0.038	1	ND	U	0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.733		0.038	0.038	1	0.914		0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.115		0.038	0.038	1	0.136		0.079	0.079	2	ND	U	0.033	0.033	1	ND	U	0.033	0.033	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	164		2.5	2.5	1	11.9		2.5	2.5	1	15		2.2	2.2	1	6.3		2.4	2.4	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

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Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2_BH-13-73					AOI2_BH-13-74					AOI2_BH-13-75					AOI2_BH-13-75				
				Sample Name	BH-13-73_8-10'					AOI2_BH-13-74_2-3_31113					BH-13-75_4-6'					BH-13-79_4-6'				
				Sample Date	3/11/2013					3/11/2013					3/11/2013					3/12/2013				
				Sample Depth (ft bgs)	8-10					2-3					4-6					4-6				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0019	0.0019	1	ND	U	0.0046	0.0046	1	ND	U	0.0023	0.0023	1	ND	U	0.28	0.28	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0019	0.0019	1	ND	U	0.0046	0.0046	1	ND	U	0.0023	0.0023	1	ND	U	0.28	0.28	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0019	0.0019	1	ND	U	0.0046	0.0046	1	ND	U	0.0023	0.0023	1	ND	U	0.28	0.28	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	ND	U	0.056	0.056	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.00038	0.00038	1	ND	U	0.00093	0.00093	1	ND	U	0.00045	0.00045	1	0.0651		0.056	0.056	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.036	0.036	1	0.142		0.034	0.034	1	ND	U	0.036	0.036	1	ND	U	0.032	0.032	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.036	0.036	1	0.639		0.034	0.034	1	ND	U	0.036	0.036	1	0.0592		0.032	0.032	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.036	0.036	1	0.609		0.034	0.034	1	ND	U	0.036	0.036	1	0.0788		0.032	0.032	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.036	0.036	1	0.404		0.034	0.034	1	ND	U	0.036	0.036	1	0.0422		0.032	0.032	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.036	0.036	1	0.718		0.034	0.034	1	ND	U	0.036	0.036	1	0.0704		0.032	0.032	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.036	0.036	1	0.674		0.034	0.034	1	ND	U	0.036	0.036	1	0.0903		0.032	0.032	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.036	0.036	1	0.0548		0.034	0.034	1	ND	U	0.036	0.036	1	ND	U	0.032	0.032	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.036	0.036	1	ND	U	0.034	0.034	1	ND	U	0.036	0.036	1	ND	U	0.032	0.032	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.036	0.036	1	0.529		0.034	0.034	1	ND	U	0.036	0.036	1	0.148		0.032	0.032	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.036	0.036	1	0.822		0.034	0.034	1	ND	U	0.036	0.036	1	0.21		0.032	0.032	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	10		2	2	1	9.9		2.4	2.4	1	8.1		2	2	1	117		2.2	2.2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
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PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

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Table 5
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AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2_BH-13-80					AOI2-BH-13-55					AOI2-BH-13-56					AOI2-BH-13-60				
				Sample Name	AOI2_BH-13-80_2-3_31113					AOI2-BH-13-55_2-2.5_032013					AOI2-BH-13-56_2-2.5_032013					AOI2-BH-13-60_2.5-3_032013				
				Sample Date	3/11/2013					3/20/2013					3/20/2013					3/20/2013				
				Sample Depth (ft bgs)	2-3					2-2.5					2-2.5					2.5-3				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	2.64		0.63	0.63	1	0.0783	J	0.026	0.62	1	0.144	J	0.024	0.57	1	3.85	J	0.21	5.1	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.13	0.13	1	ND	U	0.016	0.12	1	ND	U	0.014	0.11	1	ND	U	0.13	1	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.13	0.13	1	ND	U	0.017	0.12	1	ND	U	0.015	0.11	1	ND	U	0.14	1	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	1.86		0.63	0.63	1	0.0281	J	0.02	0.62	1	0.0335	J	0.018	0.57	1	1.6	J	0.16	5.1	1
Benzene	71-43-2	330	0.5	mg/kg	**5.14**		0.13	0.13	1	ND	U	0.015	0.12	1	0.159		0.014	0.11	1	0.411	J	0.12	1	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	2.3		0.13	0.13	1	0.0357	J	0.033	0.12	1	0.0881	J	0.03	0.11	1	1		0.27	1	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	1.52		0.63	0.63	1	ND	U	0.0093	0.62	1	0.149	J	0.0085	0.57	1	0.808	J	0.075	5.1	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.13	0.13	1	ND	U	0.029	0.12	1	ND	U	0.027	0.11	1	ND	U	0.24	1	1
Toluene	108-88-3	10,000	100	mg/kg	1.86		0.13	0.13	1	0.0339	J	0.013	0.12	1	0.042	J	0.012	0.11	1	0.811	J	0.11	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	4.17		0.13	0.13	1	0.0643	J	0.017	0.12	1	0.192		0.016	0.11	1	4.74		0.14	1	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.728		0.037	0.037	1	0.316		0.014	0.041	1	0.0915		0.015	0.043	1	**412**		5.4	15	200
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.74		0.037	0.037	1	0.663		0.012	0.041	1	0.437		0.013	0.043	1	290		0.93	3.1	40
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	1.3		0.037	0.037	1	0.737		0.013	0.041	1	0.335		0.014	0.043	1	**380**		5	15	200
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.414		0.037	0.037	1	0.38		0.015	0.041	1	0.371		0.016	0.043	1	106		1.1	3.1	40
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.877		0.037	0.037	1	0.659		0.014	0.041	1	0.481		0.014	0.043	1	**283**		1	3.1	40
Chrysene	218-01-9	190,000	230	mg/kg	1.27		0.037	0.037	1	0.843		0.014	0.041	1	0.371		0.015	0.043	1	**382**		5.2	15	200
Fluorene	86-73-7	190,000	3,800	mg/kg	7.97		0.37	0.37	10	0.237		0.013	0.041	1	ND	U	0.014	0.043	1	242		1	3.1	40
Naphthalene	91-20-3	190,000	25	mg/kg	1.92		0.037	0.037	1	0.103		0.011	0.041	1	0.875		0.012	0.043	1	**189**		0.84	3.1	40
Phenanthrene	85-01-8	190,000	10,000	mg/kg	12.7		0.37	0.37	10	0.717		0.019	0.041	1	0.431		0.02	0.043	1	1,110		7	15	200
Pyrene	129-00-0	190,000	2,200	mg/kg	3.75		0.37	0.37	10	1.22		0.016	0.041	1	0.279		0.017	0.043	1	648		5.9	15	200
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	156		2.1	2.1	1	145		0.15	2.6	1	228		0.11	2	1	168		0.13	2.4	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
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DF - Dilution factor
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[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-04					AOI2-BH-16-05					AOI2-BH-16-06					AOI2-BH-16-10				
				Sample Name	AOI2-BH-16-004-4-5-20160906					AOI2-BH-16-005-3.5-4-20160906					AOI2-BH-16-006-4-5-20160906					AOI2-BH-16-010-3-4-20160722				
				Sample Date	9/6/2016					9/6/2016					9/6/2016					7/22/2016				
				Sample Depth (ft bgs)	4-5					3.5-4					4-5					3-4				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.075	0.26	50	ND	U	0.068	0.24	50	ND	U	0.071	0.25	50	ND	U	0.13	0.45	50
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.066	0.26	50	ND	U	0.061	0.24	50	ND	U	0.063	0.25	50	ND	U	0.11	0.45	50
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.055	0.26	50	ND	U	0.051	0.24	50	ND	U	0.053	0.25	50	ND	U	0.096	0.45	50
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.088	0.26	50	ND	U	0.08	0.24	50	ND	U	0.084	0.25	50	ND	UJ	0.15	0.45	50
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.071	0.26	50	ND	U	0.065	0.24	50	ND	U	0.068	0.25	50	0.25	J	0.12	0.45	50
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.053	0.26	50	ND	U	0.048	0.24	50	ND	U	0.05	0.25	50	0.34	J	0.091	0.45	50
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.09	0.26	50	0.55		0.082	0.24	50	0.29		0.086	0.25	50	0.21	J	0.16	0.45	50
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.13	0.26	50	ND	U	0.12	0.24	50	ND	U	0.12	0.25	50	ND	U	0.22	0.45	50
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.082	0.26	50	ND	U	0.074	0.24	50	ND	U	0.078	0.25	50	ND	U	0.14	0.45	50
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.15	0.78	50	ND	U	0.14	0.71	50	ND	U	0.14	0.75	50	0.27	J	0.26	1.4	50
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.076		0.0011	0.0084	1	0.11		0.0011	0.008	1	0.2		0.0011	0.0081	1	1.9		0.0079	0.082	10
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.082		0.00095	0.0084	1	0.15		0.00091	0.008	1	0.039		0.00092	0.0081	1	2.4		0.0078	0.082	10
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.061		0.0013	0.0084	1	0.2		0.0012	0.008	1	0.045		0.0012	0.0081	1	2.7		0.021	0.082	10
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.037		0.00058	0.0084	1	0.034		0.00056	0.008	1	0.01		0.00056	0.0081	1	1.2		0.013	0.082	10
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.13		0.0024	0.0084	1	0.32		0.0023	0.008	1	0.036		0.0023	0.0081	1	4.6		0.0072	0.082	10
Chrysene	218-01-9	190,000	230	mg/kg	0.086		0.00066	0.0084	1	0.19		0.00064	0.008	1	0.098		0.00064	0.0081	1	3.1		0.0054	0.082	10
Fluorene	86-73-7	190,000	3,800	mg/kg	0.06		0.00059	0.0084	1	0.087		0.00057	0.008	1	0.88		0.00057	0.0081	1	1.7		0.0071	0.082	10
Naphthalene	91-20-3	190,000	25	mg/kg	0.067		0.002	0.0084	1	0.017		0.0019	0.008	1	2.2		0.02	0.081	10	1.5		0.011	0.082	10
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.24		0.0013	0.0084	1	0.34		0.0013	0.008	1	1.3		0.0013	0.0081	1	5.2		0.0082	0.082	10
Pyrene	129-00-0	190,000	2,200	mg/kg	0.17		0.0012	0.0084	1	0.37		0.0011	0.008	1	0.12		0.0011	0.0081	1	4.2		0.0066	0.082	10
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	86.8		0.38	0.4	1	10.1		0.41	0.43	1	12.9		0.42	0.44	1	112		0.47	0.49	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-11					AOI2-BH-16-12					AOI2-BH-16-16					AOI2-BH-16-17				
				Sample Name	AOI2-BH-16-011-4-5-20160722					AOI2-BH-16-012-3-4-20160721					AOI2-BH-16-016-2-3-20160728					AOI2-BH-16-017-7-8-20160728				
				Sample Date	7/22/2016					7/20/2016					7/28/2016					7/28/2016				
				Sample Depth (ft bgs)	4-5					3-4					2-3					7-8				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.15	J	0.07	0.24	50	ND	U	0.11	0.37	50	ND	U	0.0012	0.0044	1	ND	U	0.0015	0.0053	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.062	0.24	50	ND	U	0.094	0.37	50	ND	U	0.0011	0.0044	1	ND	U	0.0013	0.0053	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.052	0.24	50	ND	U	0.079	0.37	50	ND	U	0.00092	0.0044	1	ND	U	0.0011	0.0053	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.082	0.24	50	ND	U	0.12	0.37	50	ND	U	0.0015	0.0044	1	ND	U	0.0018	0.0053	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.066	0.24	50	0.19	J	0.1	0.37	50	ND	U	0.0012	0.0044	1	ND	U	0.0014	0.0053	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	0.15	J	0.049	0.24	50	0.24	J	0.075	0.37	50	ND	U	0.00088	0.0044	1	ND	U	0.0011	0.0053	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.27		0.084	0.24	50	0.24	J	0.13	0.37	50	0.0023	J	0.0015	0.0044	1	ND	U	0.0018	0.0053	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.12	0.24	50	ND	U	0.18	0.37	50	ND	U	0.0021	0.0044	1	ND	U	0.0026	0.0053	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.076	0.24	50	0.23	J	0.12	0.37	50	ND	U	0.0014	0.0044	1	ND	U	0.0016	0.0053	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.14	0.73	50	0.39	J	0.21	1.1	50	ND	U	0.0025	0.013	1	ND	U	0.003	0.016	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.79		0.0076	0.078	10	0.99		0.008	0.082	10	0.066	J	0.0072	0.074	10	ND	U	0.00074	0.0076	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.4		0.0075	0.078	10	1.6		0.0079	0.082	10	1		0.0071	0.074	10	0.00085	J	0.00073	0.0076	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.56		0.02	0.078	10	1.6		0.021	0.082	10	ND	U	0.019	0.074	10	ND	U	0.0019	0.0076	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.098		0.012	0.078	10	0.68		0.013	0.082	10	0.3		0.011	0.074	10	ND	U	0.0012	0.0076	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.59		0.0069	0.078	10	2.9		0.0072	0.082	10	1		0.0066	0.074	10	0.0014	J	0.00067	0.0076	1
Chrysene	218-01-9	190,000	230	mg/kg	0.7		0.0052	0.078	10	2		0.0054	0.082	10	1.6		0.0049	0.074	10	0.00092	J	0.0005	0.0076	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.92		0.0068	0.078	10	1.1		0.0071	0.082	10	0.052	J	0.0064	0.074	10	0.0011	J	0.00066	0.0076	1
Naphthalene	91-20-3	190,000	25	mg/kg	1.6		0.011	0.078	10	1.1		0.012	0.082	10	0.049	J	0.01	0.074	10	ND	U	0.0011	0.0076	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	2.6		0.0078	0.078	10	4.4		0.0082	0.082	10	0.14		0.0074	0.074	10	0.0024	J	0.00076	0.0076	1
Pyrene	129-00-0	190,000	2,200	mg/kg	1.2		0.0063	0.078	10	3.4		0.0066	0.082	10	0.56		0.006	0.074	10	0.0013	J	0.00061	0.0076	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	50		0.37	0.39	1	115		0.47	0.49	1	168		1.5	1.6	5	6.7		0.35	0.37	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface
[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).
[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-18					AOI2-BH-16-19					AOI2-BH-16-20					AOI2-BH-16-21				
				Sample Name	AOI2-BH-16-018-4-5.5-20160727					AOI2-BH-16-019-3.5-4.5-2016072					AOI2-BH-16-020-5-6-20160722					AOI2-BH-16-021-5-6-20160725				
				Sample Date	7/27/2016					7/25/2016					7/22/2016					7/25/2016				
				Sample Depth (ft bgs)	4-5.5					3.5-4.5					5-6					5-6				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0014	0.005	1	ND	U	0.0015	0.0051	1	ND	U	0.0018	0.0061	1	ND	U	0.0014	0.0048	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.0013	0.005	1	ND	U	0.0013	0.0051	1	ND	U	0.0016	0.0061	1	ND	U	0.0012	0.0048	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.0011	0.005	1	ND	U	0.0011	0.0051	1	ND	U	0.0013	0.0061	1	ND	U	0.001	0.0048	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0017	0.005	1	ND	U	0.0017	0.0051	1	ND	U	0.0021	0.0061	1	ND	U	0.0016	0.0048	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.0014	0.005	1	ND	U	0.0014	0.0051	1	ND	U	0.0017	0.0061	1	ND	U	0.0013	0.0048	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.001	0.005	1	ND	U	0.001	0.0051	1	ND	U	0.0012	0.0061	1	ND	U	0.00096	0.0048	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0017	0.005	1	ND	U	0.0018	0.0051	1	ND	U	0.0021	0.0061	1	ND	U	0.0016	0.0048	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.0024	0.005	1	ND	U	0.0025	0.0051	1	ND	U	0.003	0.0061	1	ND	U	0.0023	0.0048	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0016	0.005	1	ND	U	0.0016	0.0051	1	ND	U	0.0019	0.0061	1	ND	U	0.0015	0.0048	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.0028	0.015	1	ND	U	0.0029	0.015	1	ND	U	0.0035	0.018	1	ND	U	0.0027	0.014	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.00082	0.0084	1	ND	U	0.00081	0.0084	1	0.0064	J	0.00097	0.01	1	ND	U	0.0007	0.0073	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.00081	0.0084	1	ND	U	0.0008	0.0084	1	ND	U	0.00095	0.01	1	ND	U	0.00069	0.0073	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.0022	0.0084	1	ND	U	0.0021	0.0084	1	ND	U	0.0025	0.01	1	ND	U	0.0019	0.0073	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.0013	0.0084	1	ND	U	0.0013	0.0084	1	ND	U	0.0015	0.01	1	ND	U	0.0011	0.0073	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.00074	0.0084	1	ND	U	0.00074	0.0084	1	0.0011	J	0.00088	0.01	1	ND	U	0.00064	0.0073	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.00055	0.0084	1	ND	U	0.00055	0.0084	1	0.0021	J	0.00066	0.01	1	ND	U	0.00048	0.0073	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	UJ	0.00073	0.0084	1	ND	U	0.00073	0.0084	1	0.011		0.00086	0.01	1	ND	U	0.00063	0.0073	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	UJ	0.0012	0.0084	1	ND	U	0.0012	0.0084	1	0.0017	J	0.0014	0.01	1	ND	U	0.001	0.0073	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.00084	0.0084	1	ND	U	0.00084	0.0084	1	0.012		0.001	0.01	1	ND	U	0.00073	0.0073	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.00068	0.0084	1	ND	U	0.00068	0.0084	1	0.0029	J	0.0008	0.01	1	ND	U	0.00059	0.0073	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	5.9	J	0.51	0.53	1	8.4		0.39	0.41	1	10.5		0.42	0.45	1	5.6		0.4	0.42	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
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[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	AOI2-BH-16-22					AOI2-WAREHOUSE #1					AOI2-WAREHOUSE #3					AOI2-WAREHOUSE#5				
				Sample Name	AOI2-BH-16-022-5-6-20160729					AOI2-WAREHOUSE #1_7.5-8_032113					AOI2-WAREHOUSE #3_5-6_32213					AOI2-WAREHOUSE#5_2-3_32013				
				Sample Date	7/29/2016					3/21/2013					3/22/2013					3/20/2013				
				Sample Depth (ft bgs)	5-6					7.5-8					5-6					2-3				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0014	0.005	1	ND	U	0.019	0.46	1	0.179	J	0.024	0.57	1	1.79		0.021	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.0013	0.005	1	ND	U	0.012	0.092	1	ND	U	0.014	0.11	1	ND	U	0.013	0.1	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.0011	0.005	1	ND	U	0.012	0.092	1	ND	U	0.015	0.11	1	ND	U	0.014	0.1	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0017	0.005	1	ND	U	0.015	0.46	1	ND	U	0.018	0.57	1	0.371	J	0.016	0.5	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.0014	0.005	1	0.376		0.011	0.092	1	**0.753**		0.014	0.11	1	**1.32**		0.012	0.1	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.001	0.005	1	0.0978		0.024	0.092	1	0.285		0.03	0.11	1	2.41		0.026	0.1	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.0041	J	0.0017	0.005	1	1.84		0.0068	0.46	1	0.193	J	0.0084	0.57	1	2		0.0074	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.0024	0.005	1	ND	U	0.022	0.092	1	ND	U	0.027	0.11	1	ND	U	0.024	0.1	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0016	0.005	1	0.0531	J	0.0096	0.092	1	0.201		0.012	0.11	1	0.133		0.011	0.1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.0029	0.015	1	0.0962		0.013	0.092	1	0.623		0.016	0.11	1	0.661		0.014	0.1	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.13		0.00078	0.008	1	ND	U	0.012	0.034	1	ND	U	0.012	0.035	1	0.219		0.013	0.038	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.015		0.00077	0.008	1	0.188		0.01	0.034	1	0.114		0.011	0.035	1	0.257		0.011	0.038	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.0066	J	0.0021	0.008	1	0.332		0.011	0.034	1	0.194		0.011	0.035	1	0.345		0.012	0.038	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.023		0.0012	0.008	1	0.0871		0.012	0.034	1	0.0665		0.013	0.035	1	0.207		0.014	0.038	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.033		0.00071	0.008	1	0.163		0.011	0.034	1	0.115		0.012	0.035	1	0.283		0.013	0.038	1
Chrysene	218-01-9	190,000	230	mg/kg	0.034		0.00053	0.008	1	0.359		0.011	0.034	1	0.311		0.012	0.035	1	0.388		0.013	0.038	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.25		0.0007	0.008	1	1.32		0.011	0.034	1	ND	U	0.011	0.035	1	0.221		0.012	0.038	1
Naphthalene	91-20-3	190,000	25	mg/kg	0.092		0.0011	0.008	1	ND	U	0.0092	0.034	1	ND	U	0.0095	0.035	1	0.128		0.01	0.038	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.59		0.0008	0.008	1	3.34		0.015	0.034	1	ND	U	0.016	0.035	1	0.555		0.017	0.038	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.057		0.00065	0.008	1	0.854		0.013	0.034	1	0.336		0.013	0.035	1	0.615		0.014	0.038	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	7.1		0.46	0.48	1	11.3		0.08	1.4	1	46.7		0.13	2.3	1	32.9		0.14	2.5	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface
[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).
[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-150-1					PB-150-2					PB-150-3					PB-150-4				
				Sample Name	150-1					150-2					150-3					150-4				
				Sample Date	5/8/2006					5/8/2006					5/8/2006					5/8/2006				
				Sample Depth (ft bgs)	2.5-3					2.5-3					2.5-3					2.5-3				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	NA					NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	NA					NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	NA					NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					NA				
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.0005	0.013	23.61	ND	U	0.0005	0.013	25.13	ND	U	0.0005	0.012	22.44	ND	U	0.0005	0.013	24.95
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.001	0.026	23.61	ND	U	0.001	0.027	25.13	ND	U	0.001	0.024	22.44	ND	U	0.001	0.027	24.95
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.026	23.61	ND	U	0.001	0.027	25.13	ND	U	0.001	0.024	22.44	ND	U	0.001	0.027	24.95
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	NA					NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.026	23.61	ND	U	0.001	0.027	25.13	ND	U	0.001	0.024	22.44	ND	U	0.001	0.027	24.95
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	NA					NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.037	J	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.052	J	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.001	0.026	23.61	ND	U	0.001	0.027	25.13	ND	U	0.001	0.024	22.44	ND	U	0.001	0.027	24.95
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.061	J	0.033	0.037	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	NA					NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-150-5					PB-150-6					PB-150-7					PB-201-PER1				
				Sample Name	150-5					150-6					150-7					PB-201-PER1				
				Sample Date	5/9/2006					5/9/2006					5/10/2006					5/25/2007				
				Sample Depth (ft bgs)	2.5-3					2.5-3					4.5-5					2.5-3				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	NA					NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	NA					NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	NA					NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					NA				
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.0005	0.013	23.3	ND	U	0.0005	0.012	22.12	ND	U	0.0005	0.012	21.83	ND	UD		0.27	50
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.001	0.025	23.3	ND	U	0.001	0.024	22.12	ND	U	0.001	0.023	21.83	ND	UD		0.27	50
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.001	0.025	23.3	ND	U	0.001	0.024	22.12	ND	U	0.001	0.023	21.83	3.5	D		0.27	50
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	NA					NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.001	0.025	23.3	ND	U	0.001	0.024	22.12	ND	U	0.001	0.023	21.83	0.17	J,D		0.27	50
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	NA					NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.31		0.033	0.036	1	0.052	J	0.033	0.036	1	ND	U	0.033	0.36	1	ND	U		0.38	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.36	1	0.33	J		0.38	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.053	J	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.36	1	0.2	J		0.38	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.36	1	0.38	J		0.38	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.033	0.036	1	ND	U	0.033	0.036	1	ND	U	0.033	0.36	1	0.22	J		0.38	1
Chrysene	218-01-9	190,000	230	mg/kg	0.25		0.033	0.036	1	0.17	J	0.033	0.036	1	0.41	J	0.033	0.36	1	0.33	J		0.38	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.91		0.033	0.036	1	0.069	J	0.033	0.036	1	ND	U	0.033	0.36	1	0.95			0.38	1
Naphthalene	91-20-3	190,000	25	mg/kg	0.2		0.001	0.025	23.3	ND	U	0.001	0.024	22.12	0.079	J	0.001	0.023	21.83	ND	UD		0.27	50
Phenanthrene	85-01-8	190,000	10,000	mg/kg	2.7		0.033	0.036	1	0.13	J	0.033	0.036	1	ND	U	0.033	0.36	1	1.8			0.38	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.56		0.033	0.036	1	0.42		0.033	0.036	1	ND	U	0.033	0.36	1	0.37	J		0.38	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	NA					NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-201-PER2					PB-201-PER3					PB-201-SUB1					S-350				
				Sample Name	PB-201-PER2					PB-201-PER3					PB-201-SUB1					S-350 @ 14'_04172013				
				Sample Date	5/25/2007					5/25/2007					5/25/2007					4/17/2013				
				Sample Depth (ft bgs)	2.5-3					2.5-3					4.5-5					13.5-14				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	NA					NA					NA					ND	U	0.0002	0.0048	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	NA					NA					NA					ND	U	0.00012	0.00096	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	NA					NA					NA					ND	U	0.00013	0.00096	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA					NA					NA					ND	U	0.00015	0.0048	1
Benzene	71-43-2	330	0.5	mg/kg	0.083	J,D		0.13	50	ND	UD		0.31	50	ND	UD		0.13	50	ND	U	0.00011	0.00096	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	UD		0.13	50	ND	UD		0.31	50	ND	UD		0.13	50	ND	U	0.00025	0.00096	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	1.8	D		0.13	50	ND	UD		0.31	50	3.2	D		0.13	50	ND	U	7.1E-05	0.0048	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	NA					NA					NA					ND	U	0.00023	0.00096	1
Toluene	108-88-3	10,000	100	mg/kg	0.092	J,D		0.13	50	ND	UD		0.31	50	0.086	J,D		0.13	50	ND	U	0.0001	0.00096	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	NA					NA					NA					ND	U	0.00013	0.00096	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U		0.39	1	ND	U		0.44	1	ND	U		0.39	1	ND	U	0.038	0.11	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U		0.39	1	1.2			0.44	1	ND	U		0.39	1	ND	U	0.026	0.11	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U		0.39	1	0.56			0.44	1	ND	U		0.39	1					
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U		0.39	1	2.1			0.44	1	ND	U		0.39	1	ND	U	0.05	0.11	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U		0.39	1	0.78			0.44	1	ND	U		0.39	1	ND	U	0.026	0.11	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U		0.39	1	0.89			0.44	1	ND	U		0.39	1	ND	U	0.045	0.11	1
Fluorene	86-73-7	190,000	3,800	mg/kg	1.5			0.39	1	ND	U		0.44	1	ND	U		0.39	1					
Naphthalene	91-20-3	190,000	25	mg/kg	0.24	D		0.13	50	ND	UD		0.31	50	ND	UD		0.13	50	ND	U	0.043	0.11	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	2.6			0.39	1	0.36	J		0.44	1	1.3			0.39	1	ND	U	0.033	0.11	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U		0.39	1	0.7			0.44	1	ND	U		0.39	1	ND	U	0.034	0.11	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	NA					NA					NA					7		0.17	1	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
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ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-350					S-350					S-351					S-351				
				Sample Name	S-350 @ 24'_04172013					S-350_8-10'					S-351 @ 16'_04162013					S-351 @ 30'_04162013				
				Sample Date	4/17/2013					3/7/2013					4/16/2013					4/16/2013				
				Sample Depth (ft bgs)	23.5-24					8-10					15.5-16					29.5-30				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0002	0.0049	1	ND	U	0.0026	0.0026	1	0.123	J	0.023	0.55	1	ND	U	0.014	0.33	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.00012	0.00097	1	ND	U	0.00053	0.00053	1	ND	U	0.014	0.11	1	ND	U	0.0083	0.066	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.00013	0.00097	1	ND	U	0.00053	0.00053	1	ND	U	0.015	0.11	1	ND	U	0.0089	0.066	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.00016	0.0049	1	ND	U	0.0026	0.0026	1	ND	U	0.018	0.55	1	0.0179	J	0.01	0.33	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.00012	0.00097	1	0.0008		0.00053	0.00053	1	ND	U	0.013	0.11	1	ND	U	0.0078	0.066	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.00026	0.00097	1	ND	U	0.00053	0.00053	1	ND	U	0.029	0.11	1	ND	U	0.017	0.066	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.000072	0.0049	1	ND	U	0.0026	0.0026	1	0.092	J	0.0082	0.55	1	1.31		0.0049	0.33	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.00023	0.00097	1	ND	U	0.00053	0.00053	1	ND	U	0.026	0.11	1	ND	U	0.015	0.066	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0001	0.00097	1	ND	U	0.00053	0.00053	1	0.0187	J	0.012	0.11	1	ND	U	0.0069	0.066	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.00013	0.00097	1	ND	U	0.00053	0.00053	1	0.0484	J	0.015	0.11	1	ND	U	0.0091	0.066	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.036	0.11	1	ND	U	0.044	0.044	1	ND	U	0.036	0.11	1	0.0834	J	0.038	0.11	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.025	0.11	1	ND	U	0.044	0.044	1	ND	U	0.024	0.11	1	ND	U	0.025	0.11	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg						ND	U	0.044	0.044	1	ND	U	0.041	0.11	1	ND	U	0.042	0.11	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.048	0.11	1	ND	U	0.044	0.044	1	ND	U	0.047	0.11	1	ND	U	0.049	0.11	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.025	0.11	1	ND	U	0.044	0.044	1	ND	U	0.025	0.11	1	ND	U	0.026	0.11	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.043	0.11	1	ND	U	0.044	0.044	1	ND	U	0.043	0.11	1	ND	U	0.044	0.11	1
Fluorene	86-73-7	190,000	3,800	mg/kg						ND	U	0.044	0.044	1	ND	U	0.037	0.11	1	0.0757	J	0.039	0.11	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.041	0.11	1	ND	U	0.044	0.044	1	ND	U	0.041	0.11	1	ND	U	0.042	0.11	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.032	0.11	1	ND	U	0.044	0.044	1	0.063	J	0.032	0.11	1	0.271		0.033	0.11	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.032	0.11	1	ND	U	0.044	0.044	1	0.0343	J	0.032	0.11	1	0.0972	J	0.033	0.11	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	4		0.16	0.98	1	10.8		2	2	1	2.2		0.17	0.99	1	3.6		0.17	0.99	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-351					S-354					S-354					S-354[3]				
				Sample Name	S-351_8-10'					S-354_4-6'					S-354_8-10'					S-345 @ 15'_04112013				
				Sample Date	3/7/2013					3/6/2013					3/6/2013					4/11/2013				
				Sample Depth (ft bgs)	8-10					4-6					8-10					14.5-15				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.688		0.25	0.25	1	ND	U	0.3	0.3	1	ND	U	0.0055	0.0055	1	ND	U	0.00021	0.005	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00013	0.001	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00014	0.001	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.25	0.25	1	ND	U	0.3	0.3	1	ND	U	0.0055	0.0055	1	ND	U	0.00016	0.005	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00012	0.001	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	0.114		0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00026	0.001	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.431		0.25	0.25	1	ND	U	0.3	0.3	1	ND	U	0.0055	0.0055	1	0.00035	J	0.000074	0.005	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00024	0.001	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.051	0.051	1	ND	U	0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00011	0.001	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.051	0.051	1	0.0654		0.06	0.06	1	ND	U	0.0011	0.0011	1	ND	U	0.00014	0.001	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.038	0.038	1	0.309		0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.012	0.035	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.011	0.035	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.011	0.035	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.013	0.035	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.012	0.035	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.012	0.035	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.012	0.035	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.0096	0.035	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.038	0.038	1	3.08		0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.016	0.035	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.038	0.038	1	ND	U	0.069	0.069	2	ND	U	0.035	0.035	1	ND	U	0.014	0.035	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	9.4		1.9	1.9	1	6.8		1.7	1.7	1	2.7		2.2	2.2	1	2	J	0.13	2.2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-354[3]					S-355					S-355					S-355				
				Sample Name	S-345 @ 24'_04112013					S-355 @ 14'_04102013					S-355 @ 24'_04102013					S-355_8-10'				
				Sample Date	4/11/2013					4/10/2013					4/10/2013					3/6/2013				
				Sample Depth (ft bgs)	23.5-24					13.5-14					23.5-24					8-10				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.128	J	0.021	0.51	1	ND	U	0.00022	0.0053	1	ND	U	0.022	0.54	1	ND	U	0.003	0.003	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.013	0.1	1	ND	U	0.00013	0.0011	1	ND	U	0.014	0.11	1	ND	U	0.00061	0.00061	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.014	0.1	1	ND	U	0.00014	0.0011	1	ND	U	0.014	0.11	1	ND	U	0.00061	0.00061	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	0.0569	J	0.016	0.51	1	ND	U	0.00017	0.0053	1	ND	U	0.017	0.54	1	ND	U	0.003	0.003	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.012	0.1	1	ND	U	0.00013	0.0011	1	ND	U	0.013	0.11	1	ND	U	0.00061	0.00061	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	0.16		0.027	0.1	1	ND	U	0.00028	0.0011	1	ND	U	0.028	0.11	1	ND	U	0.00061	0.00061	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	15.1		0.0076	0.51	1	ND	U	0.000079	0.0053	1	3.29		0.008	0.54	1	ND	U	0.003	0.003	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.024	0.1	1	ND	U	0.00025	0.0011	1	ND	U	0.025	0.11	1	ND	U	0.00061	0.00061	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.011	0.1	1	ND	U	0.00011	0.0011	1	ND	U	0.011	0.11	1	ND	U	0.00061	0.00061	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	0.14		0.014	0.1	1	ND	U	0.00015	0.0011	1	0.0491	J	0.015	0.11	1	ND	U	0.00061	0.00061	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.012	0.036	1	ND	U	0.011	0.033	1	0.121		0.013	0.036	1	ND	U	0.037	0.037	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.011	0.036	1	ND	U	0.01	0.033	1	ND	U	0.011	0.036	1	ND	U	0.037	0.037	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.012	0.036	1	ND	U	0.011	0.033	1	0.0469		0.012	0.036	1	ND	U	0.037	0.037	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.013	0.036	1	ND	U	0.012	0.033	1	ND	U	0.013	0.036	1	ND	U	0.037	0.037	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.012	0.036	1	ND	U	0.011	0.033	1	ND	U	0.012	0.036	1	ND	U	0.037	0.037	1
Chrysene	218-01-9	190,000	230	mg/kg	0.278		0.012	0.036	1	ND	U	0.011	0.033	1	0.0963		0.012	0.036	1	ND	U	0.037	0.037	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.012	0.036	1	ND	U	0.011	0.033	1	0.717		0.012	0.036	1	ND	U	0.037	0.037	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.0097	0.036	1	ND	U	0.0089	0.033	1	ND	U	0.0098	0.036	1	ND	U	0.037	0.037	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.016	0.036	1	ND	U	0.015	0.033	1	1.59		0.016	0.036	1	ND	U	0.037	0.037	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.139		0.014	0.036	1	ND	U	0.013	0.033	1	0.128		0.014	0.036	1	ND	U	0.037	0.037	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	6.8		0.14	2.4	1	6.9		0.12	2	1	4.5		0.13	2.3	1	ND	U	2.4	2.4	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-356					S-357					S-357					S-358				
				Sample Name	AOI2_S-356_2-3_30613					AOI2_S-357_4-5_30613					S-357 @ 24'_04092013					S-358_4-5_30713				
				Sample Date	3/6/2013					3/6/2013					4/9/2013					3/7/2013				
				Sample Depth (ft bgs)	2-3					4-5					23.5-24					4-5				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	0.0043	0.0043	1	ND	U	0.0047	0.0047	1	0.275	J	0.019	0.45	1	ND	U	0.0055	0.0055	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.012	0.091	1	ND	U	0.0011	0.0011	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.012	0.091	1	ND	U	0.0011	0.0011	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.0043	0.0043	1	ND	U	0.0047	0.0047	1	0.0854	J	0.014	0.45	1	ND	U	0.0055	0.0055	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.011	0.091	1	ND	U	0.0011	0.0011	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.024	0.091	1	ND	U	0.0011	0.0011	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	ND	U	0.0043	0.0043	1	ND	U	0.0047	0.0047	1	0.148	J	0.0067	0.45	1	ND	U	0.0055	0.0055	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.021	0.091	1	ND	U	0.0011	0.0011	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.0095	0.091	1	ND	U	0.0011	0.0011	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.00086	0.00086	1	ND	U	0.00095	0.00095	1	ND	U	0.013	0.091	1	ND	U	0.0011	0.0011	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.031	0.031	1	0.037		0.037	0.037	1	0.475		0.011	0.032	1	0.0724		0.04	0.04	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.031	0.031	1	0.16		0.037	0.037	1	0.244		0.0098	0.032	1	0.202		0.04	0.04	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.031	0.031	1	0.151		0.037	0.037	1	0.49		0.011	0.032	1	0.204		0.04	0.04	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.031	0.031	1	0.107		0.037	0.037	1	0.0916		0.012	0.032	1	0.16		0.04	0.04	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.031	0.031	1	0.177		0.037	0.037	1	0.299		0.011	0.032	1	0.214		0.04	0.04	1
Chrysene	218-01-9	190,000	230	mg/kg	ND	U	0.031	0.031	1	0.17		0.037	0.037	1	0.489		0.011	0.032	1	0.217		0.04	0.04	1
Fluorene	86-73-7	190,000	3,800	mg/kg	ND	U	0.031	0.031	1	ND	U	0.037	0.037	1	0.576		0.011	0.032	1	ND	U	0.04	0.04	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.031	0.031	1	ND	U	0.037	0.037	1	0.025	J	0.0088	0.032	1	ND	U	0.04	0.04	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	ND	U	0.031	0.031	1	0.141		0.037	0.037	1	2.17		0.015	0.032	1	0.251		0.04	0.04	1
Pyrene	129-00-0	190,000	2,200	mg/kg	ND	U	0.031	0.031	1	0.213		0.037	0.037	1	1.35		0.012	0.032	1	0.338		0.04	0.04	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	10.8		2.1	2.1	1	54		2.3	2.3	1	4.8		0.26	4.6	2	**807**		2	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface
[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).
[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).
[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-359					S-359					S-359					S-360				
				Sample Name	S-359 @ 15'_04052013					S-359_2-4'					S-359_8-10'					AOI2_S-360_6-7_30813				
				Sample Date	4/5/2013					3/8/2013					3/8/2013					3/8/2013				
				Sample Depth (ft bgs)	14.5-15					2-4					8-10					6-7				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.0487	J	0.019	0.46	1	0.364		0.36	0.36	1	ND	U	0.0062	0.0062	1	ND	U	0.6	0.6	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.012	0.092	1	ND	U	0.071	0.071	1	ND	U	0.0012	0.0012	1	ND	U	0.12	0.12	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.012	0.092	1	ND	U	0.071	0.071	1	ND	U	0.0012	0.0012	1	ND	U	0.12	0.12	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	0.0235	J	0.015	0.46	1	ND	U	0.36	0.36	1	ND	U	0.0062	0.0062	1	ND	U	0.6	0.6	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.011	0.092	1	0.237		0.071	0.071	1	ND	U	0.0012	0.0012	1	**7.15**		0.12	0.12	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.024	0.092	1	0.469		0.071	0.071	1	ND	U	0.0012	0.0012	1	14.7		0.12	0.12	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.644		0.0068	0.46	1	0.819		0.36	0.36	1	0.0257		0.0062	0.0062	1	2.84		0.6	0.6	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.022	0.092	1	ND	U	0.071	0.071	1	ND	U	0.0012	0.0012	1	0.492		0.12	0.12	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.0097	0.092	1	0.287		0.071	0.071	1	ND	U	0.0012	0.0012	1	ND	U	0.12	0.12	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	0.0483	J	0.013	0.092	1	1.14		0.071	0.071	1	ND	U	0.0012	0.0012	1	ND	U	0.12	0.12	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.158		0.013	0.037	1	ND	U	0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.0425		0.011	0.037	1	0.056		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.083		0.012	0.037	1	0.074		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.024	J	0.014	0.037	1	0.0483		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.032	J	0.012	0.037	1	0.0686		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Chrysene	218-01-9	190,000	230	mg/kg	0.124		0.012	0.037	1	0.147		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Fluorene	86-73-7	190,000	3,800	mg/kg	0.459		0.012	0.037	1	0.343		0.041	0.041	1	ND	U	0.038	0.038	1	ND	U	0.04	0.04	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.01	0.037	1	ND	U	0.041	0.041	1	ND	U	0.038	0.038	1	0.805		0.04	0.04	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	1.06		0.017	0.037	1	0.672		0.041	0.041	1	ND	U	0.038	0.038	1	0.686		0.04	0.04	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.192		0.014	0.037	1	0.193		0.041	0.041	1	ND	U	0.038	0.038	1	0.104		0.04	0.04	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	5.9		0.12	2.2	1	46.7		2.8	2.8	1	9.7		2.3	2.3	1	12.3		2.5	2.5	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-361					S-361					S-362					S-362				
				Sample Name	AOI2_S-361_8-9_30813					S-361 @ 18'_04032013					S-362 @ 15'_04032013					S-362 @ 22'_04032013				
				Sample Date	3/8/2013					4/3/2013					4/3/2013					4/3/2013				
				Sample Depth (ft bgs)	8-9					17.5-18					14.5-15					21.5-22				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	1.1	1.1	1	0.0895	J	0.02	0.48	1	ND	U	0.00025	0.0061	1	ND	U	0.00026	0.0062	1
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.21	0.21	1	ND	U	0.012	0.095	1	ND	U	0.00015	0.0012	1	ND	U	0.00016	0.0012	1
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.21	0.21	1	ND	U	0.013	0.095	1	ND	U	0.00016	0.0012	1	ND	U	0.00017	0.0012	1
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	1.1	1.1	1	0.0272	J	0.015	0.48	1	ND	U	0.00019	0.0061	1	ND	U	0.0002	0.0062	1
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.21	0.21	1	0.0309	J	0.011	0.095	1	ND	U	0.00014	0.0012	1	0.00065	J	0.00015	0.0012	1
Ethylbenzene	100-41-4	1,000	70	mg/kg	1.91		0.21	0.21	1	0.102		0.025	0.095	1	ND	U	0.00032	0.0012	1	0.003		0.00033	0.0012	1
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	25		1.1	1.1	1	3.75		0.0071	0.48	1	ND	U	0.00009	0.0061	1	ND	U	0.000093	0.0062	1
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.21	0.21	1	ND	U	0.022	0.095	1	ND	U	0.00029	0.0012	1	ND	U	0.00029	0.0012	1
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.21	0.21	1	ND	U	0.01	0.095	1	ND	U	0.00013	0.0012	1	0.00088	J	0.00013	0.0012	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.21	0.21	1	0.0686	J	0.013	0.095	1	ND	U	0.00017	0.0012	1	0.00088	J	0.00017	0.0012	1
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	1.33		0.18	0.18	5	0.216		0.011	0.032	1	ND	U	0.014	0.039	1	ND	U	0.014	0.041	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.18	0.18	5	0.0183	J	0.0097	0.032	1	ND	U	0.012	0.039	1	ND	U	0.013	0.041	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.241		0.18	0.18	5	0.0444		0.01	0.032	1	ND	U	0.013	0.039	1	ND	U	0.013	0.041	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.18	0.18	5	ND	U	0.012	0.032	1	ND	U	0.015	0.039	1	ND	U	0.015	0.041	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.18	0.18	5	0.0203	J	0.011	0.032	1	ND	U	0.013	0.039	1	ND	U	0.014	0.041	1
Chrysene	218-01-9	190,000	230	mg/kg	0.603		0.18	0.18	5	0.103		0.011	0.032	1	ND	U	0.013	0.039	1	0.0806		0.014	0.041	1
Fluorene	86-73-7	190,000	3,800	mg/kg	6.31		0.18	0.18	5	2.16		0.01	0.032	1	ND	U	0.013	0.039	1	0.282		0.013	0.041	1
Naphthalene	91-20-3	190,000	25	mg/kg	ND	U	0.18	0.18	5	ND	U	0.0087	0.032	1	ND	U	0.011	0.039	1	ND	U	0.011	0.041	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	14		0.18	0.18	5	4.83		0.058	0.13	4	ND	U	0.018	0.039	1	0.483		0.019	0.041	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.935		0.18	0.18	5	0.256		0.012	0.032	1	ND	U	0.015	0.039	1	0.053		0.016	0.041	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	8.2		2.2	2.2	1	3.5		0.12	2.1	1	14.3		0.11	1.9	1	13.4		0.11	2	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
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AOI 2 Remedial Investigation Report
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Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-362					S-363					S-363					S-422				
				Sample Name	S-362_2-3_30713					S-363 @ 10-12'_032813					S-363_4-6'					AOI2-S-422-13-15-20160722				
				Sample Date	3/7/2013					3/28/2013					3/8/2013					7/22/2016				
				Sample Depth (ft bgs)	2-3					10-12					4-6					13-15				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	ND	U	1.1	1.1	1	ND	U	0.00018	0.0043	1	26.8		1.4	1.4	1	**62.3**		0.6	2.1	500
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.22	0.22	1	ND	U	0.00011	0.00085	1	ND	U	0.0012	0.0012	1	ND	U	0.053	0.21	50
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.22	0.22	1	ND	U	0.00012	0.00085	1	ND	U	0.0012	0.0012	1	ND	U	0.044	0.21	50
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	1.1	1.1	1	ND	U	0.00014	0.0043	1	9.72		1.4	1.4	1	23		0.7	2.1	500
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.22	0.22	1	ND	U	0.0001	0.00085	1	0.116		0.0012	0.0012	1	ND	U	0.057	0.21	50
Ethylbenzene	100-41-4	1,000	70	mg/kg	0.564		0.22	0.22	1	ND	U	0.00022	0.00085	1	9.36		0.27	0.27	1	ND	U	0.042	0.21	50
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	3.93		1.1	1.1	1	ND	U	0.000064	0.0043	1	0.108		0.0061	0.0061	1	9.3		0.072	0.21	50
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.22	0.22	1	0.0061		0.0002	0.00085	1	0.0021		0.0012	0.0012	1	ND	U	0.1	0.21	50
Toluene	108-88-3	10,000	100	mg/kg	ND	U	0.22	0.22	1	ND	U	0.00009	0.00085	1	ND	U	0.0012	0.0012	1	ND	U	0.065	0.21	50
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.22	0.22	1	ND	U	0.00012	0.00085	1	17.6		0.27	0.27	1	29.9		1.2	6.2	500
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	ND	U	0.19	0.19	5	ND	U	0.011	0.032	1	0.859		0.038	0.038	1	0.052		0.00071	0.0073	1
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	ND	U	0.19	0.19	5	ND	U	0.0097	0.032	1	0.103		0.038	0.038	1	0.013		0.0007	0.0073	1
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	0.202		0.19	0.19	5	ND	U	0.01	0.032	1	0.313		0.038	0.038	1	0.03		0.0019	0.0073	1
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	ND	U	0.19	0.19	5	ND	U	0.012	0.032	1	ND	U	0.038	0.038	1	0.0052	J	0.0011	0.0073	1
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	ND	U	0.19	0.19	5	ND	U	0.011	0.032	1	0.139		0.038	0.038	1	0.039		0.00064	0.0073	1
Chrysene	218-01-9	190,000	230	mg/kg	0.464		0.19	0.19	5	ND	U	0.011	0.032	1	0.369		0.038	0.038	1	0.067		0.00048	0.0073	1
Fluorene	86-73-7	190,000	3,800	mg/kg	2.08		0.19	0.19	5	ND	U	0.01	0.032	1	2.2		0.038	0.038	1	0.24		0.00063	0.0073	1
Naphthalene	91-20-3	190,000	25	mg/kg	0.48		0.19	0.19	5	ND	U	0.0086	0.032	1	4.42		0.077	0.077	2	0.18		0.001	0.0073	1
Phenanthrene	85-01-8	190,000	10,000	mg/kg	3.42		0.19	0.19	5	ND	U	0.014	0.032	1	6.99		0.077	0.077	2	0.43		0.00073	0.0073	1
Pyrene	129-00-0	190,000	2,200	mg/kg	0.348		0.19	0.19	5	ND	U	0.012	0.032	1	1.44		0.038	0.038	1	0.071		0.00059	0.0073	1
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	25.7		2	2	1	4.9		0.13	2.3	1	9.5		2.4	2.4	1	2.2		0.34	0.36	1
Potassium	7440-09-7	NS	NS	mg/kg	NA					NA					NA					NA				

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	S-423					PB-3B-7-PERIMETER-1					PB-3B-7-PERIMETER-2					PB-3B-7-PERIMETER-3				
				Sample Name	AOI2-S-423-13-15-20160725					PB-3B-7-PERIMETER-1					PB-3B-7-PERIMETER-2					PB-3B-7-PERIMETER-3				
				Sample Date	7/25/2016					11/30/2006					11/30/2006					11/30/2006				
				Sample Depth (ft bgs)	13-15					2.5-3					2.5-3					2.5-3				
				Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	0.28		0.069	0.24	50	NA					NA					NA				
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	ND	U	0.062	0.24	50	NA					NA					NA				
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	ND	U	0.052	0.24	50	NA					NA					NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	ND	U	0.082	0.24	50	NA					NA					NA				
Benzene	71-43-2	330	0.5	mg/kg	ND	U	0.066	0.24	50	NA					NA					NA				
Ethylbenzene	100-41-4	1,000	70	mg/kg	ND	U	0.049	0.24	50	NA					NA					NA				
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	0.2	J	0.084	0.24	50	NA					NA					NA				
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	ND	U	0.12	0.24	50	NA					NA					NA				
Toluene	108-88-3	10,000	100	mg/kg	0.96		0.076	0.24	50	NA					NA					NA				
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	ND	U	0.14	0.73	50	NA					NA					NA				
SEMI-VOLATILE ORGANIC COMPOUNDS																								
Anthracene	120-12-7	190,000	350	mg/kg	0.04		0.0034	0.035	5	NA					NA					NA				
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	0.4		0.0034	0.035	5	NA					NA					NA				
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	ND	U	0.009	0.035	5	NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	0.037		0.0054	0.035	5	NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	0.24		0.0031	0.035	5	NA					NA					NA				
Chrysene	218-01-9	190,000	230	mg/kg	1.3		0.0023	0.035	5	NA					NA					NA				
Fluorene	86-73-7	190,000	3,800	mg/kg	0.11		0.003	0.035	5	NA					NA					NA				
Naphthalene	91-20-3	190,000	25	mg/kg	0.031	J	0.0049	0.035	5	NA					NA					NA				
Phenanthrene	85-01-8	190,000	10,000	mg/kg	0.36		0.0035	0.035	5	NA					NA					NA				
Pyrene	129-00-0	190,000	2,200	mg/kg	0.28		0.0028	0.035	5	NA					NA					NA				
METALS																								
Lead	7439-92-1	190,000	450	mg/kg	1.9		0.42	0.44	1	NA					NA					NA				
Potassium	7440-09-7	NS	NS	mg/kg	NA					208		3.31	4.03	1	132		3.31	3.61	1	1,490		3.31	3.96	1

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 5
Summary of Subsurface Soil Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP Non-residential Soil Direct Contact MSC [1]	PADEP Non-Residential Soil to Groundwater MSC [2]	Location	PB-3B-7-SUB-1				
				Sample Name	PB-3B-7-SUB-1				
				Sample Date	11/30/2006				
				Sample Depth (ft bgs)	4.5-5				
				Unit	Result	Q	MDL	RL	DF
VOLATILE ORGANIC COMPOUNDS									
1,2,4-Trimethylbenzene	95-63-6	640	35	mg/kg	NA				
1,2-Dibromoethane (EDB)	106-93-4	4.3	0.005	mg/kg	NA				
1,2-Dichloroethane (EDC)	107-06-2	98	0.5	mg/kg	NA				
1,3,5-Trimethylbenzene	108-67-8	10,000	210	mg/kg	NA				
Benzene	71-43-2	330	0.5	mg/kg	NA				
Ethylbenzene	100-41-4	1,000	70	mg/kg	NA				
Isopropylbenzene (Cumene)	98-82-8	10,000	2,500	mg/kg	NA				
Methyl Tertiary Butyl Ether	1634-04-4	9,900	2	mg/kg	NA				
Toluene	108-88-3	10,000	100	mg/kg	NA				
Xylenes, Total (Dimethylbenzene)	1330-20-7	9,100	1,000	mg/kg	NA				
SEMI-VOLATILE ORGANIC COMPOUNDS									
Anthracene	120-12-7	190,000	350	mg/kg	NA				
Benzo(A)Pyrene	50-32-8	190,000	430	mg/kg	NA				
Benzo(A)Anthracene	56-55-3	190,000	46	mg/kg	NA				
Benzo(G,H,I)Perylene	191-24-2	190,000	170	mg/kg	NA				
Benzo(B)Fluoranthene	205-99-2	190,000	180	mg/kg	NA				
Chrysene	218-01-9	190,000	230	mg/kg	NA				
Fluorene	86-73-7	190,000	3,800	mg/kg	NA				
Naphthalene	91-20-3	190,000	25	mg/kg	NA				
Phenanthrene	85-01-8	190,000	10,000	mg/kg	NA				
Pyrene	129-00-0	190,000	2,200	mg/kg	NA				
METALS									
Lead	7439-92-1	190,000	450	mg/kg	NA				
Potassium	7440-09-7	NS	NS	mg/kg	3,190		3.31	3.89	1

Note:
CAS - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
MSC - medium specific concentrations
mg/kg - milligrams per kilogram
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
NS - No standard
ft bgs - feet below ground surface

[1] : PADEP Act 2 Non-Residential Subsurface Soil (2-15 ft bgs) Direct Contact MSCs (last updated August 27, 2016).

[2] PADEP Non-Residential Soil to Groundwater MSC for unsaturated soils in a used aquifer with total dissolved solids less than 2500 mg/l (last updated August 27, 2016).

[3] : Sample name does not match location due to mislabeling on the chain of custody.

Qualifiers:
U - Compound analyzed but not detected.
J - Compound detected between the RL and MDL. Result should be considered an estimate.

Exceedances:
10 - Result exceeds PADEP Non-residential subsurface soil direct contact MSC.
10 - Result exceeds PADEP Non-residential soil to groundwater MSC.
10 - MDL exceeds PADEP Non-residential subsurface soil direct contact MSC.

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	C-HEADER_071410					PGW-MW8S					PGW-MW-8S_040813					PZ-100-20160818-WG				
			Sample Date	7/14/2010					5/29/2014					4/8/2013					8/18/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	1.3	J	0.19	2	1	0.94	J	0.19	2	1	0.91	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND		0.011	0.02	1	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND		0.3	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	0.61	J	0.17	2	1	1.5	J	0.36	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	1.3		0.21	0.5	1	2.4		0.24	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	0.53	J	0.4	1	1	0.78	J	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	2	1	7.1		0.26	1	1	35.8		0.45	2	1	5.3		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	ND		0.26	1	1	2.1		0.16	1	1	2		0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	0.36	J	0.22	1	1	1.9		0.23	1	1	20.8		0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	1.5		0.2	1	1	8.4		0.24	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.997		0.02	0.1	1	3.57		0.02	0.1	1	0.05	J	0.014	0.11	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					2.78		0.012	0.1	1	4.75		0.012	0.1	1	0.052	J	0.016	0.11	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					**1.45**		0.012	0.1	1	**3.33**		0.012	0.1	1	0.06	J	0.0081	0.11	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					**2.15**		0.01	0.1	1	**2.89**		0.01	0.1	1	0.078	J	0.018	0.11	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					**0.71**		0.016	0.1	1	**1.52**		0.016	0.1	1	0.073	J	0.021	0.11	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	**2.62**		0.012	0.1	1	**6.45**		0.012	1	1	0.053	J	0.0086	0.11	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	1.9		0.017	0.1	1	7.17		0.017	1	1	0.86		0.018	0.11	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	ND		0.036	0.1	1	ND	U	0.036	0.1	1	0.28		0.02	0.11	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	0.351		0.021	0.1	1	14.1		0.021	1	1	0.65		0.018	0.11	1
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	8.01		0.015	1	1	16.8		0.015	1	1	0.14		0.014	0.11	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	**9.1**		1.3	3	1	ND	U	1.7	3	1	ND	U	2.6	5	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	PZ-101-20160819-WG					PZ-101_06_11_2013					PZ-101_071510					RW-108-20160511				
			Sample Date	8/19/2016					6/11/2013					7/15/2010					5/11/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.01	0.03	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	2.5		0.45	2	1	3		0.5	2	1	ND	U	0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.16	1.3	10	0.376		0.02	0.1	1	NA					ND	U	0.1	0.5	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.55	J	0.19	1.3	10	1.22		0.012	0.1	1	NA					ND	U	0.1	0.5	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**0.44**	J	0.092	1.3	10	**0.916**		0.012	0.1	1	NA					ND	U	0.1	0.5	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.87	J	0.2	1.3	10	**1.41**		0.01	0.1	1	NA					ND	U	0.1	0.5	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**0.45**	J	0.24	1.3	10	**0.872**		0.016	0.1	1	NA					ND	U	0.1	0.5	1
Chrysene	218-01-9	1.9	ug/L	0.49	J	0.097	1.3	10	1.26		0.012	0.1	1	ND	U	1	5	1	ND	U	0.1	0.5	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.21	1.3	10	0.158		0.017	0.1	1	ND	U	1	5	1	ND	U	0.1	0.5	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.23	1.3	10	ND	U	0.036	0.1	1	ND	U	1	5	1	ND	U	0.1	0.5	1
Phenanthrene	85-01-8	1100	ug/L	0.48	J	0.2	1.3	10	1.28		0.021	0.1	1	ND	U	1	5	1	ND	U	0.1	0.5	1
Pyrene	129-00-0	130	ug/L	0.72	J	0.16	1.3	10	1.75		0.015	0.1	1	ND	U	1	5	1	ND	U	0.1	0.5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	0.13	1	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	RW-109_20150519					RW-109					RW-109_040413					RW-109				
			Sample Date	5/19/2015					5/29/2014					4/4/2013					11/28/2011				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	0.5	1	ND		0.19	2	1	ND	U	0.19	2	1	ND	U		0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.0096	1	ND		0.011	0.02	1	ND	U	0.011	0.02	1	ND	U		0.0098	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	0.5	1	ND		0.3	1	1	ND	U	0.26	1	1	ND	U		0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	0.5	1	ND		0.17	2	1	ND	U	0.36	2	1	ND	U		0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	0.5	1	ND		0.21	0.5	1	ND	U	0.24	1	1	ND	U		0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	0.5	1	ND		0.4	1	1	ND	U	0.23	1	1	ND	U		0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	0.5	1	ND		0.26	1	1	ND	U	0.45	2	1	ND	U		0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	0.5	1	ND		0.26	1	1	ND	U	0.16	1	1	ND	U		0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	0.5	1	ND		0.22	1	1	ND	U	0.23	1	1	ND	U		0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	0.5	1	ND		0.2	1	1	ND	U	0.24	1	1	ND	U		0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.1	J	0.1	0.1	1	0.121		0.021	0.1	1	ND	U	0.02	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.1	0.1	1	ND		0.012	0.1	1	ND	U	0.012	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.1	0.1	1	ND		0.013	0.1	1	ND	U	0.012	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.1	0.1	1	ND		0.01	0.1	1	ND	U	0.01	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.1	0.1	1	ND		0.016	0.1	1	ND	U	0.016	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.1	0.1	1	ND		0.012	0.1	1	ND	U	0.012	0.1	1	ND	U		0.078	1
Fluorene	86-73-7	1900	ug/L	0.7		0.1	0.1	1	0.591		0.017	0.1	1	0.532		0.017	0.1	1	0.26	J			1
Naphthalene	91-20-3	100	ug/L	0.2	J	0.1	0.1	1	ND		0.036	0.1	1	ND	U	0.036	0.1	1	ND	U		0.97	1
Phenanthrene	85-01-8	1100	ug/L	0.8		0.1	0.1	1	0.632		0.021	0.1	1	0.585		0.021	0.1	1	0.12	J			1
Pyrene	129-00-0	130	ug/L	0.2	J	0.1	0.1	1	0.301		0.015	0.1	1	0.174		0.015	0.1	1	ND	U		0.097	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.082	0.082	1	ND	U	1.3	3	1	0.051	B	0.026	1	2	ND	U		0.08	1

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ND - Not detected
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
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B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	RW-109					RW-600_072310					S-108-20161006-WG					S-108-20160823-WG				
			Sample Date	11/8/2010					7/23/2010					10/6/2016					8/23/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U		0.5	1	ND	U	0.5	2	1	**2370**		6.2	50	50	**3030**		1.2	10	10
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U		0.0097	1	ND	U	0.01	0.029	1	**0.071**		0.013	0.04	1	**0.066**		0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U		0.5	1	ND	U	0.5	2	1	778		6.2	50	50	1020		1.2	10	10
Benzene	71-43-2	5	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	**31.8**		0.16	1	1	**14.2**		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	321		0.23	1	1	570		2.3	10	10
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U		0.5	1	4		0.5	2	1	125		0.14	1	1	111		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U		0.5	1	2		0.5	1	1	2.4		0.17	1	1	1.1		0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	4.4		0.13	1	1	12.7		0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	4090		27.4	150	50	5760		5.5	30	10
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					3.1		0.013	0.1	1	2.5		0.13	1.1	10
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					2.1		0.015	0.1	1	2.2		0.15	1.1	10
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					**1.6**		0.0074	0.1	1	**1.9**		0.076	1.1	10
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					**3.4**		0.016	0.1	1	**2.4**		0.17	1.1	10
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					0.22		0.019	0.1	1	**1**	J	0.2	1.1	10
Chrysene	218-01-9	1.9	ug/L	ND	U		0.9	1	ND	U	1	5	1	**2.4**		0.0078	0.1	1	**3.7**		0.08	1.1	10
Fluorene	86-73-7	1900	ug/L	1	J			1	ND	U	1	5	1	4.4		0.017	0.1	1	7		0.17	1.1	10
Naphthalene	91-20-3	100	ug/L	ND	U		0.9	1	ND	U	1	5	1	78.7		0.37	2.1	20	86.9		0.19	1.1	10
Phenanthrene	85-01-8	1100	ug/L	ND	U		0.9	1	ND	U	1	5	1	4.1		0.016	0.1	1	4.8		0.16	1.1	10
Pyrene	129-00-0	130	ug/L	ND	U		0.9	1	ND	U	1	5	1	4.7		0.013	0.1	1	6.8		0.13	1.1	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U		0.052	1	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1

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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-108-20160823-WG-DUP					S-108_06_05_2013					S-108_072310					S-110_06_05_2013				
			Sample Date	8/23/2016					6/5/2013					7/23/2010					6/5/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	**2670**		1.2	10	10	**5320**		19	200	100	ND	U	0.5	2	1	10.8		0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.049		0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	***26***	100	100	ND	U	0.5	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	870		1.2	10	10	**1500**		36	200	100	ND	U	0.5	2	1	2.5		0.36	2	1
Benzene	71-43-2	5	ug/L	**14.1**		0.16	1	1	**397**		***24***	100	100	ND	U	0.5	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND		2.3	10	10	**5830**		23	100	100	ND	U	0.5	1	1	2.8		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	106		0.14	1	1	232		45	200	100	3		0.5	2	1	3.1		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1.1		0.17	1	1	ND	U	16	100	100	1		0.5	1	1	2.4		0.16	1	1
Toluene	108-88-3	1000	ug/L	12.7		0.13	1	1	**8200**		23	100	100	ND	U	0.5	1	1	1.8		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	5660		5.5	30	10	**32600**		24	100	100	1		0.5	1	1	23.3		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.13	1.1	10	1.14		0.02	0.1	1	NA					ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.15	1.1	10	0.961		0.012	0.1	1	NA					ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.075	1.1	10	**0.61**		0.012	0.1	1	NA					**0.29**		0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.17	1.1	10	0.716		0.01	0.1	1	NA					0.255		0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.2	1.1	10	**0.394**		0.016	0.1	1	NA					**0.323**		0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.079	1.1	10	1.05		0.012	0.1	1	**54**		1	50	10	0.624		0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.17	1.1	10	3.03		0.017	0.1	1	ND	U	1	50	10	0.25		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.65	J	0.19	1.1	10	**213**		1.8	5	5	ND	U	1	50	10	3.06		0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.16	1.1	10	1.89		0.021	0.1	1	ND	U	1	50	10	ND	U	0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.13	1.1	10	2.22		0.015	0.1	1	110		1	50	10	0.662		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	**13**		2.4	3	1

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Table 6
Summary of Groundwater Analytical Results
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-110_072310					S-131-20161004-WG					S-131-20161004-WG-DUP					S-131-20160812-WG				
			Sample Date	7/23/2010					10/4/2016					10/4/2016					8/12/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	3		0.5	2	1	0.95	J	0.14	1	1	0.98	J	0.14	1	1	2.7		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	3		0.5	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.6		0.013	0.1	1	0.42		0.013	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.2		0.015	0.1	1	0.33		0.015	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					0.13		0.0073	0.1	1	**0.21**		0.0072	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.21		0.016	0.1	1	0.32		0.016	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.054	J	0.019	0.1	1	0.079	J	0.019	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	0.34		0.0077	0.1	1	0.56		0.0076	0.1	1	NA				
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	0.93		0.016	0.1	1	2		0.016	0.1	1	NA				
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	1		0.018	0.1	1	1.6		0.018	0.1	1	NA				
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	0.34		0.016	0.1	1	0.84		0.016	0.1	1	NA				
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	0.59		0.013	0.1	1	1.1		0.013	0.1	1	NA				
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	1.1		0.05	1	1	ND	U	4	5	1	ND	U	4	5	1	ND	U	2.6	5	1

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Table 6
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Philadelphia Energy Solutions Refining Complex
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-132_071310					S-133_060713					S-133_071310					S-134-20161004-WG				
			Sample Date	7/13/2010					6/7/2013					7/13/2010					10/4/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	31		0.5	2	1	ND	U	0.45	2	1	ND	U	0.5	2	1	4.9		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	0.21	J	0.16	1	1	1		0.5	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	2		0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					ND	U	0.02	0.1	1	NA					0.055	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.012	0.1	1	NA					ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.012	0.1	1	NA					ND	U	0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.01	0.1	1	NA					ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	ND	U	0.012	0.1	1	ND	U	1	5	1	ND	U	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	0.27		0.017	0.1	1	ND	U	1	5	1	1.2		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	0.339		0.036	0.1	1	ND	U	1	5	1	0.36		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	ND	U	0.021	0.1	1	ND	U	1	5	1	0.14		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	0.242		0.015	0.1	1	ND	U	1	5	1	0.031	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	4	5	1

Note:
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MDL - Method detection limit
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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-134-20160812-WG					S-134_06_11_2013					S-134_071410					S-136-20161004-WG				
			Sample Date	8/12/2016					6/11/2013					7/14/2010					10/4/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	16		0.14	1	1	ND	U	0.45	2	1	ND	U	0.5	2	1	2.7		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1	1	J	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.24	1	1	2		0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					ND	U	0.02	0.1	1	NA					0.29		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.012	0.1	1	NA					0.035	J	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.012	0.1	1	NA					0.024	J	0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.01	0.1	1	NA					0.033	J	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	NA					ND	U	0.012	0.1	1	ND	U	1	5	1	0.068	J	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	NA					ND	U	0.017	0.1	1	ND	U	1	5	1	0.82		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	NA					ND	U	0.036	0.1	1	ND	U	1	5	1	0.2		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	NA					ND	U	0.021	0.1	1	ND	U	1	5	1	0.9		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	NA					ND	U	0.015	0.1	1	ND	U	1	5	1	0.19		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	4	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-136-20160812-WG					S-136_06_11_2013					S-136_071510					S-137-20161004-WG				
			Sample Date	8/12/2016					6/11/2013					7/15/2010					10/4/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	2.6		0.14	1	1	4.2		0.45	2	1	3		0.5	2	1	2.8		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	0.23	J	0.16	1	1	ND	U	0.5	1	1	0.74	J	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	0.41	J	0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.235		0.02	0.1	1	NA					ND	U	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.012	0.1	1	NA					ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.012	0.1	1	NA					0.053	J	0.0072	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.01	0.1	1	NA					0.039	J	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	NA					ND	U	0.012	0.1	1	ND	U	1	5	1	ND	U	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	NA					0.577		0.017	0.1	1	ND	U	1	5	1	1		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	NA					ND	U	0.036	0.1	1	12		1	5	1	0.28		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	NA					0.47		0.021	0.1	1	ND	U	1	5	1	ND	U	0.016	0.1	1
Pyrene	129-00-0	130	ug/L	NA					0.272		0.015	0.1	1	ND	U	1	5	1	0.13		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	4	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-137-20160812-WG					S-137_06_11_2013					S-137_071310					S-139-20160816-WG				
			Sample Date	8/12/2016					6/11/2013					7/13/2010					8/16/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	5.7		0.14	1	1	3.9		0.45	2	1	3		0.5	2	1	2.6		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	2.7		0.16	1	1	11		0.5	1	1	0.36	J	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					ND	U	0.02	0.1	1	NA					0.13		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.012	0.1	1	NA					0.063	J	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.012	0.1	1	NA					0.19		0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.01	0.1	1	NA					0.21		0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.016	0.1	1	NA					0.13		0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	NA					ND	U	0.012	0.1	1	ND	U	1	5	1	0.18		0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	NA					1.62		0.017	0.1	1	ND	U	1	5	1	0.19		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	NA					ND	U	0.036	0.1	1	ND	U	1	5	1	0.21		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	NA					ND	U	0.021	0.1	1	ND	U	1	5	1	0.47		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	NA					0.211		0.015	0.1	1	ND	U	1	5	1	0.39		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.6	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-139_060713					S-139_071210					S-140-20160816-WG					S-140_060613				
			Sample Date	6/7/2013					7/12/2010					8/16/2016					6/6/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1	0.24	J	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1	0.63	J	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	0.65	J	0.45	2	1	3		0.5	2	1	ND	U	0.14	1	1	ND	U	0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.16	1	1	ND	U	0.5	1	1	0.22	J	0.17	1	1	3.1		0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1	0.71	J	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					0.47		0.013	0.1	1	ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.293		0.012	0.1	1	NA					ND	U	0.015	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**0.54**		0.012	0.1	1	NA					0.043	J	0.0072	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.465		0.01	0.1	1	NA					0.083	J	0.016	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**0.447**		0.016	0.1	1	NA					0.039	J	0.019	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.523		0.012	0.1	1	ND	U	1	49	10	0.31		0.0076	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	0.194		0.017	0.1	1	ND	U	1	49	10	0.072	J	0.016	0.1	1	ND	U	0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.245		0.036	0.1	1	ND	U	1	49	10	0.44		0.018	0.1	1	0.402		0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.375		0.021	0.1	1	ND	U	1	49	10	1.6		0.016	0.1	1	1.93		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	0.865		0.015	0.1	1	ND	U	1	49	10	0.43		0.013	0.1	1	0.258		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.6	5	1	ND	U	2.4	3	1

Note:
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ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-140_071210					S-141-20161005-WG					S-141-20160822-WG					S-141_071210				
			Sample Date	7/12/2010					10/5/2016					8/22/2016					7/12/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	0.34	J	0.12	1	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.028	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	2	1	2.8		0.14	1	1	7.5		0.14	1	1	36		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	7		0.5	1	1	ND	U	0.17	1	1	0.65	J	0.17	1	1	9		0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.6		0.013	0.1	1	13.8		0.13	1.1	10	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.28		0.015	0.1	1	3.8		0.15	1.1	10	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					0.18		0.0073	0.1	1	**2.3**		0.075	1.1	10	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.37		0.016	0.1	1	**3.6**		0.17	1.1	10	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.054	J	0.019	0.1	1	**1**	J	0.2	1.1	10	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	49	10	0.4		0.0077	0.1	1	**6**		0.079	1.1	10	ND	U	1	51	10
Fluorene	86-73-7	1900	ug/L	ND	U	1	49	10	1.8		0.016	0.1	1	20.2		0.17	1.1	10	91		1	51	10
Naphthalene	91-20-3	100	ug/L	ND	U	1	49	10	2.2		0.018	0.1	1	7.4		0.19	1.1	10	ND	U	1	51	10
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	49	10	3.6		0.016	0.1	1	43.2		0.16	1.1	10	190		1	51	10
Pyrene	129-00-0	130	ug/L	ND	U	1	49	10	0.98		0.013	0.1	1	15.6		0.13	1.1	10	61		1	51	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	0.05	1	1

Note:
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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-143_072610					S-143_071210					S-150-20160811-WG					S-153_06_05_2013				
			Sample Date	7/26/2010					7/12/2010					8/11/2016					6/5/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.5	2	1	1.7		0.12	1	1	0.82	J	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.01	0.029	1	**0.087**		0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.5	2	1	7		0.12	1	1	0.49	J	0.36	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	**8.9**		0.16	1	1	**5.5**		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	1.2		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	2	1	ND	U	0.5	2	1	0.58	J	0.14	1	1	5.2		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	1.7		0.17	1	1	6.8		0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	0.67	J	0.13	1	1	1.4		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	1.3	J	0.55	3	1	6.7		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					8.2		0.15	1.2	10	0.323		0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					3.9		0.18	1.2	10	0.256		0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					**7.6**		0.088	1.2	10	0.197		0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					**15.5**		0.19	1.2	10	0.371		0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					**2.5**		0.23	1.2	10	0.231		0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	50	1	NA					**16.9**		0.093	1.2	10	0.381		0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	54		1	50	1	NA					6.7		0.2	1.2	10	0.809		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	50	1	NA					15.2		0.22	1.2	10	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	50	1	NA					11.4		0.19	1.2	10	1.01		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	1	50	1	NA					17		0.15	1.2	10	0.977		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	0.05	1	1	ND	U	2.6	5	1	ND	U	2.4	3	1

Note:
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Table 6
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AOI 2 Remedial Investigation Report
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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-153_072310					S-154-20161012-WG					S-154-20160818-WG					S-154-20160818-WG-DUP				
			Sample Date	7/23/2010					10/12/2016					8/18/2016					8/18/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	8.1		0.12	1	1	7.9		0.12	1	1	7.7		0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	2.5		0.12	1	1	2.4		0.12	1	1	2.5		0.12	1	1
Benzene	71-43-2	5	ug/L	**7**		0.5	1	1	3.4		0.16	1	1	4.6		0.16	1	1	4.5		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	3.9		0.23	1	1	4.5		0.23	1	1	4.4		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	13		0.5	2	1	7.3		0.14	1	1	6.9		0.14	1	1	6.8		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	4		0.5	1	1	**35.6**		0.17	1	1	**36.3**		0.17	1	1	**36.2**		0.17	1	1
Toluene	108-88-3	1000	ug/L	2		0.5	1	1	5.1		0.13	1	1	6.6		0.13	1	1	6.4		0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	7		0.5	1	1	41.4		0.55	3	1	46.1		0.55	3	1	45.9		0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.14		0.013	0.1	1	0.092	J	0.013	0.1	1	0.12	J	0.015	0.12	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.015	0.1	1	ND	U	0.015	0.1	1	ND	U	0.018	0.12	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.0073	0.1	1	ND	U	0.0074	0.1	1	ND	U	0.0088	0.12	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	ND	U	0.019	0.12	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.019	0.1	1	ND	U	0.02	0.1	1	ND	U	0.023	0.12	1
Chrysene	218-01-9	1.9	ug/L	**8**		1	5	1	0.011	J	0.0077	0.1	1	ND	U	0.0078	0.1	1	ND	U	0.0093	0.12	1
Fluorene	86-73-7	1900	ug/L	12		1	5	1	0.92		0.016	0.1	1	1.1		0.017	0.1	1	1.2		0.02	0.12	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	0.94		0.018	0.1	1	1.4		0.018	0.1	1	1.7		0.022	0.12	1
Phenanthrene	85-01-8	1100	ug/L	29		1	5	1	0.69		0.016	0.1	1	0.91		0.016	0.1	1	0.97		0.019	0.12	1
Pyrene	129-00-0	130	ug/L	25		1	5	1	0.08	J	0.013	0.1	1	0.07	J	0.013	0.1	1	0.082	J	0.015	0.12	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.6	5	1

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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-154-20160511					S-154_20150519					S-154					S-154_06_05_2013				
			Sample Date	5/11/2016					5/19/2015					5/29/2014					6/5/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	3		0.5	0.5	1	10.2		0.19	2	1	3.8		0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.01	0.0096	1	ND		0.013	0.023	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	0.5	1	ND		0.3	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	1	J	0.5	0.5	1	3.4		0.17	2	1	1.6	J	0.36	2	1
Benzene	71-43-2	5	ug/L	2		0.5	1	1	4		0.5	0.5	1	**9.6**		0.21	0.5	1	**5.4**		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	2		0.5	0.5	1	7.8		0.4	1	1	3.1		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	5		0.5	2	1	6		0.5	0.5	1	7.4		0.26	1	1	12.4		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	**34**		0.5	1	1	**120**		0.5	0.5	1	**42.2**		0.26	1	1	**28.1**		0.16	1	1
Toluene	108-88-3	1000	ug/L	1		0.5	1	1	4		0.5	0.5	1	15.5		0.22	1	1	7.4		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	7		0.5	1	1	20		0.5	0.5	1	80.4		0.2	1	1	35.2		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.1	0.5	1	0.1	J	0.1	0.1	1	ND		0.02	0.1	1	ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.01	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.016	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.012	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	0.9		0.1	0.5	1	1		0.1	0.1	1	0.442		0.017	0.1	1	0.816		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.6		0.1	0.5	1	1		0.1	0.1	1	0.83		0.036	0.1	1	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.6		0.1	0.5	1	0.9		0.1	0.1	1	0.309		0.021	0.1	1	0.497		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1	ND		0.015	0.1	1	ND	U	0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.13	1	1	0.098	J	0.082	0.082	1	ND	U	1.3	3	1	ND	U	2.4	3	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-154_040513					S-154					S-154					S-154_072310				
			Sample Date	4/5/2013					11/28/2011					11/18/2010					7/23/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	19.8		0.19	2	1	0.9	J			1	29				1	4		0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U		0.0098	1	ND	U		0.0096	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U		0.5	1	ND	U		0.5	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	6.9		0.36	2	1	0.8	J			1	9				1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	**30.9**		0.24	1	1	2				1	**44**				1	**12**		0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	12.9		0.23	1	1	ND	U		0.5	1	24				1	4		0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	10.8		0.45	2	1	3				1	12				1	7		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	**33.2**		0.16	1	1	**26**				1	**50**				1	**31**		0.5	1	1
Toluene	108-88-3	1000	ug/L	27		0.23	1	1	0.8	J			1	53				1	11		0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	138		0.24	1	1	6				1	220				1	40		0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	NA					NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	NA					NA					NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U		0.078	1	ND	U		3.3	1	ND	U	1	5	1
Fluorene	86-73-7	1900	ug/L	0.707		0.017	0.1	1	1.5				1	2.2				1	ND	U	1	5	1
Naphthalene	91-20-3	100	ug/L	1.66		0.036	0.1	1	ND	U		0.97	1	5.8				1	ND	U	1	5	1
Phenanthrene	85-01-8	1100	ug/L	0.428		0.021	0.1	1	0.46				1	1.3				1	ND	U	1	5	1
Pyrene	129-00-0	130	ug/L	ND	U	0.015	0.1	1	ND	U		0.097	1	ND	U		0.1	1	ND	U	1	5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	0.16	B	0.026	1	2	ND	U		0.08	1	ND	U		0.052	1	ND	U	0.05	1	1

Note:
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-165-20160812-WG					S-165_06_11_2013					S-165_071410					S-166-20160812-WG				
			Sample Date	8/12/2016					6/11/2013					7/14/2010					8/12/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	1.4	J	0.19	2	1	4		0.5	4	2	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	2	2	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	1.1	J	0.36	2	1	ND	U	0.5	4	2	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	3.6		0.16	1	1	**7.6**		0.24	1	1	**88**		0.5	2	2	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	0.54	J	0.23	1	1	2		0.5	2	2	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	1.1		0.14	1	1	3.7		0.45	2	1	4		0.5	4	2	19.2		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	6		0.17	1	1	10.8		0.16	1	1	**71**		0.5	2	2	3.2		0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	1		0.23	1	1	10		0.5	2	2	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	7.9		0.24	1	1	18		0.5	2	2	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					NA					NA				
Chrysene	218-01-9	1.9	ug/L	NA					NA					ND	U	1	5	1	NA				
Fluorene	86-73-7	1900	ug/L	NA					NA					ND	U	1	5	1	NA				
Naphthalene	91-20-3	100	ug/L	NA					NA					ND	U	1	5	1	NA				
Phenanthrene	85-01-8	1100	ug/L	NA					NA					7		1	5	1	NA				
Pyrene	129-00-0	130	ug/L	NA					NA					ND	U	1	5	1	NA				
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	NA					ND	U	0.05	1	1	ND	U	2.6	5	1

Note:
CAS No. - Chemical Abstract Number
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TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
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MDL - Method detection limit
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-166_06_11_2013					S-166_071410					S-174-20161004-WG					S-174-20160822-WG				
			Sample Date	6/11/2013					7/14/2010					10/4/2016					8/22/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.81	J	0.19	2	1	ND	U	0.5	2	1	**88.1**		0.62	5	5	0.21	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	0.04	J	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	1.8	5	5	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	0.62	J	0.36	2	1	ND	U	0.5	2	1	26.2		0.62	5	5	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	1.1		0.24	1	1	ND	U	0.5	1	1	ND	U	0.82	5	5	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	90.9		1.2	5	5	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	11.9		0.45	2	1	7		0.5	2	1	7.1		0.68	5	5	1.4		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	2.3		0.16	1	1	10		0.5	1	1	ND	U	0.87	5	5	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.63	5	5	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	3.8		0.24	1	1	3		0.5	1	1	649		2.7	15	5	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.023	0.11	1	NA					2.9		0.13	1	10	1		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.013	0.11	1	NA					0.96	J	0.15	1	10	0.12		0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.014	0.11	1	NA					**0.56**	J	0.074	1	10	0.077	J	0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.011	0.11	1	NA					0.94	J	0.16	1	10	0.12		0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.018	0.11	1	NA					**4.3**		0.19	1	10	**0.63**		0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.252		0.013	0.11	1	ND	U	1	50	1	**4.8**		0.078	1	10	0.86		0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.019	0.11	1	ND	U	1	50	1	17.2		0.17	1	10	3.3		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.04	0.11	1	ND	U	1	50	1	12.7		0.18	1	10	1.6		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	1.78		0.024	0.11	1	ND	U	1	50	1	24.5		0.16	1	10	3.3		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.476		0.017	0.11	1	ND	U	1	50	1	5.7		0.13	1	10	0.92		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	2.8	B	2.4	3	1	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1

Note:
CAS No. - Chemical Abstract Number
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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-177-20160815-WG					S-177_071410					S-177_06_11_2013					S-178-20160815-WG				
			Sample Date	8/15/2016					7/14/2010					6/11/2013					8/15/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.2	J	0.12	1	1	ND	U	0.5	2	1	ND	U	0.19	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.036	J	0.013	0.04	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	0.049		0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	0.59	J	0.16	1	1	ND	U	0.5	1	1	ND	U	0.24	1	1	0.18	J	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	0.95	J	0.14	1	1	5		0.5	2	1	ND	U	0.45	2	1	ND	U	0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	0.18	J	0.13	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	0.24	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	0.71	J	0.55	3	1	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.27		0.013	0.1	1	NA					ND	U	0.02	0.1	1	ND	U	0.041	0.33	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.087	J	0.015	0.1	1	NA					ND	U	0.012	0.1	1	ND	U	0.047	0.33	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.042	J	0.0072	0.1	1	NA					ND	U	0.012	0.1	1	0.038	J	0.023	0.33	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.088	J	0.016	0.1	1	NA					0.206		0.01	0.1	1	0.091	J	0.051	0.33	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.039	J	0.019	0.1	1	NA					ND	U	0.016	0.1	1	ND	U	0.062	0.33	1
Chrysene	218-01-9	1.9	ug/L	0.14		0.0077	0.1	1	ND	U	1	50	1	0.172		0.012	0.1	1	0.04	J	0.025	0.33	1
Fluorene	86-73-7	1900	ug/L	1.3		0.016	0.1	1	ND	U	1	50	1	ND	U	0.017	0.1	1	ND	U	0.052	0.33	1
Naphthalene	91-20-3	100	ug/L	0.71		0.018	0.1	1	ND	U	1	50	1	ND	U	0.036	0.1	1	ND	U	0.058	0.33	1
Phenanthrene	85-01-8	1100	ug/L	0.21		0.016	0.1	1	ND	U	1	50	1	0.161		0.021	0.1	1	ND	U	0.05	0.33	1
Pyrene	129-00-0	130	ug/L	0.29		0.013	0.1	1	ND	U	1	50	1	0.229		0.015	0.1	1	0.062	J	0.041	0.33	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	2.6	5	1

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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-178_06_11_2013					S-246A-20161005-WG					S-246A_06_05_2013					S-247_060613				
			Sample Date	6/11/2013					10/5/2016					6/5/2013					6/6/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	3		0.19	2	1	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	1.5	J	0.36	2	1	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	**523**		2.4	10	10	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	121		0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	19.5		0.45	2	1	ND	U	0.14	1	1	ND	U	0.45	2	1	ND	U	0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.16	1	1	ND	U	0.17	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Toluene	108-88-3	1000	ug/L	1.2		0.23	1	1	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	518		2.4	10	10	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.476		0.021	0.11	1	ND	U	0.013	0.1	1	ND	U	0.02	0.1	1	ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.163		0.012	0.11	1	0.017	J	0.015	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.013	0.11	1	0.0094	J	0.0073	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.011	0.11	1	0.017	J	0.016	0.1	1	ND	U	0.01	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.11	1	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.193		0.012	0.11	1	0.0092	J	0.0077	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	2.38		0.018	0.11	1	ND	U	0.016	0.1	1	0.173	0	0.017	0.1	1	0.206		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.037	0.11	1	0.066	J	0.018	0.1	1	0.492	0	0.036	0.1	1	0.173		0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.879		0.022	0.11	1	0.034	J	0.016	0.1	1	NA					ND	U	0.021	0.1	1
Pyrene	129-00-0	130	ug/L	0.394		0.016	0.11	1	0.017	J	0.013	0.1	1	ND	U	0.015	0.1	1	0.353		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	3		2.4	3	1	ND	U	4	5	1	ND	U	2.4	3	1	ND	U	2.4	3	1

Note:
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ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
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B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-247_072210					S-248-20161005-WG					S-248_060613					S-248_072210				
			Sample Date	7/22/2010					10/5/2016					6/6/2013					7/22/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.03	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.16	1	1	0.39	J	0.24	1	1	2		0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	2	1	ND	U	0.14	1	1	ND	U	0.45	2	1	3		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	ND	U	0.17	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.22		0.013	0.1	1	ND	U	0.02	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.088	J	0.015	0.1	1	0.382		0.012	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					0.16		0.0072	0.1	1	**0.46**		0.012	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.3		0.016	0.1	1	0.434		0.01	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.25		0.019	0.1	1	**0.483**		0.016	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	0.23		0.0076	0.1	1	0.662		0.012	0.1	1	ND	U	1	5	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	0.02	J	0.016	0.1	1	0.549		0.017	0.1	1	7		1	5	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	0.057	J	0.018	0.1	1	0.396		0.036	0.1	1	ND	U	1	5	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	0.095	J	0.016	0.1	1	0.458		0.021	0.1	1	9		1	5	1
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	0.51		0.013	0.1	1	1.41		0.015	0.1	1	7		1	5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1

Note:
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-249-20161005-WG					S-249-20160817-WG					S-249-20160511					S-249_20150519				
			Sample Date	10/5/2016					8/17/2016					5/11/2016					5/19/2015				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	2	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.029	1	ND	U	0.01	0.0096	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	2	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	ND	U	0.14	1	1	ND	U	0.5	2	1	ND	U	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	0.78	J	0.17	1	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.5	1	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.02	J	0.013	0.1	1	ND	U	0.014	0.11	1	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.034	J	0.015	0.1	1	ND	U	0.016	0.11	1	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.031	J	0.0073	0.1	1	0.011	J	0.0079	0.11	1	ND	U	0.1	0.5	1	0.1	J	0.1	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.062	J	0.016	0.1	1	ND	U	0.017	0.11	1	ND	U	0.1	0.5	1	0.2	J	0.1	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.027	J	0.019	0.1	1	ND	U	0.021	0.11	1	ND	U	0.1	0.5	1	0.2	J	0.1	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.021	J	0.0077	0.1	1	ND	U	0.0083	0.11	1	ND	U	0.1	0.5	1	0.1	J	0.1	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.016	0.1	1	ND	U	0.018	0.11	1	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1
Naphthalene	91-20-3	100	ug/L	0.05	J	0.018	0.1	1	0.24		0.02	0.11	1	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.029	J	0.016	0.1	1	ND	U	0.017	0.11	1	ND	U	0.1	0.5	1	ND	U	0.1	0.1	1
Pyrene	129-00-0	130	ug/L	0.041	J	0.013	0.1	1	ND	U	0.014	0.11	1	ND	U	0.1	0.5	1	0.1	J	0.1	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	0.13	1	1	0.098	J	0.082	0.082	1

Note:
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-249					S-249_060613					S-249_040413					S-249				
			Sample Date	5/29/2014					6/6/2013					4/4/2013					11/28/2011				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND		0.19	2	1	ND	U	0.19	2	1	ND	U	0.19	2	1	ND	U		0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND		0.014	0.025	1	ND	U	0.011	0.02	1	ND	U	0.011	0.02	1	ND	U		0.0098	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND		0.3	1	1	ND	U	0.26	1	1	ND	U	0.26	1	1	ND	U		0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND		0.17	2	1	ND	U	0.36	2	1	ND	U	0.36	2	1	ND	U		0.5	1
Benzene	71-43-2	5	ug/L	ND		0.21	0.5	1	ND	U	0.24	1	1	ND	U	0.24	1	1	ND	U		0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND		0.4	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U		0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND		0.26	1	1	ND	U	0.45	2	1	ND	U	0.45	2	1	ND	U		0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND		0.26	1	1	1.1		0.16	1	1	0.37	J	0.16	1	1	ND	U		0.5	1
Toluene	108-88-3	1000	ug/L	ND		0.22	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U		0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND		0.2	1	1	ND	U	0.24	1	1	ND	U	0.24	1	1	ND	U		0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND		0.02	0.1	1	ND	U	0.02	0.1	1	ND	U	0.02	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND		0.012	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND		0.012	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND		0.01	0.1	1	ND	U	0.01	0.1	1	ND	U	0.01	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND		0.016	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND		0.012	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1	ND	U		0.08	1
Fluorene	86-73-7	1900	ug/L	ND		0.017	0.1	1	ND	U	0.017	0.1	1	ND	U	0.017	0.1	1	ND	U		0.1	1
Naphthalene	91-20-3	100	ug/L	ND		0.036	0.1	1	ND	U	0.036	0.1	1	ND	U	0.036	0.1	1	ND	U		1	1
Phenanthrene	85-01-8	1100	ug/L	ND		0.021	0.1	1	ND	U	0.021	0.1	1	ND	U	0.021	0.1	1	ND	U		0.08	1
Pyrene	129-00-0	130	ug/L	ND		0.015	0.1	1	ND	U	0.015	0.1	1	ND	U	0.015	0.1	1	ND	U		0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	4.3		1.3	3	1	ND	U	2.4	3	1	0.19	B	0.026	1	2	ND	U		0.08	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-249					S-249_072210					S-251_06_10_2013					S-251_071210				
			Sample Date	11/18/2010					7/22/2010					6/10/2013					7/12/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U		0.5	1	ND	U	0.5	2	1	ND	U	0.19	2	1	**68**		0.5	10	5
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U		0.0096	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.5	5	5
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U		0.5	1	ND	U	0.5	2	1	ND	U	0.36	2	1	48		0.5	10	5
Benzene	71-43-2	5	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	**14.2**		0.24	1	1	**370**		0.5	5	5
Ethylbenzene	100-41-4	700	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	0.85	J	0.23	1	1	120		0.5	5	5
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U		0.5	1	ND	U	0.5	2	1	ND	U	0.45	2	1	34		0.5	10	5
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1				1	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.5	5	5
Toluene	108-88-3	1000	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	0.41	J	0.23	1	1	ND	U	0.5	5	5
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U		0.5	1	ND	U	0.5	1	1	0.42	J	0.24	1	1	33		0.5	5	5
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					ND	U	0.02	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					ND	U	0.012	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					ND	U	0.012	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					ND	U	0.01	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					ND	U	0.016	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	0.061	J			1	ND	U	1	5	1	ND	U	0.012	0.1	1	ND	U	1	49	10
Fluorene	86-73-7	1900	ug/L	ND	U		0.096	1	ND	U	1	5	1	ND	U	0.017	0.1	1	ND	U	1	49	10
Naphthalene	91-20-3	100	ug/L	ND	U		0.96	1	ND	U	1	5	1	ND	U	0.036	0.1	1	ND	U	1	49	10
Phenanthrene	85-01-8	1100	ug/L	0.04	J			1	ND	U	1	5	1	0.153		0.021	0.1	1	ND	U	1	49	10
Pyrene	129-00-0	130	ug/L	ND	U		0.096	1	ND	U	1	5	1	ND	U	0.015	0.1	1	ND	U	1	49	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U		0.052	1	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	0.05	1	1

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ND - Not detected
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-252_060613					S-252_071210					S-253-20160816-WG					S-253_06_10_2013				
			Sample Date	6/6/2013					7/12/2010					8/16/2016					6/10/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	18.2		0.19	2	1	**140**		0.5	4	2	ND	U	0.12	1	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	0.047		0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	2	2	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	0.63	J	0.36	2	1	42		0.5	4	2	ND	U	0.12	1	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	**230**		2.4	10	10	**1300**		0.5	10	10	ND	U	0.16	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	24.2		0.23	1	1	96		0.5	2	2	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	4.1		0.45	2	1	13		0.5	4	2	9.9		0.14	1	1	16.9		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.54	J	0.16	1	1	5		0.5	2	2	3.5		0.17	1	1	13.5		0.16	1	1
Toluene	108-88-3	1000	ug/L	7.8		0.23	1	1	9		0.5	2	2	ND	U	0.13	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	33.4		0.24	1	1	250		0.5	2	2	ND	U	0.55	3	1	0.31	J	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					0.15		0.013	0.1	1	0.555		0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	NA					ND	U	0.015	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	NA					0.01	J	0.0073	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	NA					0.021	J	0.016	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	49	10	ND	U	0.0077	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	0.381		0.017	0.1	1	ND	U	1	49	10	1.8		0.016	0.1	1	2.64		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.643		0.036	0.1	1	ND	U	1	49	10	0.51		0.018	0.1	1	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.021	0.1	1	ND	U	1	49	10	0.32		0.016	0.1	1	2.15		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.015	0.1	1	ND	U	1	49	10	0.11		0.013	0.1	1	ND	U	0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.6	5	1	ND	U	2.4	3	1

Note:
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MDL - Method detection limit
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ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-253_070910					S-294-20161005-WG					S-294-20160817-WG					S-294_06_04_2013				
			Sample Date	7/9/2010					10/5/2016					8/17/2016					6/4/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	**145**		0.12	1	1	**122**		0.12	1	1	**108**		0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	**0.085**		0.013	0.04	1	0.044		0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	49.1		0.12	1	1	41.2		0.12	1	1	35		0.36	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	**52**		0.16	1	1	**79.9**		0.16	1	1	**111**		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	111		0.23	1	1	148		0.23	1	1	118		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	21		0.5	2	1	101		0.14	1	1	141		0.14	1	1	151		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	16		0.5	1	1	2.1		0.17	1	1	3.1		0.17	1	1	7.3		0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	2.8		0.13	1	1	6.2		0.13	1	1	6		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	140		0.55	3	1	127		0.55	3	1	122		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					**84.8**		1.3	10.2	100	22.3		1.3	10.2	100	9.02	J	2	10	100
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					**44.1**		1.5	10.2	100	**6.7**		0.015	0.1	1	0.227		0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					**24.4**		***0.72***	10.2	100	**4.2**		0.0072	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					**41.1**		***1.6***	10.2	100	**8**		0.016	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					**3.9**		0.019	0.1	1	**1.3**		0.019	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	49	10	**47.8**		0.77	10.2	100	**7.8**		0.0076	0.1	1	0.248		0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	49	10	149		1.6	10.2	100	64.7		1.6	10.2	100	34.1		1.7	10	100
Naphthalene	91-20-3	100	ug/L	ND	U	1	49	10	**1210**		1.8	10.2	100	**635**		1.8	10.2	100	**306**		3.6	10	100
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	49	10	347		1.6	10.2	100	106		1.6	10.2	100	37.4		2.1	10	100
Pyrene	129-00-0	130	ug/L	ND	U	1	49	10	**139**		1.3	10.2	100	26.4		1.3	10.2	100	2.24		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	2.6	J	2.6	5	1	ND	U	2.4	3	1

Note:
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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-294_071510					S-295-20160817-WG					S-295_06_11_2013					S-295_071510				
			Sample Date	7/15/2010					8/17/2016					6/11/2013					7/15/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	**410**		0.5	20	10	22.4		0.12	1	1	45.7		1.9	20	10	**360**		0.5	10	5
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	0.037	J	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	10	10	ND	U	0.36	1	1	ND	U	2.6	10	10	ND	U	0.5	5	5
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	130		0.5	20	10	9.6		0.12	1	1	21.2		3.6	20	10	130		0.5	10	5
Benzene	71-43-2	5	ug/L	**130**		0.5	10	10	**49.1**		0.16	1	1	**582**		2.4	10	10	**1900**		0.5	50	50
Ethylbenzene	100-41-4	700	ug/L	470		0.5	10	10	6.2		0.23	1	1	18.8		2.3	10	10	140		0.5	5	5
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	110		0.5	20	10	7.1		0.14	1	1	12.2	J	4.5	20	10	71		0.5	10	5
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	10	10	0.4	J	0.17	1	1	2.2	J	1.6	10	10	ND	U	0.5	5	5
Toluene	108-88-3	1000	ug/L	ND	U	0.5	10	10	6.8		0.13	1	1	93.2		2.3	10	10	560		0.5	5	5
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	720		0.5	10	10	37.7		0.55	3	1	202		2.4	10	10	1200		0.5	5	5
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.051	J	0.018	0.14	1	NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.22		0.021	0.14	1	NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					0.098	J	0.01	0.14	1	NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.14	J	0.023	0.14	1	NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.035	J	0.027	0.14	1	NA					NA				
Chrysene	218-01-9	1.9	ug/L	**140**		1	47	10	0.18		0.011	0.14	1	NA					ND	U	1	50	1
Fluorene	86-73-7	1900	ug/L	480		1	47	10	0.036	J	0.023	0.14	1	NA					ND	U	1	50	1
Naphthalene	91-20-3	100	ug/L	**8500**		1	470	100	0.47		0.026	0.14	1	NA					**740**		1	50	1
Phenanthrene	85-01-8	1100	ug/L	1000		1	47	10	0.06	J	0.022	0.14	1	NA					97		1	50	1
Pyrene	129-00-0	130	ug/L	**380**		1	47	10	0.58		0.018	0.14	1	NA					ND	U	1	50	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	**33.1**		2.6	5	1	NA					**1040**		0.05	5	5

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-298-20161003-WG					S-298-20160822-WG					S-298_070810					S-299-20161004-WG				
			Sample Date	10/3/2016					8/22/2016					7/8/2010					10/4/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.6	J	0.12	1	1	0.78	J	0.12	1	1	**620**		0.5	10	5	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	**0.074**		0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	5	5	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	0.21	J	0.12	1	1	210		0.5	10	5	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	0.86	J	0.16	1	1	0.61	J	0.16	1	1	**90**		0.5	5	5	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	68		0.5	5	5	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	6.5		0.14	1	1	11		0.14	1	1	29		0.5	10	5	20.7		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.45	J	0.17	1	1	0.38	J	0.17	1	1	ND	U	0.5	5	5	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	0.43	J	0.13	1	1	0.35	J	0.13	1	1	170		0.5	5	5	0.45	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.8	J	0.55	3	1	3		0.55	3	1	520		0.5	5	5	2.9	J	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	4.9		0.13	1	10	14.2		0.13	1.1	10	NA					0.63		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	3.8		0.15	1	10	**13.8**		0.15	1.1	10	NA					0.087	J	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**2.6**		0.073	1	10	**9.3**		0.075	1.1	10	NA					0.032	J	0.0072	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	**2.7**		0.16	1	10	**10.6**		0.17	1.1	10	NA					0.069	J	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**1.3**		0.19	1	10	**4**		0.2	1.1	10	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	**5.4**		0.077	1	10	**17**		0.079	1.1	10	ND	U	1	50	10	0.063	J	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	7.7		0.16	1	10	19.4		0.17	1.1	10	ND	U	1	50	10	7.7		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	0.81	J	0.18	1	10	2.5		0.19	1.1	10	**190**		1	50	10	0.92		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	16.3		0.16	1	10	42.1		0.16	1.1	10	110		1	50	10	8.5		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	10.9		0.13	1	10	36.5		0.13	1.1	10	55		1	50	10	0.38		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	0.05	1	1	ND	U	4	5	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-299-20160816-WG					S-299_06_10_2013					S-299_070810					S-300-20161012-WG				
			Sample Date	8/16/2016					6/10/2013					7/8/2010					10/12/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	0.59	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.04		0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	0.3	J	0.16	1	1	0.48	J	0.24	1	1	ND	U	0.5	1	1	3.5		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	19		0.14	1	1	24.7		0.45	2	1	22		0.5	2	1	27.8		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.53	J	0.17	1	1	19.3		0.16	1	1	16		0.5	1	1	**70.8**		0.17	1	1
Toluene	108-88-3	1000	ug/L	2.2		0.13	1	1	0.28	J	0.23	1	1	ND	U	0.5	1	1	0.56	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.9	J	0.55	3	1	2.1		0.24	1	1	2		0.5	1	1	1.4	J	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.67		0.013	0.1	1	0.486		0.02	0.1	1	NA					0.15		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.093	J	0.015	0.1	1	ND	U	0.012	0.1	1	NA					ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.032	J	0.0074	0.1	1	ND	U	0.012	0.1	1	NA					ND	U	0.0072	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.061	J	0.016	0.1	1	ND	U	0.01	0.1	1	NA					ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.02	0.1	1	ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.07	J	0.0079	0.1	1	ND	U	0.012	0.1	1	ND	U	1	49	10	ND	U	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	6.8		0.017	0.1	1	NA					ND	U	1	49	10	2.5		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	1.2		0.019	0.1	1	ND	U	0.036	0.1	1	ND	U	1	49	10	1.1		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	7.9		0.016	0.1	1	NA					ND	U	1	49	10	1.6		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.36		0.013	0.1	1	0.408		0.015	0.1	1	ND	U	1	49	10	0.049	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	4	5	1

Note:
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TDS - Total Dissolved Solids
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ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-300-20160823-WG					S-300_06_10_2013					S-300_070810					S-301-20160815-WG				
			Sample Date	8/23/2016					6/10/2013					7/8/2010					8/15/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	1		0.12	1	1	ND	U	0.19	2	1	ND	U	0.5	2	1	0.36	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	0.44	J	0.12	1	1	ND	U	0.36	2	1	ND	U	0.5	2	1	0.24	J	0.12	1	1
Benzene	71-43-2	5	ug/L	**11.2**		0.16	1	1	**9.4**		0.24	1	1	**14**		0.5	1	1	4.4		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	1.3		0.23	1	1	1.7		0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	24.4		0.14	1	1	18.1		0.45	2	1	29		0.5	2	1	21.1		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	**66.5**		0.17	1	1	**110**		0.16	1	1	**81**		0.5	1	1	8.1		0.17	1	1
Toluene	108-88-3	1000	ug/L	0.61	J	0.13	1	1	0.33	J	0.23	1	1	ND	U	0.5	1	1	0.75	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	2.3	J	0.55	3	1	1.8		0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.13		0.013	0.1	1	0.264		0.02	0.1	1	NA					0.061	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.1	1	ND	U	0.012	0.1	1	NA					ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.0073	0.1	1	ND	U	0.012	0.1	1	NA					ND	U	0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.016	0.1	1	ND	U	0.01	0.1	1	NA					ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1	NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.0077	0.1	1	ND	U	0.012	0.1	1	ND	U	1	49	10	ND	U	0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	1.8		0.016	0.1	1	2.54		0.017	0.1	1	ND	U	1	49	10	1.8		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	1.2		0.018	0.1	1	5.35		0.071	0.2	2	ND	U	1	49	10	1.1		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	1.4		0.016	0.1	1	1.45		0.021	0.1	1	ND	U	1	49	10	0.67		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.058	J	0.013	0.1	1	ND	U	0.015	0.1	1	ND	U	1	49	10	0.028	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.6	5	1

Note:
CAS No. - Chemical Abstract Number
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TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
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ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-301-20160815-WG-DUP					S-301_06_10_2013					S-301_070810					S-302-20160818-WG				
			Sample Date	8/15/2016					6/10/2013					7/8/2010					8/17/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.36	J	0.12	1	1	ND	U	0.19	2	1	9		0.5	2	1	0.46	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	4		0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	4.3		0.16	1	1	3.6		0.24	1	1	**9**		0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	20		0.14	1	1	18.4		0.45	2	1	41		0.5	2	1	4.9		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	7.8		0.17	1	1	ND	U	0.16	1	1	4		0.5	1	1	0.54	J	0.17	1	1
Toluene	108-88-3	1000	ug/L	0.51	J	0.13	1	1	0.48	J	0.23	1	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.1	J	0.015	0.12	1	ND	U	0.02	0.1	1	NA					4.9		0.13	1	10
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.017	0.12	1	ND	U	0.012	0.1	1	NA					4.3		0.15	1	10
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.012	J	0.0085	0.12	1	ND	U	0.012	0.1	1	NA					**1.7**		0.073	1	10
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.019	0.12	1	ND	U	0.01	0.1	1	NA					**3.8**		0.16	1	10
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.023	0.12	1	ND	U	0.016	0.1	1	NA					**0.39**	J	0.19	1	10
Chrysene	218-01-9	1.9	ug/L	ND	U	0.009	0.12	1	ND	U	0.012	0.1	1	ND	U	1	500	10	**3.4**		0.077	1	10
Fluorene	86-73-7	1900	ug/L	2.9		0.019	0.12	1	0.453		0.017	0.1	1	ND	U	1	500	10	28.3		0.16	1	10
Naphthalene	91-20-3	100	ug/L	1.5		0.021	0.12	1	ND	U	0.036	0.1	1	ND	U	1	500	10	9.9		0.18	1	10
Phenanthrene	85-01-8	1100	ug/L	1.7		0.018	0.12	1	ND	U	0.021	0.1	1	ND	U	1	500	10	50.4		0.16	1	10
Pyrene	129-00-0	130	ug/L	0.098	J	0.015	0.12	1	ND	U	0.015	0.1	1	ND	U	1	500	10	20.4		0.13	1	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.6	5	1

Note:
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-302_070910					S-303_060613					S-303_072610					S-303_071210				
			Sample Date	7/9/2010					6/6/2013					7/26/2010					7/12/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	0.4	J	0.19	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.028	1	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.01	0.028	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	0.96	J	0.24	1	1	**6**		0.5	1	1	4		0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	50		0.5	2	1	9		0.45	2	1	13		0.5	2	1	38		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	9		0.5	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1	1		0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	0.31	J	0.23	1	1	1		0.5	1	1	1		0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1		0.5	1	1	1.2		0.24	1	1	2		0.5	1	1	2		0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					1.8		0.02	0.1	1	NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.818		0.012	0.1	1	NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					**0.553**		0.012	0.1	1	NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.662		0.01	0.1	1	NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.223		0.016	0.1	1	NA					NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	49	10	0.703		0.012	0.1	1	ND	U	1	24	5	NA				
Fluorene	86-73-7	1900	ug/L	ND	U	1	49	10	NA					28		1	24	5	NA				
Naphthalene	91-20-3	100	ug/L	ND	U	1	49	10	1.95		0.036	0.1	1	48		1	24	5	NA				
Phenanthrene	85-01-8	1100	ug/L	65		1	49	10	11.7		0.021	0.1	1	54		1	24	5	NA				
Pyrene	129-00-0	130	ug/L	ND	U	1	49	10	2.07		0.015	0.1	1	ND	U	1	24	5	NA				
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	0.05	1	1

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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-304_070810					S-305-20161004-WG					S-305-20160817-WG					S-305_071410				
			Sample Date	7/8/2010					10/4/2016					8/17/2016					7/14/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	4	2
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	0.041		0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	2	2
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	4	2
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.5	2	2
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	2	2
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	3		0.5	2	1	12.3		0.14	1	1	14.3		0.14	1	1	58		0.5	4	2
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	0.5	J	0.17	1	1	0.44	J	0.17	1	1	2		0.5	2	2
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	0.25	J	0.13	1	1	ND	U	0.13	1	1	ND	U	0.5	2	2
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.5	2	2
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.17		0.013	0.1	1	0.1	J	0.013	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					ND	U	0.015	0.1	1	ND	U	0.015	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					ND	U	0.0072	0.1	1	ND	U	0.0073	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					ND	U	0.019	0.1	1	ND	U	0.019	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	49	10	ND	U	0.0076	0.1	1	ND	U	0.0077	0.1	1	ND	U	1	50	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	49	10	2.7		0.016	0.1	1	2.7		0.016	0.1	1	ND	U	1	50	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	49	10	0.82		0.018	0.1	1	0.7		0.018	0.1	1	ND	U	1	50	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	49	10	0.98		0.016	0.1	1	1.3		0.016	0.1	1	66		1	50	1
Pyrene	129-00-0	130	ug/L	ND	U	1	49	10	0.087	J	0.013	0.1	1	0.056	J	0.013	0.1	1	ND	U	1	50	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	0.05	1	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-306-20161012-WG					S-306-20160819-WG					S-306_060613					S-306_070910				
			Sample Date	10/12/2016					8/19/2016					6/6/2013					7/9/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	12.6		0.12	1	1	9.5		0.12	1	1	6.7		0.19	2	1	40		0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.028	J	0.013	0.04	1	0.035	J	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.01	0.028	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	7.4		0.12	1	1	7.2		0.12	1	1	8.6		0.36	2	1	52		0.5	2	1
Benzene	71-43-2	5	ug/L	**185**		0.16	1	1	**148**		0.16	1	1	**270**		2.4	10	10	**740**		0.5	10	10
Ethylbenzene	100-41-4	700	ug/L	6.2		0.23	1	1	4.6		0.23	1	1	5.1		0.23	1	1	490		0.5	10	10
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	52.3		0.14	1	1	57.7		0.14	1	1	53.5		0.45	2	1	73		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1.1		0.17	1	1	0.84	J	0.17	1	1	2.7		0.16	1	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	5.1		0.13	1	1	5.6		0.13	1	1	11.4		0.23	1	1	52		0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	43.2		0.55	3	1	40		0.55	3	1	50.6		0.24	1	1	300		0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	1.6		0.013	0.1	1	7.2		0.014	0.11	1	1.1		0.02	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.07	J	0.015	0.1	1	0.18		0.016	0.11	1	ND	U	0.012	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.03	J	0.0073	0.1	1	0.086	J	0.0081	0.11	1	ND	U	0.012	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.029	J	0.016	0.1	1	0.061	J	0.018	0.11	1	ND	U	0.01	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.02	J	0.019	0.1	1	0.051	J	0.021	0.11	1	ND	U	0.016	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	0.17		0.0077	0.1	1	0.25		0.0085	0.11	1	ND	U	0.012	0.1	1	ND	U	1	500	10
Fluorene	86-73-7	1900	ug/L	5.8		0.016	0.1	1	12.8		0.018	0.11	1	6.41		0.017	0.1	1	ND	U	1	500	10
Naphthalene	91-20-3	100	ug/L	2.8		0.018	0.1	1	5.6		0.02	0.11	1	ND	U	0.036	0.1	1	**670**		1	500	10
Phenanthrene	85-01-8	1100	ug/L	11.7		0.016	0.1	1	21.5		0.35	2.3	20	9.33		0.021	0.1	1	850		1	500	10
Pyrene	129-00-0	130	ug/L	0.93		0.013	0.1	1	2.7		0.014	0.11	1	0.349		0.015	0.1	1	ND	U	1	500	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	***20.2***	25	5	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	0.05	1	1

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-307-20161004-WG					S-307-20161004-WG-DUP					S-307-20160812-WG					S-307_06_05_2013				
			Sample Date	10/4/2016					10/4/2016					8/12/2016					6/5/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	ND	U	0.14	1	1	ND	U	0.14	1	1	ND	U	0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1	ND	U	0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.1		0.013	0.1	1	0.097	J	0.013	0.1	1	NA					ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.026	J	0.015	0.1	1	0.039	J	0.015	0.1	1	NA					ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.0084	J	0.0072	0.1	1	0.0078	J	0.0073	0.1	1	NA					ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	NA					ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.019	0.1	1	NA					ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.04	J	0.0077	0.1	1	0.0096	J	0.0077	0.1	1	NA					ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	0.25		0.016	0.1	1	0.29		0.016	0.1	1	NA					0.731		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.11		0.018	0.1	1	0.16		0.018	0.1	1	NA					ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.048	J	0.016	0.1	1	0.035	J	0.016	0.1	1	NA					ND	U	0.021	0.1	1
Pyrene	129-00-0	130	ug/L	0.1	J	0.013	0.1	1	0.078	J	0.013	0.1	1	NA					ND	U	0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.4	3	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-307_071310					S-308_06_12_2013					S-309-20161004-WG					S-309-20160812-WG				
			Sample Date	7/13/2010					6/12/2013					10/4/2016					8/12/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	0.7	J	0.19	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	0.51	J	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	2	1	ND	U	0.45	2	1	1.7		0.14	1	1	2.6		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	33.1		0.23	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	1	1	3.2		0.24	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					0.11		0.013	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					ND	U	0.015	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					ND	U	0.0072	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					ND	U	0.016	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					ND	U	0.019	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	NA					ND	U	0.0076	0.1	1	NA				
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	NA					0.77		0.016	0.1	1	NA				
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	NA					0.47		0.018	0.1	1	NA				
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	NA					0.92		0.016	0.1	1	NA				
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	NA					0.079	J	0.013	0.1	1	NA				
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	4	5	1	ND	U	2.6	5	1

Note:
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TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-309_06_05_2013					S-309_070810					S-310_06_04_2013					S-310_070810				
			Sample Date	6/5/2013					7/8/2010					6/4/2013					7/8/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.19	2	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.01	0.028	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	8.1		0.45	2	1	17		0.5	2	1	ND	U	0.45	2	1	ND	U	0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.22	J	0.16	1	1	ND	U	0.5	1	1	ND	U	0.16	1	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.24	1	1	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					ND	U	0.022	0.11	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	NA					ND	U	0.013	0.11	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	NA					ND	U	0.013	0.11	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	NA					ND	U	0.011	0.11	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	NA					ND	U	0.017	0.11	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	49	10	ND	U	0.013	0.11	1	ND	U	1	49	10
Fluorene	86-73-7	1900	ug/L	0.915		0.017	0.1	1	ND	U	1	49	10	ND	U	0.018	0.11	1	ND	U	1	49	10
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	ND	U	1	49	10	ND	U	0.039	0.11	1	ND	U	1	49	10
Phenanthrene	85-01-8	1100	ug/L	1.23		0.021	0.1	1	ND	U	1	49	10	ND	U	0.023	0.11	1	ND	U	1	49	10
Pyrene	129-00-0	130	ug/L	0.175		0.015	0.1	1	ND	U	1	49	10	ND	U	0.016	0.11	1	ND	U	1	49	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	0.05	1	1

Note:
CAS No. - Chemical Abstract Number
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-314_060613					S-314_070910					S-316_070910					S-317-20160816-WG				
			Sample Date	6/6/2013					7/9/2010					7/9/2010					8/16/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.027	1	ND	U	0.01	0.029	1	0.048		0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.5	2	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	0.5	J	0.24	1	1	1		0.5	1	1	5		0.5	1	1	0.18	J	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	45.1		0.45	2	1	100		0.5	2	1	36		0.5	2	1	1.9		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	9.2		0.16	1	1	4		0.5	1	1	2		0.5	1	1	1.6		0.17	1	1
Toluene	108-88-3	1000	ug/L	0.31	J	0.23	1	1	ND	U	0.5	1	1	ND	U	0.5	1	1	1	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.2		0.24	1	1	2		0.5	1	1	3		0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					NA					0.04	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	NA					NA					0.064	J	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	NA					NA					0.031	J	0.0073	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	NA					NA					0.052	J	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	NA					NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	500	10	ND	U	1	49	10	0.13		0.0077	0.1	1
Fluorene	86-73-7	1900	ug/L	1.71		0.017	0.1	1	870		1	500	10	ND	U	1	49	10	0.29		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	ND	U	1	500	10	ND	U	1	49	10	0.11		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	1.46		0.021	0.1	1	**1900**		1	500	10	ND	U	1	49	10	0.39		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.324		0.015	0.1	1	ND	U	1	500	10	ND	U	1	49	10	0.15		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	0.05	1	1	ND	U	0.05	1	1	ND	U	2.6	5	1

Note:
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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-317_070910					S-318-20160815-WG					S-318-20160817-WG					S-318_060613				
			Sample Date	7/9/2010					8/15/2016					8/17/2016					6/6/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.028	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	1		0.5	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	0.36	J	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	84		0.5	2	1	10.4		0.14	1	1	6.9		0.14	1	1	25		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	9		0.5	1	1	0.76	J	0.17	1	1	0.9	J	0.17	1	1	14		0.16	1	1
Toluene	108-88-3	1000	ug/L	1		0.5	1	1	ND	U	0.13	1	1	0.31	J	0.13	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	3		0.5	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1	1.6		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					0.29		0.013	0.1	1	0.16		0.013	0.1	1	0.475		0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					0.3		0.015	0.1	1	0.072	J	0.015	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					0.2		0.0074	0.1	1	0.042	J	0.0072	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					0.4		0.016	0.1	1	0.061	J	0.016	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					0.08	J	0.02	0.1	1	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	500	10	0.3		0.0078	0.1	1	0.061	J	0.0077	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	500	10	4.2		0.017	0.1	1	2.8		0.016	0.1	1	2.41		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	500	10	1.3		0.018	0.1	1	0.81		0.018	0.1	1	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	500	10	3.4		0.016	0.1	1	2.7		0.016	0.1	1	2.88		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	1	500	10	1.7		0.013	0.1	1	0.55		0.013	0.1	1	0.446		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	2.6	5	1	ND	U	2.6	5	1	ND	U	2.4	3	1

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-318_070910					S-328_071210					S-333_06_17_2013					S-333 DUP_06_17_2013				
			Sample Date	7/9/2010					7/12/2010					6/17/2013					6/17/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.5	2	1	ND	U	0.19	2	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.5	2	1	ND	U	0.36	2	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	51		0.5	2	1	13		0.5	2	1	ND	U	0.45	2	1	ND	U	0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	20		0.5	1	1	3		0.5	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	1	1	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1		0.5	1	1	ND	U	0.5	1	1	ND	U	0.24	1	1	ND	U	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					ND	U	0.02	0.1	1	ND	U	0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					ND	U	0.01	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					ND	U	0.016	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	48	10	ND	U	1	5	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	48	10	ND	U	1	5	1	ND	U	0.017	0.1	1	ND	U	0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	48	10	ND	U	1	5	1	ND	U	0.036	0.1	1	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	48	10	12		1	5	1	ND	U	0.021	0.1	1	ND	U	0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	1	48	10	ND	U	1	5	1	ND	U	0.015	0.1	1	ND	U	0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	0.05	1	1	ND	U	2.4	3	1	ND	U	2.4	3	1

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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
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B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-335_06_11_2013					S-336-20161006-WG					S-336-20160817-WG					S-336-20160817-WG-DUP				
			Sample Date	6/11/2013					10/6/2016					8/17/2016					8/17/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	0.16	J	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.24	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.45	2	1	3.8		0.14	1	1	6.6		0.14	1	1	6.2		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	2.2		0.16	1	1	3.9		0.17	1	1	5.1		0.17	1	1	4.7		0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.24	1	1	1.2	J	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	0.21		0.013	0.1	1	0.15		0.013	0.11	1	0.14		0.013	0.11	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.208		0.012	0.1	1	ND	U	0.015	0.1	1	ND	U	0.015	0.11	1	ND	U	0.015	0.11	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.163		0.012	0.1	1	ND	U	0.0074	0.1	1	ND	U	0.0076	0.11	1	ND	U	0.0076	0.11	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	ND	U	0.016	0.1	1	ND	U	0.017	0.11	1	ND	U	0.017	0.11	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.149		0.016	0.1	1	ND	U	0.02	0.1	1	ND	U	0.02	0.11	1	ND	U	0.02	0.11	1
Chrysene	218-01-9	1.9	ug/L	0.257		0.012	0.1	1	ND	U	0.0079	0.1	1	ND	U	0.008	0.11	1	ND	U	0.008	0.11	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.017	0.1	1	1.2		0.017	0.1	1	1.7		0.017	0.11	1	1.5		0.017	0.11	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	0.47		0.019	0.1	1	0.64		0.019	0.11	1	0.52		0.019	0.11	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.021	0.1	1	0.86		0.016	0.1	1	1.2		0.016	0.11	1	0.84		0.016	0.11	1
Pyrene	129-00-0	130	ug/L	0.702		0.015	0.1	1	0.1	J	0.013	0.1	1	0.17		0.013	0.11	1	0.16		0.013	0.11	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.6	5	1

Note:
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-336_06_11_2013					S-337-20161006-WG					S-337-20161006-WG-DUP					S-337_06_12_2013				
			Sample Date	6/11/2013					10/6/2016					10/6/2016					6/12/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	2.5		0.19	2	1	1.4		0.12	1	1	1.3		0.12	1	1	**88.8**		0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	1.1	J	0.36	2	1	5.3		0.12	1	1	4.9		0.12	1	1	171		0.36	2	1
Benzene	71-43-2	5	ug/L	4.5		0.24	1	1	**14.5**		0.16	1	1	**13.8**		0.16	1	1	**52.8**		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	0.23	J	0.23	1	1	5.3		0.23	1	1	5		0.23	1	1	32.8		0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	14.6		0.45	2	1	26.9		0.14	1	1	24.2		0.14	1	1	32.5		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	**22.7**		0.16	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1	ND	U	0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	2.9		0.13	1	1	2.9		0.13	1	1	19.3		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	2.4		0.24	1	1	1.8	J	0.55	3	1	1.4	J	0.55	3	1	26		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.301		0.02	0.1	1	0.04	J	0.013	0.1	1	0.067	J	0.013	0.1	1	0.165		0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	0.031	J	0.015	0.1	1	0.055	J	0.015	0.1	1	0.143		0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	0.02	J	0.0073	0.1	1	0.046	J	0.0074	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	0.042	J	0.016	0.1	1	0.085	J	0.016	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	ND	U	0.019	0.1	1	ND	U	0.02	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	0.04	J	0.0077	0.1	1	0.087	J	0.0079	0.1	1	0.184		0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	1.05		0.017	0.1	1	0.29		0.016	0.1	1	0.34		0.017	0.1	1	0.674		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	0.904		0.036	0.1	1	0.74		0.018	0.1	1	0.74		0.019	0.1	1	38.3		0.36	1	1
Phenanthrene	85-01-8	1100	ug/L	0.856		0.021	0.1	1	0.13		0.016	0.1	1	0.17		0.016	0.1	1	0.425		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	0.424		0.015	0.1	1	0.13		0.013	0.1	1	0.24		0.013	0.1	1	0.409		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	4	5	1	ND	U	4	5	1	ND	U	2.4	3	1

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Table 6
Summary of Groundwater Analytical Results
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-346-20161004-WG					S-346-20160823-WG					S-346_06_12_2013					S-350-20161005-WG				
			Sample Date	10/4/2016					8/23/2016					6/12/2013					10/5/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	**738**		0.62	5	5	**1080**		1.2	10	10	**180**		0.19	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.032	J	0.013	0.04	1	0.05		0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	1.8	5	5	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	209		0.62	5	5	287		0.12	1	1	61.2		0.36	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	**17.8**		0.82	5	5	**44.4**		0.16	1	1	**85.8**		0.24	1	1	**14.9**		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	541		1.2	5	5	**856**		2.3	10	10	249		2.3	10	10	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	31.8		0.68	5	5	58.4		0.14	1	1	27		0.45	2	1	10.7		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	15		0.87	5	5	11.3		0.17	1	1	8.4		0.16	1	1	0.98	J	0.17	1	1
Toluene	108-88-3	1000	ug/L	6.9		0.63	5	5	11.4		0.13	1	1	33.4		0.23	1	1	0.55	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	4050		2.7	15	5	6820		5.5	30	10	1430		2.4	10	10	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	4		0.13	1	10	9.7		0.13	1	10	1.59		0.02	0.1	1	0.59		0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.57	J	0.15	1	10	2.5		0.15	1	10	0.187		0.012	0.1	1	0.045	J	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**0.28**	J	0.073	1	10	**1.3**		0.074	1	10	ND	U	0.012	0.1	1	0.021	J	0.0074	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.47	J	0.16	1	10	**1.7**		0.16	1	10	ND	U	0.01	0.1	1	0.042	J	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.19	1	10	**0.63**	J	0.19	1	10	ND	U	0.016	0.1	1	ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.87	J	0.077	1	10	**3.7**		0.078	1	10	0.281		0.012	0.1	1	0.061	J	0.0078	0.1	1
Fluorene	86-73-7	1900	ug/L	14.3		0.16	1	10	32.2		0.17	1	10	NA					4.9		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	27.4		0.18	1	10	58.3		0.18	1	10	NA					0.71		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	30		0.16	1	10	72.1		0.16	1	10	NA					1.9		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	3.9		0.13	1	10	12.4		0.13	1	10	0.945		0.015	0.1	1	0.31		0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	4	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-350-20160817-WG					S-350_06_05_2013					S-351-20161005-WG					S-351-20160817-WG				
			Sample Date	8/17/2016					6/5/2013					10/5/2016					8/17/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	2.6		0.12	1	1	22.2		0.19	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	0.043		0.013	0.04	1	ND	U	0.011	0.02	1	0.036	J	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	1.2		0.12	1	1	20.1		0.36	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	**32.1**		0.16	1	1	**79.6**		0.24	1	1	1.2		0.16	1	1	0.66	J	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	7.8		0.23	1	1	76.3		0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	62.3		0.14	1	1	99.1		0.45	2	1	3.2		0.14	1	1	2.4		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1.9		0.17	1	1	3.7		0.16	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	2.2		0.13	1	1	3.6		0.23	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	7.9		0.55	3	1	24.9		0.24	1	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	2.6		0.013	0.1	1	3.62		0.02	0.1	1	0.18		0.013	0.1	1	0.087	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.052	J	0.015	0.1	1	ND	U	0.012	0.1	1	0.032	J	0.015	0.1	1	ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.0089	J	0.0072	0.1	1	ND	U	0.012	0.1	1	0.011	J	0.0072	0.1	1	ND	U	0.0072	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.016	0.1	1	ND	U	0.01	0.1	1	0.021	J	0.016	0.1	1	ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1	ND	U	0.019	0.1	1	ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.041	J	0.0077	0.1	1	ND	U	0.012	0.1	1	0.029	J	0.0077	0.1	1	ND	U	0.0076	0.1	1
Fluorene	86-73-7	1900	ug/L	27.6		0.33	2	20	37.8		0.017	0.1	1	0.41		0.016	0.1	1	0.38		0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	1.2		0.018	0.1	1	86		0.036	0.1	1	0.28		0.018	0.1	1	0.13		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	14.8		0.016	0.1	1	29.3		0.021	0.1	1	0.39		0.016	0.1	1	0.33		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.64		0.013	0.1	1	1.03		0.015	0.1	1	0.11		0.013	0.1	1	0.035	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	2.4	3	1	ND	U	***8.1***	10	2	ND	U	2.6	5	1

Note:
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MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-351_20150519					S-351-20160512					S-351_06_04_2013					S-354-20160816-WG				
			Sample Date	5/19/2015					5/12/2016					6/4/2013					8/16/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	2	1	8.8		0.19	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.0095	1	ND	U	0.01	0.03	1	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	2	1	2.1		0.36	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	2		0.5	0.5	1	ND	U	0.5	1	1	4.1		0.24	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	0.6	J	0.5	0.5	1	ND	U	0.5	1	1	7.4		0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	8		0.5	0.5	1	ND	U	0.5	2	1	27		0.45	2	1	9.4		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1	1.5		0.16	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1	0.73	J	0.23	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	0.6	J	0.5	0.5	1	ND	U	0.5	1	1	6.4		0.24	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	1		0.1	0.1	1	ND	U	0.1	0.5	1	1.43		0.02	0.1	1	1.1		0.017	0.14	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.3	J	0.1	0.1	1	ND	U	0.1	0.5	1	0.142		0.012	0.1	1	ND	U	0.02	0.14	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.1	J	0.1	0.1	1	ND	U	0.1	0.5	1	ND	U	0.012	0.1	1	0.059	J	0.0099	0.14	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.1	J	0.1	0.1	1	ND	U	0.1	0.5	1	ND	U	0.01	0.1	1	0.1	J	0.022	0.14	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.1	0.1	1	ND	U	0.1	0.5	1	ND	U	0.016	0.1	1	0.032	J	0.026	0.14	1
Chrysene	218-01-9	1.9	ug/L	0.3	J	0.1	0.1	1	ND	U	0.1	0.5	1	0.158		0.012	0.1	1	0.35		0.01	0.14	1
Fluorene	86-73-7	1900	ug/L	2		0.1	0.1	1	ND	U	0.1	0.5	1	4		0.017	0.1	1	2.1		0.022	0.14	1
Naphthalene	91-20-3	100	ug/L	1		0.1	0.1	1	ND	U	0.1	0.5	1	42.5		0.36	1	10	1.2		0.025	0.14	1
Phenanthrene	85-01-8	1100	ug/L	3		0.1	0.1	1	ND	U	0.1	0.5	1	3.35		0.021	0.1	1	0.94		0.022	0.14	1
Pyrene	129-00-0	130	ug/L	1		0.1	0.1	1	ND	U	0.1	0.5	1	0.787		0.015	0.1	1	0.33		0.017	0.14	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	0.31	J	0.082	0.082	1	ND	U	0.13	1	1	ND	U	2.4	3	1	**7.1**	J	***5.2***	10	2

Note:
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Q - Qualifier
MDL - Method detection limit
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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-354_06_05_2013					S-355-20161003-WG					S-355-20160822-WG					S-355_06_05_2013				
			Sample Date	6/5/2013					10/3/2016					8/22/2016					6/5/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.53	J	0.19	2	1	ND	U	0.12	1	1	0.22	J	0.12	1	1	1.4	J	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.12	1	1	0.59	J	0.12	1	1	0.47	J	0.36	2	1
Benzene	71-43-2	5	ug/L	0.48	J	0.24	1	1	ND	U	0.16	1	1	0.82	J	0.16	1	1	1.2		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	0.48	J	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	0.97	J	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	26.2		0.45	2	1	11.1		0.14	1	1	42.7		0.14	1	1	90.5		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.16	1	1	**40.4**		0.17	1	1	**68.1**		0.17	1	1	11.1		0.16	1	1
Toluene	108-88-3	1000	ug/L	0.77	J	0.23	1	1	0.84	J	0.13	1	1	3.1		0.13	1	1	1.7		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.6		0.24	1	1	2.1	J	0.55	3	1	14.2		0.55	3	1	5.1		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	2.2		0.013	0.1	1	1.7		0.013	0.11	1	ND	U	0.041	0.2	2
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	0.041	J	0.015	0.1	1	0.068	J	0.015	0.11	1	ND	U	0.023	0.2	2
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	0.027	J	0.0074	0.1	1	0.039	J	0.0075	0.11	1	ND	U	0.025	0.2	2
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	0.054	J	0.016	0.1	1	0.058	J	0.017	0.11	1	ND	U	0.02	0.2	2
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	0.053	J	0.02	0.1	1	ND	U	0.02	0.11	1	ND	U	0.031	0.2	2
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	0.16		0.0078	0.1	1	0.19		0.0079	0.11	1	ND	U	0.024	0.2	2
Fluorene	86-73-7	1900	ug/L	1.65		0.017	0.1	1	2.2		0.017	0.1	1	4.2		0.017	0.11	1	3.06		0.034	0.2	2
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	0.93		0.018	0.1	1	1.6		0.019	0.11	1	ND	U	0.071	0.2	2
Phenanthrene	85-01-8	1100	ug/L	0.57		0.021	0.1	1	2.1		0.016	0.1	1	5.6		0.016	0.11	1	0.57		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	0.289		0.015	0.1	1	0.28		0.013	0.1	1	0.4		0.013	0.11	1	ND	U	0.03	0.2	2
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.4	3	1

Note:
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15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-357-20161004-WG					S-357-20160822-WG					S-359-20160817-WG					S-359-20160812-WG				
			Sample Date	10/4/2016					8/22/2016					8/17/2016					8/12/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.62	5	5	0.54	J	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	**0.058**		0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	1.8	5	5	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.62	5	5	0.19	J	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	2.8	J	0.82	5	5	1.1		0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	1.2	5	5	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	21.1		0.68	5	5	7.3		0.14	1	1	19.5		0.14	1	1	30.9		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.87	5	5	0.65	J	0.17	1	1	ND	U	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.63	5	5	0.46	J	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	2.7	15	5	1.4	J	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	13.4		0.14	1.1	10	5.8		0.13	1	10	0.047	J	0.013	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	**7.5**		0.16	1.1	10	2.2		0.15	1	10	0.024	J	0.015	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**4.6**		0.08	1.1	10	**1.4**		0.074	1	10	0.016	J	0.0072	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	**4.8**		0.18	1.1	10	**1.3**		0.16	1	10	ND	U	0.016	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**2.2**		0.21	1.1	10	**0.9**	J	0.2	1	10	ND	U	0.019	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	**15.5**		0.084	1.1	10	**4.6**		0.079	1	10	0.056	J	0.0077	0.1	1	NA				
Fluorene	86-73-7	1900	ug/L	1.3		0.18	1.1	10	0.4	J	0.17	1	10	0.71		0.016	0.1	1	NA				
Naphthalene	91-20-3	100	ug/L	2.1		0.2	1.1	10	0.62	J	0.19	1	10	0.49		0.018	0.1	1	NA				
Phenanthrene	85-01-8	1100	ug/L	3.9		0.17	1.1	10	1.9		0.16	1	10	0.051	J	0.016	0.1	1	NA				
Pyrene	129-00-0	130	ug/L	27.3		0.14	1.1	10	8.1		0.13	1	10	0.14		0.013	0.1	1	NA				
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	3.9	J	2.6	5	1	ND	U	2.6	5	1

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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-359_06_04_2013					S-361-20161004-WG					S-361_06_04_2013					S-362_06_04_2013				
			Sample Date	6/4/2013					10/4/2016					6/4/2013					6/4/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	0.34	J	0.19	2	1	ND	U	0.12	1	1	40.5		0.19	2	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	0.12	1	1	7.1		0.36	2	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	0.27	J	0.24	1	1	ND	U	0.16	1	1	**40.1**		0.24	1	1	ND	U	0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	0.23	J	0.23	1	1	ND	U	0.23	1	1	57.2		0.23	1	1	0.46	J	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	11.5		0.45	2	1	7.9		0.14	1	1	30.1		0.45	2	1	20.8		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	2.7		0.16	1	1	2.8		0.17	1	1	10.6		0.16	1	1	ND	U	0.16	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	0.13	1	1	1.9		0.23	1	1	ND	U	0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	0.7	J	0.24	1	1	ND	U	0.55	3	1	52.8		0.24	1	1	0.36	J	0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.163		0.02	0.1	1	0.33		0.013	0.1	1	ND	U	0.02	0.1	1	0.912		0.02	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	0.065	J	0.015	0.1	1	ND	U	0.012	0.1	1	0.358		0.012	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	0.03	J	0.0072	0.1	1	ND	U	0.012	0.1	1	ND	U	0.012	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	0.056	J	0.016	0.1	1	ND	U	0.01	0.1	1	ND	U	0.01	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	0.21		0.0077	0.1	1	ND	U	0.012	0.1	1	0.424		0.012	0.1	1
Fluorene	86-73-7	1900	ug/L	1.35		0.017	0.1	1	2.4		0.016	0.1	1	0.687		0.017	0.1	1	2.41		0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	0.46		0.018	0.1	1	ND	U	0.036	0.1	1	ND	U	0.036	0.1	1
Phenanthrene	85-01-8	1100	ug/L	1.34		0.021	0.1	1	4.2		0.016	0.1	1	ND	U	0.021	0.1	1	3.86		0.021	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.015	0.1	1	0.36		0.013	0.1	1	ND	U	0.015	0.1	1	1.04		0.015	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	4	5	1	ND	U	2.4	3	1	ND	U	2.4	3	1

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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-406-20161005-WG					S-406-20160810-WG					S-383_06_05_2013					S-422-20161005-WG				
			Sample Date	10/5/2016					8/10/2016					6/5/2013					10/5/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	**109**		0.19	2	1	5.3		0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	76.2		0.36	2	1	6.9		0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.16	1	1	0.53	J	0.24	1	1	0.72	J	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	0.63	J	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	4.9		0.14	1	1	9.7		0.14	1	1	14.3		0.45	2	1	6.7		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	0.54	J	0.17	1	1	5.7		0.16	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	0.22	J	0.13	1	1	0.29	J	0.23	1	1	0.33	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.55	3	1	4.1		0.24	1	1	2.3	J	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.16		0.013	0.1	1	1.6		0.013	0.1	1	ND	U	0.062	0.31	2	0.086	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.11		0.015	0.1	1	0.34		0.015	0.1	1	0.774		0.035	0.31	2	ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.075	J	0.0072	0.1	1	0.17		0.0073	0.1	1	**0.471**		0.038	0.31	2	ND	U	0.0072	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.12		0.016	0.1	1	0.24		0.016	0.1	1	ND	U	0.031	0.31	2	ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.03	J	0.019	0.1	1	0.088	J	0.019	0.1	1	**0.425**		0.048	0.31	2	ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	0.2		0.0076	0.1	1	0.67		0.0077	0.1	1	**2.12**		0.036	0.31	2	ND	U	0.0076	0.1	1
Fluorene	86-73-7	1900	ug/L	0.83		0.016	0.1	1	3.5		0.016	0.1	1	ND	U	0.052	0.31	2	0.077	J	0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	0.58		0.018	0.1	1	3.3		0.018	0.1	1	ND	U	0.11	0.31	2	0.26		0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	0.62		0.016	0.1	1	4.6		0.016	0.1	1	76.9		0.32	1.5	10	0.11		0.016	0.1	1
Pyrene	129-00-0	130	ug/L	0.34		0.013	0.1	1	1.1		0.013	0.1	1	40.5		0.23	1.5	10	0.052	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	2.4	B	2.4	3	1	ND	U	4	5	1

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-422-20160810-WG					S-423-20161005-WG					S-423-20160816-WG					S-48_071410				
			Sample Date	8/10/2016					10/5/2016					8/16/2016					7/14/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	17.1		0.12	1	1	0.48	J	0.12	1	1	0.62	J	0.12	1	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	7.5		0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	0.41	J	0.16	1	1	1.8		0.16	1	1	1.6		0.16	1	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	5.3		0.14	1	1	32.5		0.14	1	1	32.4		0.14	1	1	48		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	**42.7**		0.17	1	1	**51.6**		0.17	1	1	8		0.5	1	1
Toluene	108-88-3	1000	ug/L	0.5	J	0.13	1	1	1.3		0.13	1	1	1.4		0.13	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	38.7		0.55	3	1	0.92	J	0.55	3	1	1.3	J	0.55	3	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.098	J	0.013	0.11	1	0.48		0.013	0.1	1	1.5		0.014	0.11	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.11	1	0.16		0.015	0.1	1	ND	U	0.016	0.11	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.0075	0.11	1	0.084	J	0.0073	0.1	1	**0.71**		0.008	0.11	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.017	0.11	1	0.16		0.016	0.1	1	0.54		0.018	0.11	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.02	0.11	1	0.031	J	0.019	0.1	1	0.076	J	0.021	0.11	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.0079	0.11	1	0.72		0.0077	0.1	1	**3.9**		0.0084	0.11	1	**75**		1	50	1
Fluorene	86-73-7	1900	ug/L	0.13		0.017	0.11	1	2.8		0.016	0.1	1	6.7		0.018	0.11	1	690		1	50	1
Naphthalene	91-20-3	100	ug/L	0.88		0.019	0.11	1	0.48		0.018	0.1	1	1.7		0.02	0.11	1	ND	U	1	50	1
Phenanthrene	85-01-8	1100	ug/L	0.19		0.016	0.11	1	4.6		0.016	0.1	1	9.2		0.017	0.11	1	**1900**		1	500	10
Pyrene	129-00-0	130	ug/L	0.046	J	0.013	0.11	1	0.36		0.013	0.1	1	0.98		0.014	0.11	1	**340**		1	50	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	4	5	1	3	J	2.6	5	1	ND	U	0.05	1	1

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Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-61-20161004-WG					S-61-20160819-WG					S-63-20160816-WG					S-64-20161005-WG				
			Sample Date	10/4/2016					8/19/2016					8/16/2016					10/5/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.62	5	5	0.2	J	0.12	1	1	4.7		0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	1.8	5	5	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.62	5	5	ND	U	0.12	1	1	8.6		0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.82	5	5	ND	U	0.16	1	1	**14.5**		0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	1.2	5	5	ND	U	0.23	1	1	2.2		0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	6		0.68	5	5	0.91	J	0.14	1	1	51.4		0.14	1	1	7.6		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.87	5	5	ND	U	0.17	1	1	0.71	J	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.63	5	5	0.23	J	0.13	1	1	2.1		0.13	1	1	0.5	J	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	2.7	15	5	ND	U	0.55	3	1	9.8		0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	2.7		0.15	1.2	10	12.7		0.13	1	10	6.6		0.013	0.1	1	0.12		0.013	0.11	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	1	J	0.17	1.2	10	2.3		0.15	1	10	0.18		0.015	0.1	1	0.098	J	0.015	0.11	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**0.77**	J	0.083	1.2	10	**3.1**		0.073	1	10	0.11		0.0074	0.1	1	0.072	J	0.0075	0.11	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	**1.3**		0.18	1.2	10	**4.5**		0.16	1	10	0.084	J	0.016	0.1	1	0.16		0.017	0.11	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**0.36**	J	0.22	1.2	10	**1.7**		0.19	1	10	0.034	J	0.019	0.1	1	0.045	J	0.02	0.11	1
Chrysene	218-01-9	1.9	ug/L	**3**		0.087	1.2	10	**10.2**		0.077	1	10	0.54		0.0078	0.1	1	0.2		0.0079	0.11	1
Fluorene	86-73-7	1900	ug/L	8		0.19	1.2	10	13.1		0.16	1	10	7.3		0.017	0.1	1	0.65		0.017	0.11	1
Naphthalene	91-20-3	100	ug/L	6.8		0.21	1.2	10	15.4		0.18	1	10	8.7		0.018	0.1	1	0.2		0.019	0.11	1
Phenanthrene	85-01-8	1100	ug/L	16.1		0.18	1.2	10	20.6		0.16	1	10	12.7		0.016	0.1	1	0.5		0.016	0.11	1
Pyrene	129-00-0	130	ug/L	5.7		0.15	1.2	10	22.5		0.13	1	10	3.2		0.013	0.1	1	0.25		0.013	0.11	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	2.6	5	1	ND	U	4	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-64-20160810-WG					S-71-20161004-WG					S-71-20160819-WG					S-71_06_11_2013				
			Sample Date	8/10/2016					10/4/2016					8/19/2016					6/11/2013				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	0.7	J	0.12	1	1	0.43	J	0.12	1	1	ND	U	0.19	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.26	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	0.42	J	0.12	1	1	0.19	J	0.12	1	1	ND	U	0.36	2	1
Benzene	71-43-2	5	ug/L	0.48	J	0.16	1	1	1.2		0.16	1	1	0.96	J	0.16	1	1	1.1		0.24	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	23.7		0.14	1	1	17.3		0.14	1	1	12.9		0.14	1	1	10.1		0.45	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	16.8		0.17	1	1	**43.5**		0.17	1	1	**237**		1.6	10	10
Toluene	108-88-3	1000	ug/L	0.52	J	0.13	1	1	1.2		0.13	1	1	0.63	J	0.13	1	1	1.2		0.23	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.1	J	0.55	3	1	2.8	J	0.55	3	1	2.7	J	0.55	3	1	3.6		0.24	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	0.16		0.013	0.1	1	0.56		0.013	0.1	1	0.62		0.013	0.11	1	ND	U	0.025	0.13	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	0.063	J	0.015	0.1	1	0.32		0.015	0.1	1	0.32		0.015	0.11	1	ND	U	0.014	0.13	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.031	J	0.0074	0.1	1	**0.24**		0.0074	0.1	1	**0.21**		0.0076	0.11	1	ND	U	0.015	0.13	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.074	J	0.016	0.1	1	0.47		0.016	0.1	1	0.31		0.017	0.11	1	ND	U	0.013	0.13	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.032	J	0.02	0.1	1	0.098	J	0.02	0.1	1	0.15		0.02	0.11	1	ND	U	0.02	0.13	1
Chrysene	218-01-9	1.9	ug/L	0.15		0.0079	0.1	1	0.47		0.0078	0.1	1	0.42		0.008	0.11	1	ND	U	0.015	0.13	1
Fluorene	86-73-7	1900	ug/L	1.6		0.017	0.1	1	1.5		0.017	0.1	1	1.2		0.017	0.11	1	0.89		0.021	0.13	1
Naphthalene	91-20-3	100	ug/L	0.59		0.019	0.1	1	0.5		0.018	0.1	1	0.41		0.019	0.11	1	ND	U	0.044	0.13	1
Phenanthrene	85-01-8	1100	ug/L	1.1		0.016	0.1	1	1.6		0.016	0.1	1	1.2		0.016	0.11	1	0.315		0.026	0.13	1
Pyrene	129-00-0	130	ug/L	0.24		0.013	0.1	1	1.1		0.013	0.1	1	0.9		0.013	0.11	1	0.363		0.019	0.13	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	4	5	1	2.8	J	2.6	5	1	ND	U	2.4	3	1

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10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
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Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-71_071510					S-72-20161005-WG					S-72-20160816-WG					S-72-20160511				
			Sample Date	7/15/2010					10/5/2016					8/16/2016					5/11/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	0.17	J	0.12	1	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	2	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	2		0.5	1	1	**7.7**		0.16	1	1	4.3		0.16	1	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	6		0.5	2	1	56		0.14	1	1	44.2		0.14	1	1	9		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	**440**		0.5	1	1	ND	U	0.17	1	1	0.39	J	0.17	1	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	1		0.5	1	1	4.3		0.13	1	1	2.7		0.13	1	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	3		0.5	1	1	7.4		0.55	3	1	5.1		0.55	3	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					6.9		0.13	1	10	1.4		0.13	1	10	1		0.1	0.5	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					2.3		0.15	1	10	ND	U	0.15	1	10	1		0.1	0.5	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					**2.5**		0.072	1	10	0.15	J	0.074	1	10	**2**		0.1	0.5	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					**6.2**		0.16	1	10	0.33	J	0.16	1	10	**3**		0.1	0.5	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					**2.1**		0.19	1	10	ND	U	0.2	1	10	**1**		0.1	0.5	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	**5**		0.077	1	10	**2.3**		0.079	1	10	**3**		0.1	0.5	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	5	1	7.5		0.16	1	10	5.4		0.17	1	10	3		0.1	0.5	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	5	1	3.6		0.18	1	10	1.2		0.19	1	10	ND	U	0.1	0.5	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	5	1	9.8		0.16	1	10	8.8		0.16	1	10	2		0.1	0.5	1
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	8.9		0.13	1	10	1.1		0.13	1	10	4		0.1	0.5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	ND	U	4	5	1	ND	U	2.6	5	1	ND	U	0.13	1	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-72					S-72					S-72					S-72_071510				
			Sample Date	5/29/2014					11/28/2011					11/8/2010					7/15/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND		0.19	2	1	ND	U		0.5	1	ND	U		0.5	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND		0.011	0.02	1	ND	U		0.0098	1	ND	U		0.0097	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND		0.3	1	1	ND	U		0.5	1	ND	U		0.5	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND		0.17	2	1	ND	U		0.5	1	ND	U		0.5	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	**10.8**		0.21	0.5	1	**8**				1	**21**				1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND		0.4	1	1	ND	U		0.5	1	0.6	J			1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	7		0.26	1	1	32				1	68				1	35		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.5	J	0.26	1	1	ND	U		0.5	1	0.9	J			1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	0.66	J	0.22	1	1	1				1	4				1	2		0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND		0.2	1	1	1				1	12				1	4		0.5	1	1
Semi-Volatile Organic Compounds														NA									
Anthracene	120-12-7	66	ug/L	ND		0.1	0.5	5	NA					NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	2.31		0.058	0.5	5	NA					NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**2.05**		0.062	0.5	5	NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	**3.46**		0.051	0.5	5	NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	**1.35**		0.078	0.5	5	NA					NA					NA				
Chrysene	218-01-9	1.9	ug/L	**4.43**		0.059	0.5	5	**15**				1	**3**	J			1	**14**		1	5	1
Fluorene	86-73-7	1900	ug/L	19.8		0.085	0.5	5	7				1	4	J			1	13		1	5	1
Naphthalene	91-20-3	100	ug/L	47.7		0.18	5	5	ND	U		10	1	ND	U		1	1	ND	U	1	5	1
Phenanthrene	85-01-8	1100	ug/L	24.9		0.1	0.5	5	3.9				1	5	J			1	10		1	5	1
Pyrene	129-00-0	130	ug/L	8.38		0.075	0.5	5	ND	U		1	1	6				1	20		1	5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	1.3	3	1	3.8				1	0.091	J			1	ND	U	0.05	1	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-93-20160816-WG					PGW-MW-8D-20161007-WG					AOI2 PGW-MW-8D					SD-1-20160811-WG				
			Sample Date	8/16/2016					10/7/2016					8/31/2016					8/11/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	1.1		0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	0.4	J	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	1.1		0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	0.43	J	0.12	1	1
Benzene	71-43-2	5	ug/L	1		0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	**5.2**		0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	0.59	J	0.14	1	1	ND	U	0.14	1	1	ND	U	0.14	1	1	3		0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.39	J	0.17	1	1	1.3		0.17	1	1	2		0.17	1	1	**32.8**		0.17	1	1
Toluene	108-88-3	1000	ug/L	0.58	J	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	3.8		0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	1.7	J	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1	3.9		0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	5.8		0.013	0.1	1	ND	U	0.013	0.1	1	0.035	J	0.013	0.1	1	2.1		0.16	1.3	10
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.1	1	ND	U	0.014	0.1	1	ND	U	0.015	0.1	1	1	J	0.18	1.3	10
Benzo(A)Pyrene	50-32-8	0.2	ug/L	**0.28**		0.0074	0.1	1	ND	U	0.0071	0.1	1	ND	U	0.0073	0.1	1	**2.6**		0.089	1.3	10
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.39		0.016	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	**4.6**		0.2	1.3	10
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	0.12		0.019	0.1	1	ND	U	0.019	0.1	1	ND	U	0.019	0.1	1	**3.7**		0.24	1.3	10
Chrysene	218-01-9	1.9	ug/L	1.4		0.0078	0.1	1	ND	U	0.0075	0.1	1	ND	U	0.0077	0.1	1	**4.2**		0.094	1.3	10
Fluorene	86-73-7	1900	ug/L	1.6		0.017	0.1	1	0.035	J	0.016	0.1	1	0.03	J	0.016	0.1	1	2		0.2	1.3	10
Naphthalene	91-20-3	100	ug/L	1.7		0.018	0.1	1	1.1		0.018	0.1	1	0.02	J	0.018	0.1	1	1.6		0.22	1.3	10
Phenanthrene	85-01-8	1100	ug/L	5.8		0.016	0.1	1	0.043	J	0.015	0.1	1	0.11		0.016	0.1	1	3		0.19	1.3	10
Pyrene	129-00-0	130	ug/L	3.9		0.013	0.1	1	0.015	J	0.013	0.1	1	0.14		0.013	0.1	1	4.5		0.16	1.3	10
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	4	5	1	NA					**5.5**		2.6	5	1

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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	SD-1_06_12_2013					SD-1_072310					S-294D_40113					S-294D_102612				
			Sample Date	6/12/2013					7/23/2010					4/1/2013					10/26/2012				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	7.9		0.19	2	1	4		0.5	2	1	**96**		0.19	2	1	ND	U	2	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.01	0.029	1	ND	U	0.011	0.02	1	ND	U	0.02	0.02	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	0.5	1	1	ND	U	0.26	1	1	ND	U	1	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	2.5		0.36	2	1	3		0.5	2	1	30.4		0.36	2	1	ND	U	2	2	1
Benzene	71-43-2	5	ug/L	**10.3**		0.24	1	1	**370**		0.5	10	10	**88.6**		0.24	1	1	ND	U	1	1	1
Ethylbenzene	100-41-4	700	ug/L	10.8		0.23	1	1	1		0.5	1	1	107		0.23	1	1	2.1		1	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	2.5		0.45	2	1	2		0.5	2	1	117		0.45	2	1	ND	U	2	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	7.7		0.16	1	1	**22**		0.5	1	1	5.4		0.16	1	1	1.1		1	1	1
Toluene	108-88-3	1000	ug/L	16.8		0.23	1	1	11		0.5	1	1	4.5		0.23	1	1	ND	U	1	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	61.3		0.24	1	1	15		0.5	1	1	107		0.24	1	1	2.5		1	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	NA					11.3		0.041	2	2	ND	U	2	2	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	NA					0.514		0.012	0.1	1	ND	U	2	2	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	NA					**0.282**		0.012	0.1	1	ND	U	***2***	2	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	NA					0.345		0.01	0.1	1	ND	U	***2***	2	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	NA					0.168		0.016	0.1	1	ND	U	***2***	2	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	48	10	0.487		0.012	0.1	1	ND	U	***2***	2	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.017	0.1	1	ND	U	1	48	10	48.7		0.034	2	2	ND	U	2	2	1
Naphthalene	91-20-3	100	ug/L	0.29		0.036	0.1	1	ND	U	1	48	10	**521**		0.36	10	10	20.6		5	5	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.021	0.1	1	ND	U	1	48	10	57.1		0.042	2	2	ND	U	2	2	1
Pyrene	129-00-0	130	ug/L	ND	U	0.015	0.1	1	ND	U	1	48	10	2.97		0.015	0.1	1	ND	U	2	2	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.4	3	1	ND	U	0.05	1	1	4.8		1.7	3	1	ND	U	3	3	1

Note:
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Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-294D-20160823-WG					S-294D_081712					S-294D_06282011					S-294D_04062011				
			Sample Date	8/23/2016					8/17/2012					6/28/2011					4/6/2011				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.01	0.0097	1	ND	U	0.01	0.0097	1	ND	U	0.01	0.0097	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	0.8	J	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	0.9	J	0.5	0.5	1	0.8	J	0.5	0.5	1	0.8	J	0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.013	0.1	1	ND	U	0.1	0.09	1	NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.1	1	0.1	J	0.1	0.09	1	NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.0073	0.1	1	0.1	J	0.1	0.09	1	NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.016	0.1	1	0.1	J	0.1	0.09	1	NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.1	0.09	1	NA					NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.0077	0.1	1	0.1	J	0.1	0.09	1	ND	U	1	1	1	ND	U	1	1	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.016	0.1	1	0.2	J	0.1	0.09	1	ND	U	1	1	1	ND	U	1	1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.018	0.1	1	0.4	J	0.1	0.09	1	ND	U	1	1	1	ND	U	1	1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.016	0.1	1	0.2	J	0.1	0.09	1	ND	U	1	1	1	1	J	1	1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.013	0.1	1	0.3	J	0.1	0.09	1	ND	U	1	1	1	ND	U	1	1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	0.034	1	1	0.14	J	0.08	0.08	1	0.3	J	0.052	0.052	1

Note:
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Q - Qualifier
MDL - Method detection limit
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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-294D_072310					S-294D_53012					S-302D-20161012-WG					S-302D-20160823-WG				
			Sample Date	7/23/2010					5/30/2012					10/12/2016					8/23/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	15		0.5	2	1	3		0.5	0.5	1	ND	U	0.12	1	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.029	1	ND	U	0.01	0.0096	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	0.5	1	ND	U	0.36	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	6		0.5	2	1	0.9	J	0.5	0.5	1	ND	U	0.12	1	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	1	1	ND	U	0.5	0.5	1	ND	U	0.16	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	17		0.5	1	1	4		0.5	0.5	1	ND	U	0.23	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	3		0.5	2	1	0.6	J	0.5	0.5	1	ND	U	0.14	1	1	ND	U	0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	1	1	1		0.5	0.5	1	ND	U	0.17	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	1		0.5	1	1	ND	U	0.5	0.5	1	ND	U	0.13	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	19		0.5	1	1	5		0.5	0.5	1	ND	U	0.55	3	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					ND	U	0.013	0.1	1	ND	U	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					ND	U	0.015	0.1	1	ND	U	0.015	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					ND	U	0.0073	0.1	1	ND	U	0.0074	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					ND	U	0.016	0.1	1	ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					ND	U	0.019	0.1	1	ND	U	0.02	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	5	1	0.6		0.1	0.1	1	ND	U	0.0077	0.1	1	ND	U	0.0078	0.1	1
Fluorene	86-73-7	1900	ug/L	6		1	5	1	2		0.1	0.1	1	ND	U	0.016	0.1	1	ND	U	0.017	0.1	1
Naphthalene	91-20-3	100	ug/L	**140**		1	24	5	48		0.1	0.1	1	ND	U	0.018	0.1	1	ND	U	0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	8		1	5	1	4		0.1	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1
Pyrene	129-00-0	130	ug/L	ND	U	1	5	1	1		0.1	0.1	1	0.052	J	0.013	0.1	1	ND	U	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.05	1	1	0.78	J	0.08	1	1	ND	U	4	5	1	ND	U	2.6	5	1

Note:
CAS No. - Chemical Abstract Number
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-302D_032813					S-302D_102512					S-302D_081712					S-302D_52912				
			Sample Date	3/28/2013					10/25/2012					8/17/2012					5/29/2012				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.02	0.02	1	ND	U	0.01	0.0097	1	ND	U	0.01	0.0096	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.45	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.68	J	0.16	1	1	ND	U	1	1	1	0.6	J	0.5	0.5	1	ND	U	0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	0.1	0.09	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.017	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	0.1	0.09	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	ND	U	5	5	1	ND	U	0.1	0.09	1	ND	U	0.1	0.09	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.021	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	0.1	0.09	1
Pyrene	129-00-0	130	ug/L	0.521		0.015	0.1	1	ND	U	1	1	1	0.8		0.1	0.09	1	0.7		0.1	0.09	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	5		1.7	3	1	**5.6**		3	3	1	ND	U	0.034	1	1	ND	J	0.08	1	1

Note:
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Qualifiers:
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J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
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Summary of Groundwater Analytical Results
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Philadelphia Energy Solutions Refining Complex
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-302D_06282011					S-302D_04072011					S-302D_072610					S-305D-20161007-WG				
			Sample Date	6/28/2011					4/7/2011					7/26/2010					10/7/2016				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	2	1	ND	U	0.12	1	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.0098	1	ND	U	0.01	0.01	1	ND	U	0.01	0.029	1	ND	U	0.013	0.04	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.36	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	2	1	ND	U	0.12	1	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.16	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.23	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	2	1	ND	U	0.14	1	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	0.5	J	0.5	0.5	1	0.6	J	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.17	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.13	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	0.5	1	0.6	J	0.5	0.5	1	ND	U	0.5	1	1	ND	U	0.55	3	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					NA					0.014	J	0.013	0.1	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					NA					ND	U	0.014	0.1	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					NA					ND	U	0.0071	0.1	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					NA					ND	U	0.016	0.1	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					NA					ND	U	0.019	0.1	1
Chrysene	218-01-9	1.9	ug/L	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1	ND	U	0.0075	0.1	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1	0.055	J	0.016	0.1	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1	0.062	J	0.018	0.1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1	0.051	J	0.015	0.1	1
Pyrene	129-00-0	130	ug/L	1	J	1	1	1	ND	U	1	1	1	ND	U	1	5	1	0.016	J	0.013	0.1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.08	0.08	1	ND	U	0.052	0.052	1	ND	U	0.05	1	1	ND	U	4	5	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-305D-20160823-WG					S-305D_32713					S-305D_102512					S-305D_081712				
			Sample Date	8/23/2016					3/27/2013					10/25/2012					8/17/2012				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.19	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.011	0.02	1	ND	U	0.02	0.02	1	ND	U	0.01	0.0097	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.26	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.36	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	ND	U	0.45	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	ND	U	0.16	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.013	0.1	1	ND	U	0.02	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.1	1	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.0073	0.1	1	ND	U	0.012	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.016	0.1	1	ND	U	0.01	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.016	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1
Chrysene	218-01-9	1.9	ug/L	ND	U	0.0077	0.1	1	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Fluorene	86-73-7	1900	ug/L	0.12		0.016	0.1	1	ND	U	0.017	0.1	1	ND	U	1	1	1	0.2	J	0.1	0.09	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.018	0.1	1	ND	U	0.036	0.1	1	ND	U	5	5	1	ND	U	0.1	0.09	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.016	0.1	1	ND	U	0.021	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Pyrene	129-00-0	130	ug/L	ND	U	0.013	0.1	1	ND	U	0.015	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	2.6	5	1	ND	U	1.7	3	1	**7.4**		3	3	1	ND	U	0.034	1	1

Note:
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ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
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DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
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Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-305D_52512					S-305D_06292011					S-305D_04062011					S-305D_072610				
			Sample Date	5/25/2012					6/29/2011					4/6/2011					7/26/2010				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.0096	1	ND	U	0.01	0.0095	1	ND	U	0.01	0.0098	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	0.8	J	0.5	0.5	1	5		0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	NA					NA					NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA					NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA					NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA					NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA					NA					NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.1	0.1	1	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1
Fluorene	86-73-7	1900	ug/L	0.3	J	0.1	0.1	1	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.1	0.1	1	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1
Phenanthrene	85-01-8	1100	ug/L	0.2	J	0.1	0.1	1	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1
Pyrene	129-00-0	130	ug/L	ND	U	0.1	0.1	1	ND	U	1	1	1	ND	U	1	1	1	ND	U	1	5	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	0.08	1	1	ND	U	0.08	0.08	1	ND	U	0.052	0.052	1	ND	U	0.05	1	1

Note:
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Table 6
Summary of Groundwater Analytical Results
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-294D-20161012-WG					S-72D-20161006-WG					S-72D-20160823-WG					S-72D_52912				
			Sample Date	10/12/2016					10/6/2016					8/23/2016					5/29/2012				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.013	0.04	1	ND	U	0.01	0.0097	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.36	1	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.12	1	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.16	1	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.23	1	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.14	1	1	ND	U	0.14	1	1	ND	U	0.14	1	1	ND	U	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	ND	U	0.17	1	1	1.8		0.17	1	1	1.6		0.17	1	1	1		0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.13	1	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.55	3	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.013	0.1	1	0.018	J	0.013	0.1	1	ND	U	0.013	0.1	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.015	0.1	1	ND	U	0.015	0.1	1	ND	U	0.015	0.1	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	0.012	J	0.0072	0.1	1	ND	U	0.0074	0.1	1	ND	U	0.0073	0.1	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	0.031	J	0.016	0.1	1	ND	U	0.016	0.1	1	ND	U	0.016	0.1	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.019	0.1	1	ND	U	0.019	0.1	1	ND	U	0.019	0.1	1	NA				
Chrysene	218-01-9	1.9	ug/L	0.014	J	0.0077	0.1	1	ND	U	0.0078	0.1	1	ND	U	0.0077	0.1	1	ND	U	0.1	0.09	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.016	0.1	1	0.041	J	0.017	0.1	1	ND	U	0.016	0.1	1	ND	U	0.1	0.09	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.018	0.1	1	0.085	J	0.018	0.1	1	ND	U	0.018	0.1	1	ND	U	0.1	0.09	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.016	0.1	1	0.055	J	0.016	0.1	1	ND	U	0.016	0.1	1	ND	U	0.1	0.09	1
Pyrene	129-00-0	130	ug/L	0.026	J	0.013	0.1	1	0.024	J	0.013	0.1	1	ND	U	0.013	0.1	1	ND	U	0.1	0.09	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	4	5	1	ND	U	4	5	1	ND	U	2.6	5	1	0.17	J	0.08	1	1

Note:
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Q - Qualifier
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ND - Not detected
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[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
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Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
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Table 6
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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-72D_32713					S-72D_102512					S-72D_081712					S-72D_06282011				
			Sample Date	3/27/2013					10/25/2012					8/17/2012					6/28/2011				
			Sample Matrix	WQ					WQ					WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds																							
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.19	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.011	0.02	1	ND	U	0.02	0.02	1	ND	U	0.01	0.0096	1	ND	U	0.01	0.0098	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.26	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.36	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Benzene	71-43-2	5	ug/L	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.45	2	1	ND	U	2	2	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1.5		0.16	1	1	1.5		1	1	1	2		0.5	0.5	1	ND	U	0.5	0.5	1
Toluene	108-88-3	1000	ug/L	ND	U	0.23	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.24	1	1	ND	U	1	1	1	ND	U	0.5	0.5	1	ND	U	0.5	0.5	1
Semi-Volatile Organic Compounds																							
Anthracene	120-12-7	66	ug/L	ND	U	0.02	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	ND	U	0.012	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1	NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	ND	U	0.01	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	ND	U	0.016	0.1	1	ND	U	***1***	1	1	ND	U	0.1	0.09	1	NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	0.012	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	1	1	1
Fluorene	86-73-7	1900	ug/L	ND	U	0.017	0.1	1	ND	U	1	1	1	0.1	J	0.1	0.09	1	ND	U	1	1	1
Naphthalene	91-20-3	100	ug/L	ND	U	0.036	0.1	1	ND	U	5	5	1	ND	U	0.1	0.09	1	ND	U	1	1	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	0.021	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	1	1	1
Pyrene	129-00-0	130	ug/L	ND	U	0.015	0.1	1	ND	U	1	1	1	ND	U	0.1	0.09	1	ND	U	1	1	1
Metals Dissolved																							
Lead	7439-92-1	5	ug/L	ND	U	1.7	3	1	**8.4**		3	3	1	ND	U	0.034	1	1	ND	U	0.08	0.08	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 6
Summary of Groundwater Analytical Results
AOI 2 Remedial Investigation Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Chemical Name	CAS No.	PADEP Non-Residential Used Aquifer TDS <2,500 mg/L Groundwater MSCs [1]	Sample ID	S-72D_04072011					S-72D_072310				
			Sample Date	4/7/2011					7/23/2010				
			Sample Matrix	WQ					WQ				
			Unit	Result	Q	MDL	RL	DF	Result	Q	MDL	RL	DF
Volatile Organic Compounds													
1,2,4-Trimethylbenzene	95-63-6	62	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	2	1
1,2-Dibromoethane (EDB)	106-93-4	0.05	ug/L	ND	U	0.01	0.0098	1	ND	U	0.01	0.029	1
1,2-Dichloroethane (EDC)	107-06-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1
1,3,5-Trimethylbenzene	108-67-8	1200	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	2	1
Benzene	71-43-2	5	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Ethylbenzene	100-41-4	700	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Isopropylbenzene (Cumene)	98-82-8	3500	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	2	1
Methyl Tertiary Butyl Ether	1634-04-4	20	ug/L	1		0.5	0.5	1	1		0.5	1	1
Toluene	108-88-3	1000	ug/L	ND	U	0.5	0.5	1	ND	U	0.5	1	1
Xylenes, Total (Dimethylbenzene)	1330-20-7	10000	ug/L	ND	U	0.5	0.5	1	1		0.5	1	1
Semi-Volatile Organic Compounds													
Anthracene	120-12-7	66	ug/L	NA					NA				
Benzo(A)Anthracene	56-55-3	4.9	ug/L	NA					NA				
Benzo(A)Pyrene	50-32-8	0.2	ug/L	NA					NA				
Benzo(B)Fluoranthene	205-99-2	1.2	ug/L	NA					NA				
Benzo(G,H,I)Perylene	191-24-2	0.26	ug/L	NA					NA				
Chrysene	218-01-9	1.9	ug/L	ND	U	1	1	1	ND	U	1	5	1
Fluorene	86-73-7	1900	ug/L	ND	U	1	1	1	ND	U	1	5	1
Naphthalene	91-20-3	100	ug/L	ND	U	1	1	1	ND	U	1	5	1
Phenanthrene	85-01-8	1100	ug/L	ND	U	1	1	1	ND	U	1	5	1
Pyrene	129-00-0	130	ug/L	ND	U	1	1	1	ND	U	1	5	1
Metals Dissolved													
Lead	7439-92-1	5	ug/L	ND	U	0.052	0.052	1	ND	U	0.05	1	1

Note:
CAS No. - Chemical Abstract Number
PADEP - Pennsylvania Department of Environmental Protection
TDS - Total Dissolved Solids
mg/L - milligrams per liter
MSC - Medium Specific Concentrations
ug/L - micrograms per liter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NA - Not analyzed
[1] PADEP Act 2 Groundwater MSC for a Non-Residential Used Aquifer TDS <2500 mg/l (last updated August 27, 2016).

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected between the MDL. Result should be considered an estimate.
B - Compound found in blank

Exceedances:
10 - Result exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l
15 - MDL exceeds PADEP Groundwater MSC for a Non-residential Used Aquifer TDS <2500 mg/l

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Main Office Bldg (safety office)					PB Main Office Bldg(medical area)					PB Main Office Bldg (1st floor lobby)				
									Sample	AOI2 SAMPLE 29					AOI2 SAMPLE 30					AOI2 SAMPLE 31				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	0.99		0.66	0.2	1.32	1.1		0.75	0.23	1.5	0.94		0.84	0.25	1.68
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***0.66***	***0.2***	1.32	ND	U	***0.75***	***0.23***	1.5	ND	U	***0.84***	***0.25***	1.68
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***0.66***	0.18	1.32	ND	U	***0.75***	0.21	1.5	ND	U	***0.84***	0.24	1.68
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	0.66	0.2	1.32	ND	U	0.75	0.23	1.5	ND	U	0.84	0.25	1.68
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.6		0.66	0.18	1.32	1.2		0.75	0.21	1.5	1.3		0.84	0.24	1.68
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	0.95		0.66	0.2	1.32	ND	U	0.75	0.23	1.5	ND	U	0.84	0.25	1.68
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.66	0.18	1.32	ND	U	0.75	0.21	1.5	ND	U	0.84	0.24	1.68
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.66	0.18	1.32	ND	U	0.75	0.21	1.5	ND	U	0.84	0.24	1.68
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***0.66***		1.32	ND	U	***0.75***		1.5	ND	U	***0.84***		1.68
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	6.5		0.66	0.18	1.32	4.4		0.75	0.21	1.5	4.8		0.84	0.24	1.68
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	4.4		0.66	0.21	1.32	3.17		0.75	0.24	1.5	3.41		1.7	0.49	1.68

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
NIOSH RELs - National Institute for Occupational Safety and Health Recommended Exposure Limits.
ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NS - No standard
NA - Not analyzed

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected below the reporting limit (the value given is an estimate).
Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Main Office Bldg(1st floor east wing)					PB Main Office Bldg (1st floor west wing)					PB Main Office Bldg, (2nd floor west wing)				
									Sample	AOI2 SAMPLE 32					AOI2 SAMPLE 33					AOI2 SAMPLE 34				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	0.98	0.29	1.96	0.97		0.65	0.2	1.3	1.1		0.77	0.23	1.53
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***0.98***	***0.29***	1.96	ND	U	***0.65***	***0.2***	1.3	ND	U	***0.77***	***0.23***	1.53
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***0.98***	0.27	1.96	ND	U	***0.65***	0.18	1.3	ND	U	***0.77***	0.21	1.53
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	0.98	0.29	1.96	ND	U	0.65	0.2	1.3	ND	U	0.77	0.23	1.53
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.3		0.98	0.27	1.96	1.4		0.65	0.18	1.3	1.3		0.77	0.21	1.53
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	0.98	0.29	1.96	0.93		0.65	0.2	1.3	0.89		0.77	0.23	1.53
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.98	0.27	1.96	ND	U	0.65	0.18	1.3	ND	U	0.77	0.21	1.53
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.98	0.27	1.96	ND	U	0.65	0.18	1.3	ND	U	0.77	0.21	1.53
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***0.98***		1.96	ND	U	***0.65***		1.3	1.2		***0.77***		1.53
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	5.2		0.98	0.27	1.96	5		0.65	0.18	1.3	4.9		0.77	0.21	1.53
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	2.5		2	0.57	1.96	4.6		1.3	0.38	1.3	4.6		1.5	0.44	1.53

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
NIOSH RELs - National Institute for Occupational Safety and Health Recommended Exposure Limits.
ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
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Qualifiers:
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Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
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AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Main Office Bldg, (2nd floor center file room)					PB Main Office Bldg (2nd floor east conference room)					PB Lab (west lab)				
									Sample	AOI2 SAMPLE 35					AOI2 SAMPLE 36					AOI2 SAMPLE 37				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	0.95		0.73	0.22	1.46	0.78		0.73	0.22	1.46	3.9		0.79	0.24	1.57
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***0.73***	***0.22***	1.46	ND	U	***0.73***	***0.22***	1.46	ND	U	***0.79***	***0.24***	1.57
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***0.73***	0.2	1.46	ND	U	***0.73***	0.2	1.46	ND	U	***0.79***	0.22	1.57
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	0.73	0.22	1.46	ND	U	0.73	0.22	1.46	1.4		0.79	0.24	1.57
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.2		0.73	0.2	1.46	0.94		0.73	0.2	1.46	11		0.79	0.22	1.57
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1		0.73	0.22	1.46	0.74		0.73	0.22	1.46	11		0.79	0.24	1.57
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.73	0.2	1.46	ND	U	0.73	0.2	1.46	1.3		0.79	0.22	1.57
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.73	0.2	1.46	ND	U	0.73	0.2	1.46	ND	U	0.79	0.22	1.57
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	0.75		***0.73***		1.46	1.5		***0.73***		1.46	ND	U	***0.79***		1.57
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	5.9		0.73	0.2	1.46	4		0.73	0.2	1.46	88		0.79	0.22	1.57
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	5.1		1.5	0.42	1.46	3.47		1.5	0.42	1.46	51.1		1.6	0.46	1.57

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
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ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
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Qualifiers:
U - Compound analyzed but not detected
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Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Lab (2nd floor office)					PB Refinery Hall (2nd floor conference room)					PB Refinery Hall (2nd floor east wing)				
									Sample	AOI2 SAMPLE 38					AOI2 SAMPLE 39					AOI2 SAMPLE 40				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	11		0.75	0.22	1.49	1.1		0.83	0.25	1.66	1.5		0.65	0.2	1.3
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***0.75***	***0.22***	1.49	ND	U	***0.83***	***0.25***	1.66	ND	U	***0.65***	***0.2***	1.3
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***0.75***	0.21	1.49	ND	U	***0.83***	0.23	1.66	ND	U	***0.65***	0.18	1.3
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	3.9		0.75	0.22	1.49	ND	U	0.83	0.25	1.66	ND	U	0.65	0.2	1.3
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	8.4		0.75	0.21	1.49	1.4		0.83	0.23	1.66	2		0.65	0.18	1.3
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	6		0.75	0.22	1.49	1.1		0.83	0.25	1.66	1.4		0.65	0.2	1.3
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	2.6		0.75	0.21	1.49	ND	U	0.83	0.23	1.66	ND	U	0.65	0.18	1.3
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.75	0.21	1.49	0.96		0.83	0.23	1.66	1.6		0.65	0.18	1.3
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	1.4		***0.75***		1.49	1.4		***0.83***		1.66	2.3		***0.65***		1.3
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	330		7.5	2.1	14.9	6.4		0.83	0.23	1.66	8.8		0.65	0.18	1.3
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	31.6		0.75	0.43	1.49	5.3		1.7	0.48	1.66	7.2		1.3	0.38	1.3

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
NIOSH RELs - National Institute for Occupational Safety and Health Recommended Exposure Limits.
ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NS - No standard
NA - Not analyzed

Qualifiers:
U - Compound analyzed but not detected
J - Compound detected below the reporting limit (the value given is an estimate).

Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Maintenance Shop (break room)					PB Maintenance Shop (office)					PB Bldgs (adjacent gate area)				
									Sample	AOI2 SAMPLE 41					AOI2 SAMPLE 42					AOI2 SAMPLE 43				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Ambient Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	3.1		0.79	0.24	1.57	2.5		0.7	0.21	1.4	0.93		0.81	0.24	1.62
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***0.79***	***0.24***	1.57	ND	U	***0.7***	***0.21***	1.4	ND	U	***0.81***	***0.24***	1.62
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***0.79***	0.22	1.57	ND	U	***0.7***	0.2	1.4	ND	U	***0.81***	0.23	1.62
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	1.1		0.79	0.24	1.57	0.87		0.7	0.21	1.4	ND	U	0.81	0.24	1.62
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.8		0.79	0.22	1.57	1.7		0.7	0.2	1.4	1.2		0.81	0.23	1.62
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1.3		0.79	0.24	1.57	1.1		0.7	0.21	1.4	ND	U	0.81	0.24	1.62
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.79	0.22	1.57	ND	U	0.7	0.2	1.4	ND	U	0.81	0.23	1.62
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.79	0.22	1.57	ND	U	0.7	0.2	1.4	ND	U	0.81	0.23	1.62
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***0.79***		1.57	ND	U	***0.7***		1.4	ND	U	***0.81***		1.62
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	9		0.79	0.22	1.57	8.2		0.7	0.2	1.4	10		0.81	0.23	1.62
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	7.1		1.6	0.46	1.57	6.3		1.4	0.41	1.4	3.79		1.6	0.47	1.62

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
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ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
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Qualifiers:
U - Compound analyzed but not detected
J - Compound detected below the reporting limit (the value given is an estimate).
Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Outdoor Near River					Bio Area					Bio Area, Bldg 6628				
									Sample	AOI2-AA-16-001					AOI2-AI-16-001					AOI2-AI-16-002				
									Date	3/22/2016					3/22/2016					3/22/2016				
									Collected By	GHD					GHD					GHD				
									Sample Matix	Ambient Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	***4.9***	0.98	1	ND	U	***4.9***	0.98	1	1.8	J	***4.9***	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***7.7***	***1.5***	1	ND	U	***7.7***	***1.5***	1	ND	U	***7.7***	***1.5***	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***4***	***0.81***	1	ND	U	***4***	***0.81***	1	ND	U	***4***	***0.81***	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	***4.9***	0.98	1	ND	U	***4.9***	0.98	1	ND	U	***4.9***	0.98	1
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.9	J	***3.2***	0.64	1	3.7		***3.2***	0.64	1	4.6		***3.2***	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1.5	J	4.3	0.87	1	ND	U	4.3	0.87	1	2.9	J	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***5.2***	***2.6***	1	ND	U	***5.2***	***2.6***	1	ND	U	***5.2***	***2.6***	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	1.3	J	3.8	0.75	1	3.9		3.8	0.75	1	8.9		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	6.7	J	4.3	0.87	1	1.9	J	4.3	0.87	1	11.5	J	4.3	0.87	1

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
NIOSH RELs - National Institute for Occupational Safety and Health Recommended Exposure Limits.
ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
Q - Qualifier
MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
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Qualifiers:
U - Compound analyzed but not detected
J - Compound detected below the reporting limit (the value given is an estimate).
Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Control Room, Kitchen, on Stove					Control Room					Control Room				
									Sample	AOI2-AI-16-003					AOI2-AI-16-004					AOI2-AI-16-005				
									Date	3/22/2016					3/22/2016					3/22/2016				
									Collected By	GHD					GHD					GHD				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	***4.9***	0.98	1	ND	U	***4.9***	0.98	1	6.6		***4.9***	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***7.7***	***1.5***	1	ND	U	***7.7***	***1.5***	1	ND	U	***7.7***	***1.5***	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***4***	***0.81***	1	ND	U	***4***	***0.81***	1	ND	U	***4***	***0.81***	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	***4.9***	0.98	1	ND	U	***4.9***	0.98	1	2.2	J	***4.9***	0.98	1
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	2.8	J	***3.2***	0.64	1	3.2		***3.2***	0.64	1	5.9		***3.2***	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	4.3	0.87	1	ND	U	4.3	0.87	1	1.3	J	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***5.2***	***2.6***	1	ND	U	***5.2***	***2.6***	1	3	J	***5.2***	***2.6***	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	2.6	J	3.8	0.75	1	3	J	3.8	0.75	1	4.4		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	3	J	4.3	0.87	1	3.07	J	4.3	0.87	1	6.9	J	4.3	0.87	1

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
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ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
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MDL - Method detection limit
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Qualifiers:
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Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

Table 7
Summary of Indoor Air Quality Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10^{-5} HQ = 0.1	EPA RSL Cancer Risk = 10^{-6} HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Short Pier Bldg 11				
									Sample	AOI2-AI-16-006				
									Date	3/22/2016				
									Collected By	GHD				
									Sample Matix	Indoor Air				
									Unit	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	26	26	125,000	123,000	ug/m3	1.2	J	***4.9***	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	***7.7***	***1.5***	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	4.7	0.47	4,000	40,500	ug/m3	ND	U	***4***	***0.81***	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	26	26	125,000	123,000	ug/m3	ND	U	***4.9***	0.98	1
Benzene	71-43-2	16	1.6	3,190	16	1.6	319	1,600	ug/m3	1.3	J	***3.2***	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	3.6	0.36	50,000	52,000	ug/m3	ND	U	***5.2***	***2.6***	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	4.3		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	3.9	J	4.3	0.87	1

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
HQ - Hazard Quotient
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ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
Q - Qualifier
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Qualifiers:
U - Compound analyzed but not detected
J - Compound detected below the reporting limit (the value given is an estimate).
Exceedances:
10 - Result exceeds PA VI
10 - Result exceeds 1/10th PA VI
10 - Result exceeds OSHA PEL TWA
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-5})
10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10^{-6})
10 - Result exceeds NIOSH REL
10 - Result exceeds ACGIH TLVs
15 - MDL or RL exceeds standard

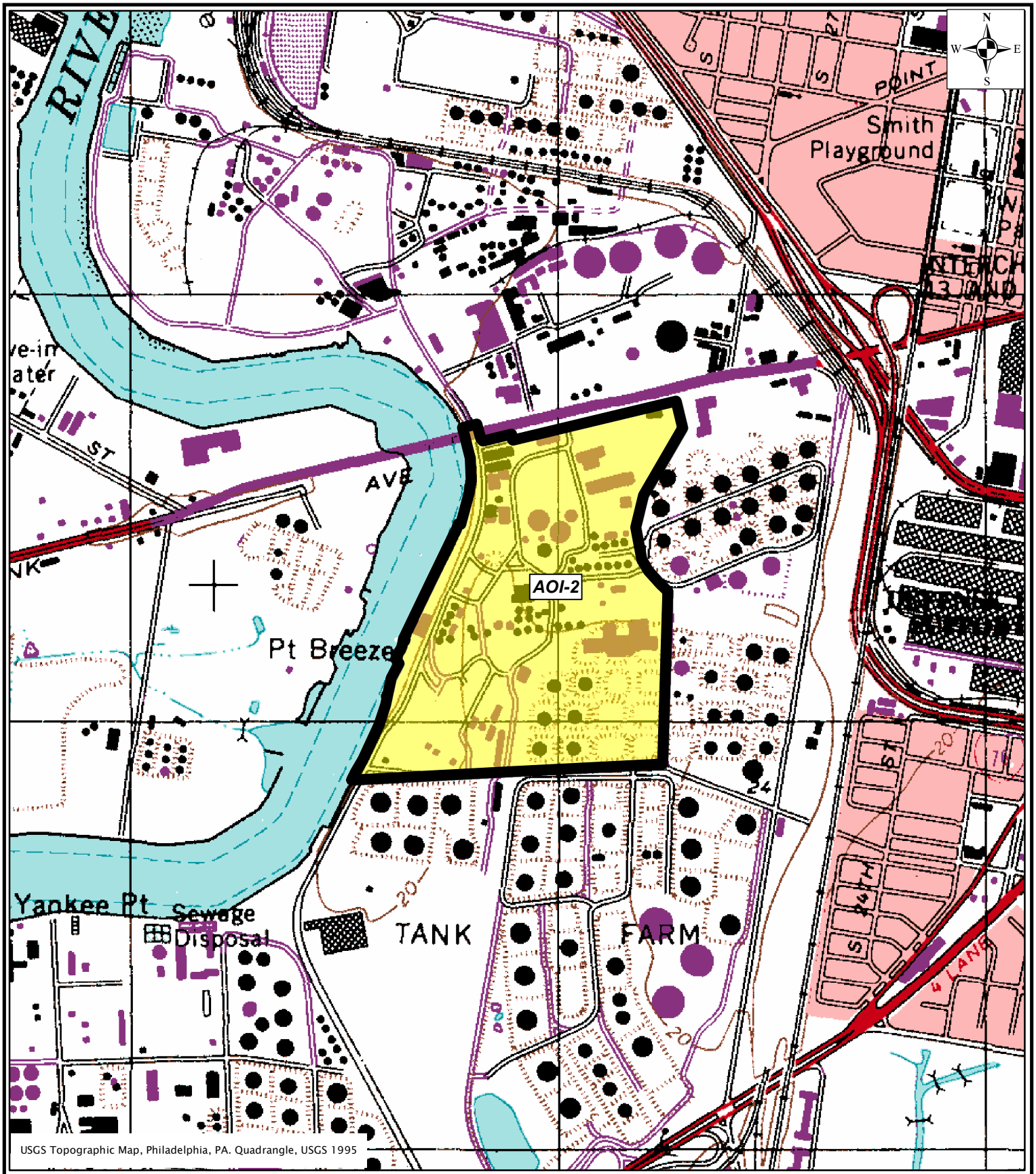
Table 8
Summary of Outdoor Worker Air Sample Analytical Results
AOI 2 Remedial Investigations Report
Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	NIOSH RELs	ACGIH TLVs	Sample	A012-AA-16-002				A012-AA-16-003				A012-AA-16-004				A012-AA-16-005				A012-AA-16-006			
				Date	7/29/2016				7/29/2016				7/29/2016				7/29/2016				7/29/2016			
				Collected By	Langan				Langan				Langan				Langan				Langan			
				Unit	Result	Q	MDL	RL	Result	Q	MDL	RL	Result	Q	MDL	RL	Result	Q	MDL	RL	Result	Q	MDL	RL
1,2,4-Trimethylbenzene	95-63-6	125,000	123,000	ug/m3	5.2		0.21	4.2	1.8	J	0.21	4.2	ND	U	0.21	4.2	2.5	J	0.22	4.4	5.5		0.21	4.2
1,2-Dibromoethane	106-93-4	346	NS	ug/m3	ND	U	1.3	2.6	ND	U	1.3	2.6	ND	U	1.3	2.6	ND	U	1.4	2.7	ND	U	1.3	2.6
1,2-Dichloroethane	107-06-2	4,000	40,500	ug/m3	ND	U	0.34	0.69	ND	U	0.34	0.69	ND	U	0.34	0.69	ND	U	0.36	0.72	ND	U	0.34	0.69
1,3,5-Trimethylbenzene	108-67-8	125,000	123,000	ug/m3	1.8	J	0.31	4.2	ND	U	0.31	4.2	ND	U	0.31	4.2	0.9	J	0.32	4.4	1.9	J	0.31	4.2
Benzene	71-43-2	319	1,600	ug/m3	0.81	J	0.2	1.1	2.6		0.2	1.1	0.92	J	0.2	1.1	3.7		0.21	1.1	8.0		0.2	1.1
Ethylbenzene	100-41-4	435,000	86,800	ug/m3	2.2	J	0.71	3.7	0.79	J	0.71	3.7	ND	U	0.71	3.7	ND	U	0.74	3.9	3.0	J	0.71	3.7
Isopropyl Benzene (Cumene)	98-82-8	245,000	246,000	ug/m3	ND	U	0.23	4.2	ND	U	0.23	4.2	ND	U	0.23	4.2	ND	U	0.24	4.4	ND	U	0.23	4.2
Methyl Tert-Butyl Ether	1634-04-4	NS	180,000	ug/m3	ND	U	0.51	6.2	ND	U	0.51	6.2	ND	U	0.51	6.2	ND	U	0.53	6.4	ND	U	0.51	6.2
Naphthalene	91-20-3	50,000	52,000	ug/m3	3.0	J	0.51	4.5	3.1	J	0.51	4.5	1.9	J	0.51	4.5	2.8	J	0.53	4.7	3.2	J	0.51	4.5
Toluene	108-88-3	375,000	75,400	ug/m3	2.8		0.26	1.3	3.3		0.26	1.3	1.9		0.26	1.3	6.1		0.27	1.3	28.6		0.26	1.3
Total Xylenes	1330-20-7	435,000	434,000	ug/m4	15.2		1.3	7.4	3.9	J	1.3	7.4	ND	U	1.3	7.4	6.3	J	1.4	7.7	17.1		1.3	7.4

Note:
CAS - Chemical Abstrct Number
ug/m3 - Micrograms per cubic meter
Q - Qualifier
MDL - Method detection limit
DF - Dilution factor
ND - Not detected
NS - No standard
NIOSH RELs - National Institute for Occupational Safety and Health Recommended Exposure Limits.
ACGIH TLVs - American Conference of Governmental Industrial Hygienists Threshold Limit Value.
NIOSH RELs and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.

Qualifiers:
U - Compound analyzed but not detected
J - Estimated Value. Result between method detection and reporting limits

FIGURES



EVERGREEN

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.

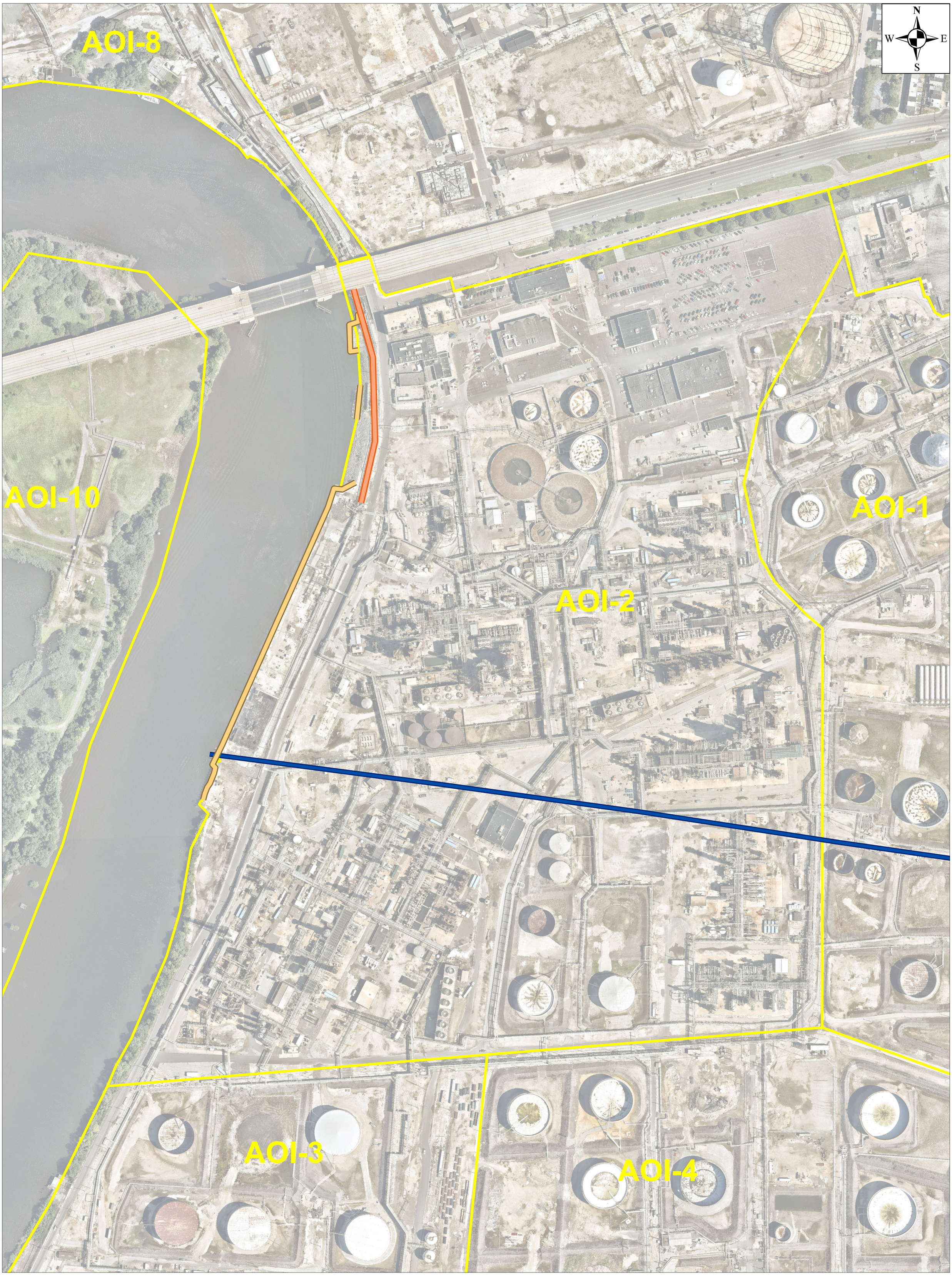
2 Righter Parkway, Suite 200
Wilmington, DE 19803

Figure 1: Site Location Map
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex

Philadelphia Pennsylvania

Job Number	Scale: 1" = 1,000'	Date
2574602	0 500 1,000 Feet	March 1, 2017

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 1 - Site Location Map.mxd



Legend

- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).

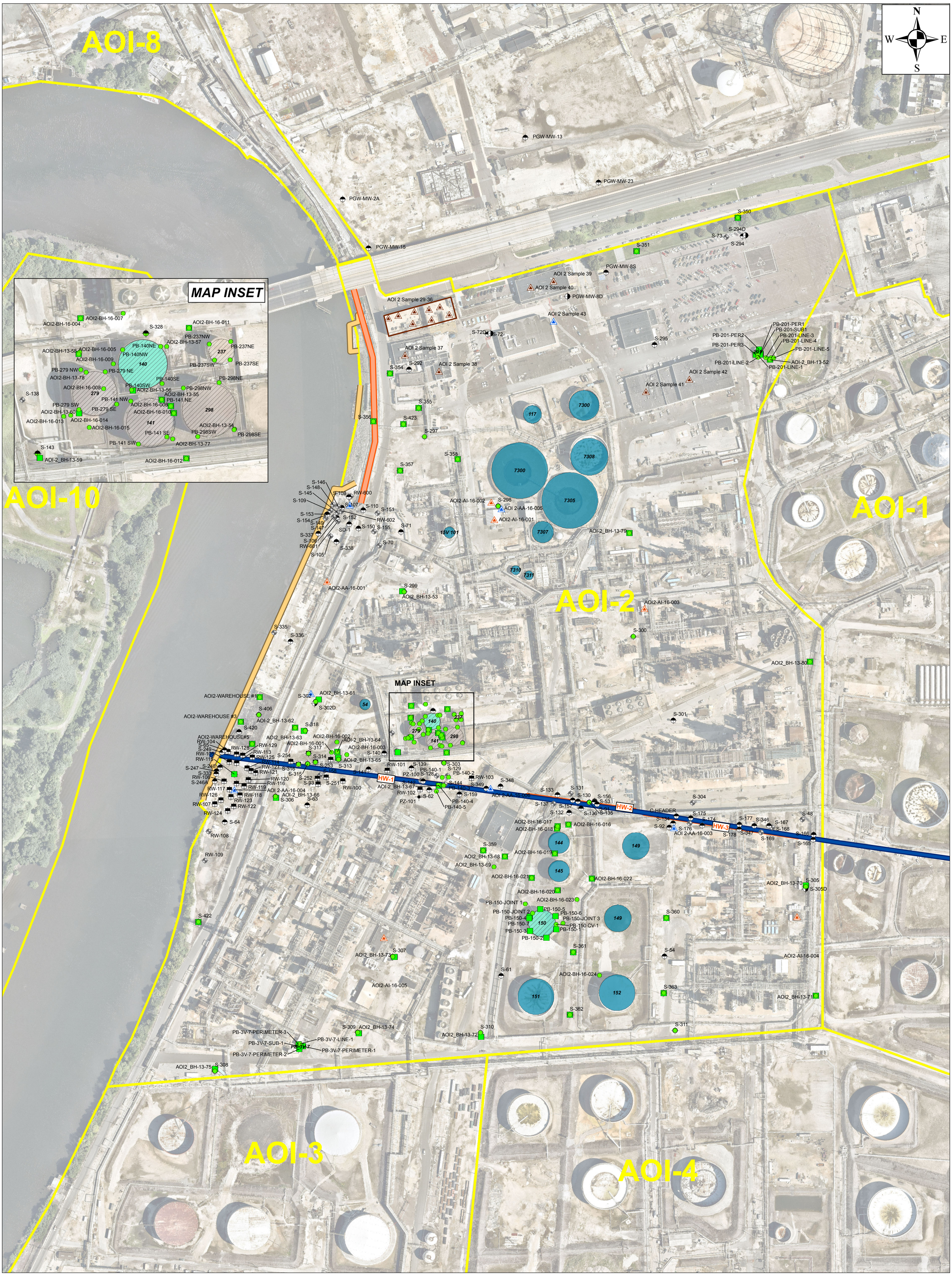
Figure 2: Site Plan
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 2 - Site Plan.mxd Date: 5/24/2017 User: MMking Time: 12:23:54 PM



Legend

- Surface Soil Boring Location
- Subsurface Soil Boring Location
- GHD Indoor Air Sample
- Stantec Indoor Air Sample
- Outdoor Worker Ambient Air Sample
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Horizontal Well
- AOI Boundary
- Tank Closed in Place
- Tank in Service
- Closed in Place Following Release

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).

Figure 3: Completed Activities
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 3 - Completed Activities.mxd Date: 7/12/2017 User: hnunn Time: 2:27:56 PM

N
W E
S

AOI-2

A
A'
B
B'

PGW-MW-13
PGW-MW-23
PGW-MW-2A
PGW-MW-15
PGW-MW-8S
PGW-MW-8D
S-350
S-294D
S-73
S-294
S-351
S-72D
S-72
S-295
S-354
S-292
S-355
S-423
S-297
S-357
S-146
S-148
S-145
S-109
S-108
RW-600
S-107
S-110
S-151
S-153
S-154
S-152
RW-602
S-149
S-147
SD-1
S-150
S-155
S-71
S-337
S-106
RW-601
S-105
S-338
S-70
S-298
S-299
S-335
S-336
S-300
S-302
S-302D
S-328
S-301
S-406
S-420
S-318
S-138
S-317
S-314
S-140
S-143
RW-104
S-65
S-249
RW-105
RW-115
RW-128
RW-129
RW-113
RW-125
RW-114
S-254
S-253
S-313
S-247
S-248
S-333
RW-106
S-246A
RW-127
S-316
RW-121
S-315
RW-120
RW-116
S-252
S-93
S-251
RW-100
RW-117
RW-119
RW-126
RW-118
RW-123
RW-107
RW-122
RW-124
S-64
RW-108
S-306
S-63
RW-101
S-139
S-303
S-129
PZ-100
S-128
S-144
S-142
RW-102
S-62
PZ-101
RW-103
S-348
S-349
S-159
HW-1
S-133
S-131
S-130
S-156
S-53
S-137
S-157
S-132
S-136
S-135
HW-2
S-304
C-HEADER
S-134
S-92
S-176
S-175
S-174
HW-3
S-177
S-346
S-167
S-48
S-178
S-347
S-168
S-169
S-166
S-165
S-359
S-305
S-305'
RW-109
S-422
S-360
S-361
S-54
S-307
S-61
S-363
S-362
S-309
S-310
S-311
S-308

Legend

- Monitoring Well in A-A' Cross Section
- Monitoring Well in B-B' Cross Section
- Monitoring Well in A-A' & B-B' Cross Section
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Horizontal Well
- A-A' Cross Section Location
- B-B' Cross Section Location
- AOI Boundary

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).

Figure 4: Geologic Cross Section Location Plan
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 4 - Geologic Cross Section Location Plan.mxd Date: 7/12/2017 User: hnunn Time: 2:28:35 PM

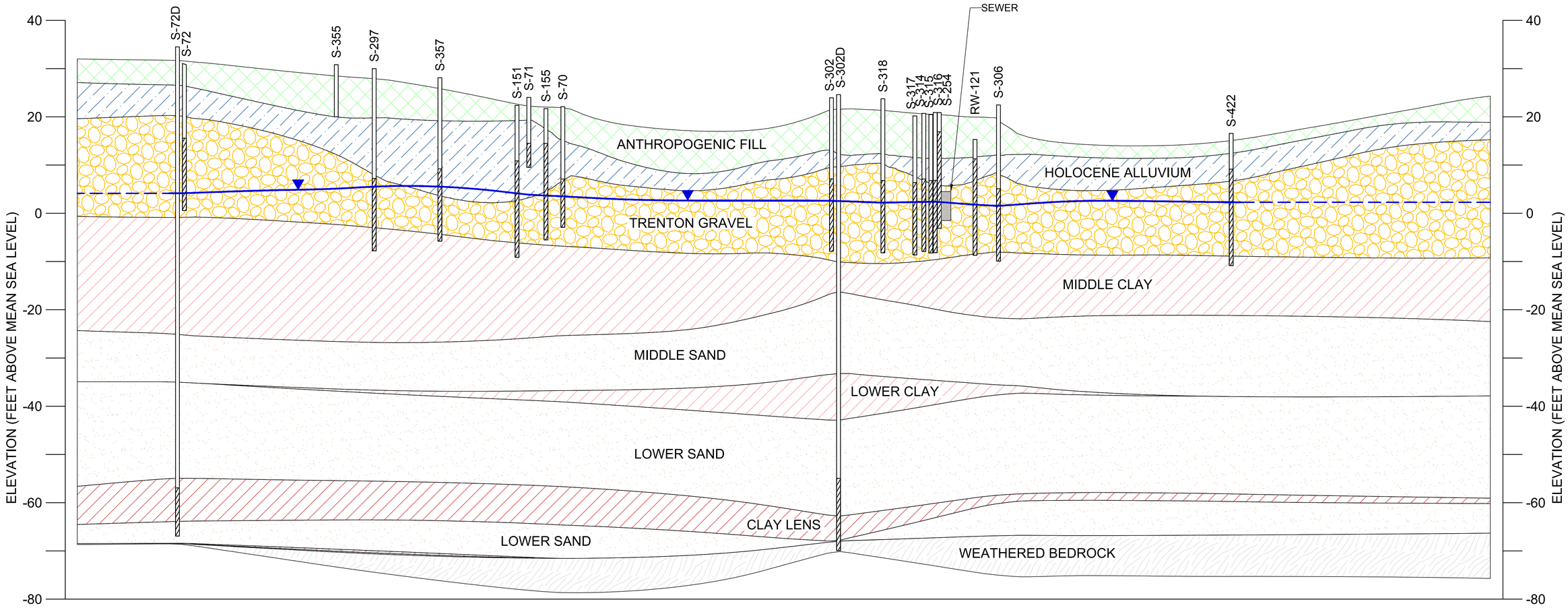
N — S

LEGEND:

- FILL
- HOLOCENE CLAY
- GRAVEL
- SAND
- CLAY
- CLAY LENS
- WEATHERED BEDROCK
- POLLOCK STREET SEWER
- UNCONFINED AQUIFER POTENTIOMETRIC SURFACE
- INFERRED UNCONFINED AQUIFER POTENTIOMETRIC SURFACE
- S-72D LOCATION ID
- WELL CASING
- WELL SCREEN

A

A'



NOTES:

1. GEOLOGIC CROSS-SECTION WAS CREATED FROM THE 3D GEOLOGIC MODEL OF AOI 2, WHICH WAS GENERATED IN EARTH VOLUMETRIC STUDIO (EVS) SOFTWARE.
2. THE UNCONFINED AQUIFER POTENTIOMETRIC SURFACE WAS INTERPOLATED IN EVS USING THE GROUNDWATER ELEVATION DATA COLLECTED DURING THE OCTOBER 2016 GAUGING EVENT BY AQUATERRA TECHNOLOGIES, INCORPORATED.

150 0 75 150
HORIZONTAL SCALE IN FEET

15 0 7.5 15
VERTICAL SCALE IN FEET

EVERGREEN

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

Project
AOI-2 REMEDIAL INVESTIGATION REPORT
PES PHILADELPHIA REFINING COMPLEX
PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title
GEOLOGIC CROSS SECTION A-A'

Project No.	Drawing No.
2574601	5
Date: 2/28/2017	
Scale: 1"=100' HOR. 1"=10' VER.	
Drawn By: MMK / Checked By: ED	
Submission Date: 2/28/2017	

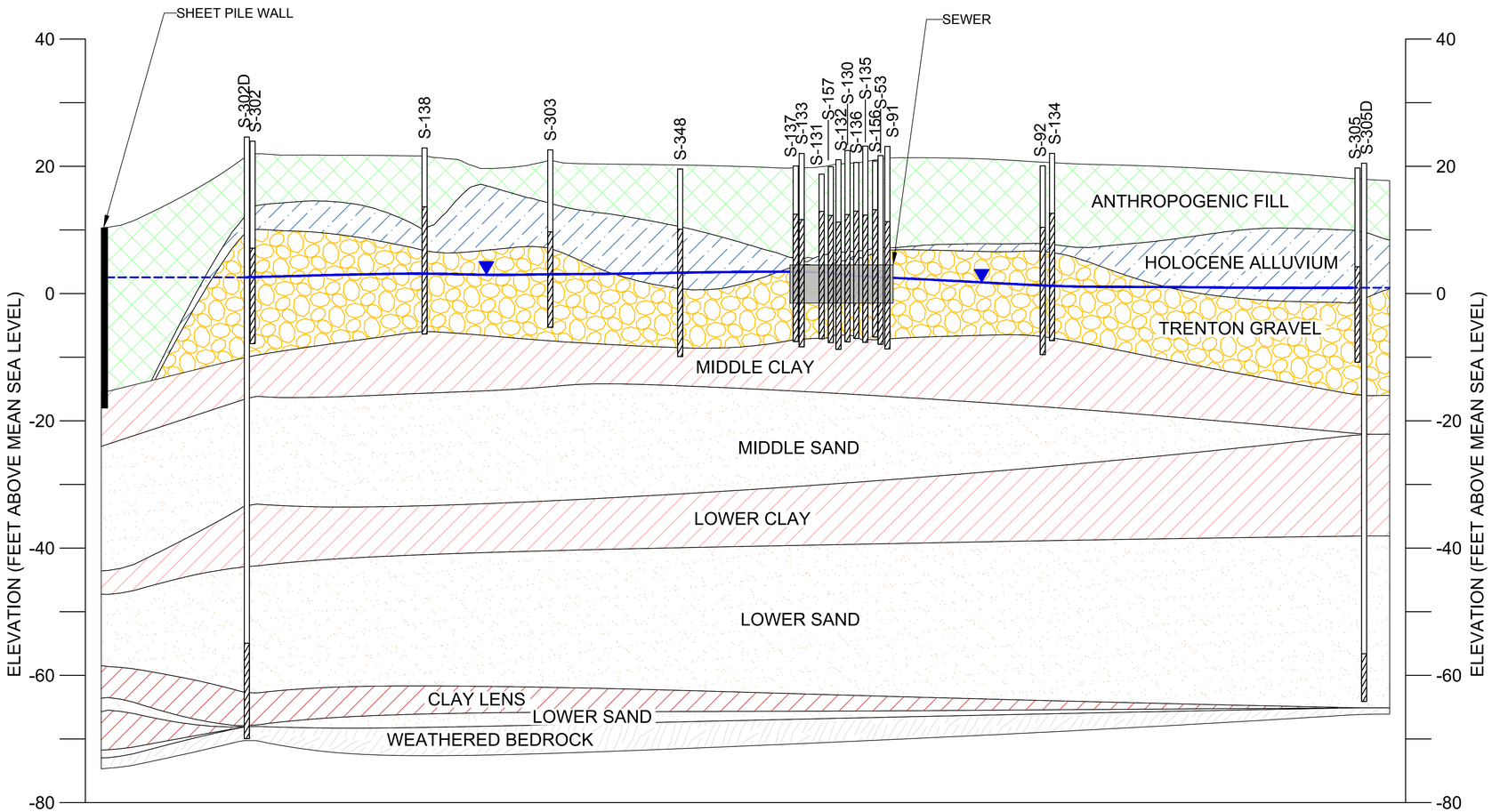
©2017 Langan

Filename: \\langan.com\data\DYL\data8\2574601\Cadd Data - 2574601\Dwg\AOI 2 RIR 2017\AOI3_RIR_Geologic_Cross_Section_031017.dwg Date: 3/10/2017 Time: 10:45 User: mhagan Style Table: Langan.stb Layout: A-A' RIR

W — E

B

B'



LEGEND:

- FILL
- HOLOCENE CLAY
- GRAVEL
- SAND
- CLAY
- CLAY LENS
- WEATHERED BEDROCK
- POLLOCK STREET SEWER
- UNCONFINED AQUIFER POTENTIOMETRIC SURFACE
- INFERRED UNCONFINED AQUIFER POTENTIOMETRIC SURFACE
- S-302D — LOCATION ID
- WELL CASING
- WELL SCREEN

NOTES:

1. GEOLOGIC CROSS-SECTION WAS CREATED FROM THE 3D GEOLOGIC MODEL OF AOI 2, WHICH WAS GENERATED IN EARTH VOLUMETRIC STUDIO (EVS) SOFTWARE.
2. THE UNCONFINED AQUIFER POTENTIOMETRIC SURFACE WAS INTERPOLATED IN EVS USING THE GROUNDWATER ELEVATION DATA COLLECTED DURING THE OCTOBER 2016 GAUGING EVENT BY AQUATERRA TECHNOLOGIES, INCORPORATED.

100 0 50 100
HORIZONTAL SCALE IN FEET

10 0 5 10
VERTICAL SCALE IN FEET

EVERGREEN

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

Project
AOI-2 REMEDIAL INVESTIGATION REPORT PES PHILADELPHIA REFINING COMPLEX
PHILADELPHIA COUNTY PENNSYLVANIA

Drawing Title
GEOLOGIC CROSS SECTION B-B'

Project No. 2574601	Drawing No. 6
Date 2/28/2017	
Scale 1"=100' HOR. 1"=10' VER.	
Drawn By MMK / Checked By ED	
Submission Date 2/28/2017	

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Filename: \\langan.com\data\DYL\data6\2574601\Cadd Data - 2574601\Dwg\AOI 2 RIR 2017\AOI3_RIR_Geologic_Cross_Section_031017.dwg Date: 3/10/2017 Time: 11:31 User: mhagan Style Table: Langan.stb Layout: B-B' RIR

N
W E
S

AOI-2

HW-1
HW-2
HW-3
C-HEADER
PZ-101
9.63
SD-1
11.62

Legend

- S-131 3.33 — Unconfined Aquifer Monitoring Well and Groundwater Elevation (ft. amsl)
- S-93 1.14 — Unconfined Aquifer Recovery Well and Groundwater Elevation (ft. amsl)
- PZ-101 9.63 — Unconfined Aquifer Piezometer and Groundwater Elevation (ft. amsl)
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Unconfined Aquifer Groundwater Contours (ft. amsl)
- Inferred Unconfined Aquifer Groundwater Contours (ft. amsl)
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Horizontal Well
- AOI Boundary
- SD-1 11.62 — Well Not Used in Contouring

Notes:
1. Aerial imagery provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. Groundwater elevations were obtained from the August 2016 gauging event performed by Aquaterra Technologies, Incorporated.
4. ft. amsl = feet above mean sea level

Figure 7: Groundwater Elevations (August 2016)
Unconfined Aquifer Wells
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 3, 2017
DRN. BY: HD
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 7 - Unconfined Aquifer Groundwater Elevation Contour Plan (August 2016).mxd Date: 7/17/2017 User: hnunn Time: 10:38:00 AM

N
W E
S

PGW-MW-13
9.57

PGW-MW-23
10.08

PGW-MW-2A
7.71

PGW-MW-15
7.86

S-350
4.43

S-294
4.67

S-294D

S-73

S-351
4.45

PGW-MW-8S

PGW-MW-8D

S-72D

S-72
4.41

S-295
9.21

S-354
3.53

S-292

S-355
3.89

S-423
5.07

S-297

S-357
5.49

S-107
RW-602
S-146
S-148
S-145
S-109
S-153
1.26
S-154
-0.38
S-108
4.20
RW-600
S-110
10.22
S-151
S-152
S-149
S-147
S-337
0.75
S-150
3.65
S-155
S-71
3.96
S-70
SD-1
11.70
S-338
S-106
RW-601
S-105
1.60

S-298
9.36

S-299
3.70

AOI-2

S-335
S-336
2.38

S-300
4.73

S-302
2.83
S-302D

S-328
3.50

S-301
3.77

S-406
2.75

RW-128
RW-104
S-65
RW-105
S-249
0.60
RW-115
S-248
1.07
S-247
1.16
S-333
1.33
S-246A
1.53
RW-106
RW-126
RW-107
S-420
2.91
RW-113
RW-129
RW-125
RW-114
RW-127
RW-121
RW-120
RW-116
RW-119
RW-117
RW-118
RW-123
RW-122
RW-124
S-64
3.70
RW-108
RW-109

S-318
2.35
S-316
5.37
S-317
2.61
S-254
2.56
S-315
S-252
2.07
S-93
2.09
S-306
1.68
S-63
1.98
S-253
2.85
S-314
2.60
S-313
2.90
S-158
S-251
2.16
RW-100
S-140
3.28
S-141
2.43
RW-101
S-139
2.45
PZ-100
-0.37
S-303
3.07
S-129
S-128
S-142
S-144
RW-103
S-348
S-349
RW-102
S-62
PZ-101
10.86
S-159
2.66

HW-1

S-131
3.62
S-133
S-130
S-156
S-53
3.91
S-135
S-157
S-137
3.41
S-136
2.80
S-132
2.85
HW-2
C-HEADER
S-304
9.28
S-175
S-134
1.36
S-176
S-92
S-174
9.13
HW-3
S-177
S-347
S-178
S-346
1.17
S-167
S-168
S-169
S-48
1.27
S-166
1.33
S-165
1.17
S-305
1.05
S-305D

S-359
3.04

S-360

S-361
2.24

S-54

S-363

S-362

S-311

S-422
2.42

S-307
2.25

S-61

S-309
1.74

S-310
7.13

S-308

Legend

- S-131 3.33 — Unconfined Aquifer Monitoring Well and Groundwater Elevation (ft. amsl)
- S-93 1.14 — Unconfined Aquifer Recovery Well and Groundwater Elevation (ft. amsl)
- PZ-101 9.63 — Unconfined Aquifer Piezometer and Groundwater Elevation (ft. amsl)
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Horizontal Well
- Unconfined Aquifer Groundwater Contours (ft. amsl)
- Inferred Unconfined Aquifer Groundwater Contours (ft. amsl)
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary
- SD-1 11.70 — Well Not Used in Contouring

Notes:
1. Aerial imagery provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. Groundwater elevations were obtained from the October 2016 gauging event performed by Aquaterra Technologies, Incorporated.
4. ft. amsl = feet above mean sea level
5. Philadelphia Gas Works (PGW) wells were gauged by Environmental Alliance, Inc. on October 26, 2016.

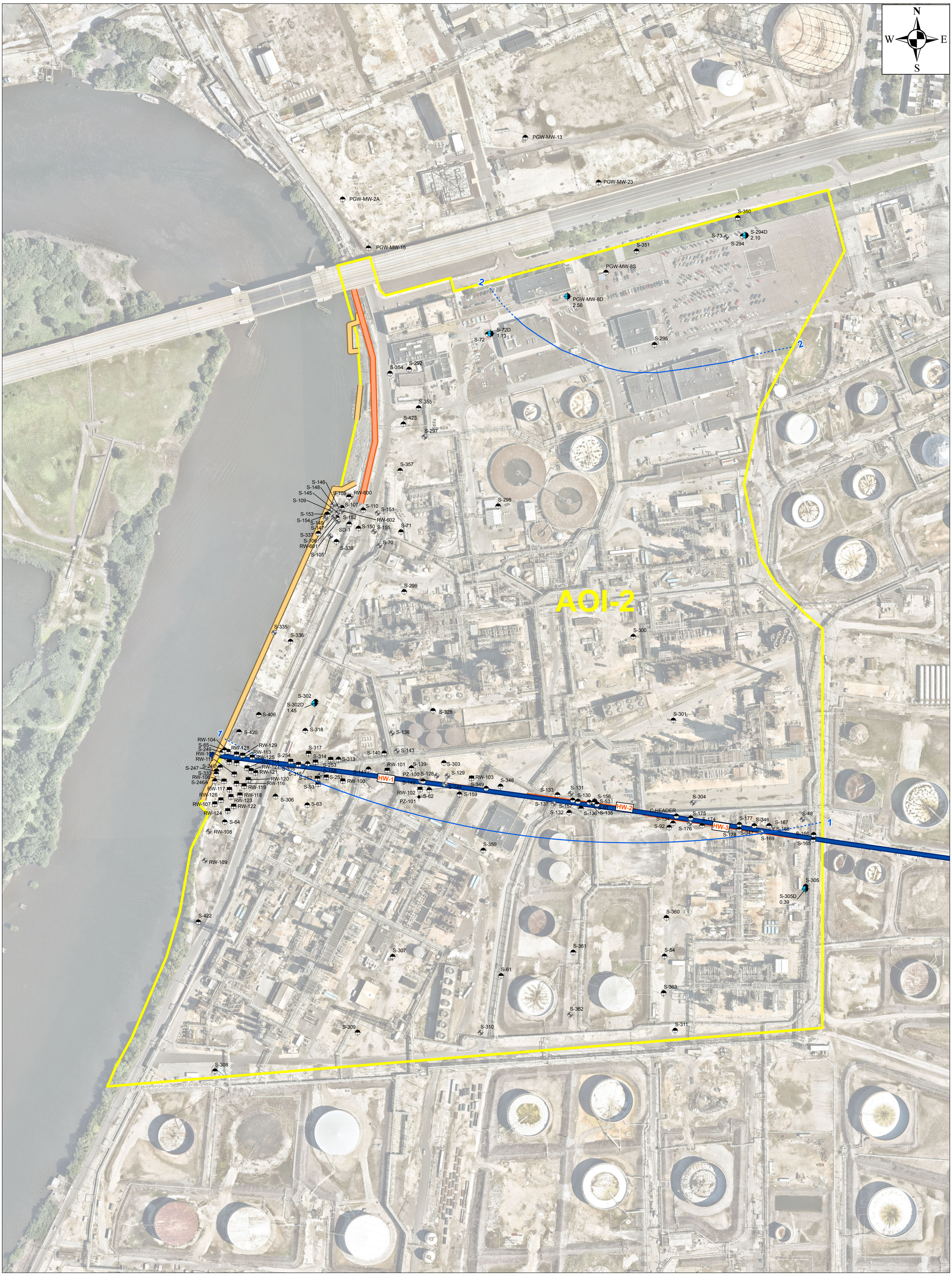
Figure 8: Groundwater Elevations (October 2016) Unconfined Aquifer Wells AOI-2 Remedial Investigation Report PES Philadelphia Refining Complex Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 3, 2017
DRN. BY: HD
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 8 - Unconfined Aquifer Groundwater Elevation Contour Plan (October 2016).mxd Date: 7/17/2017 User: hnunn Time: 10:37:24 AM



Legend

- S-294D 2.10 — Lower Aquifer Moniotring Well and Groundwater Elevation (ft. amsl)
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Horizontal Well
- Lower Aquifer Groundwater Contours (ft. amsl)
- Inferred Lower Aquifer Groundwater Contours (ft. amsl)
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary

Notes:
1. Aerial imagery provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. Groundwater elevations were obtained from the August 2016 gauging event performed by Aquaterra Technologies, Incorporated.
4. ft. amsl = feet above mean sea level

Figure 9: Groundwater Elevations (August 2016)
Lower Aquifer Wells
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 3, 2017
DRN. BY: HD
CKD. BY: ED
JOB#: 2574602

Path: \\Langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 9 - Lower Aquifer Groundwater Elevations (August 2016).mxd Date: 7/17/2017 User: hnunn Time: 10:47:00 AM

N
W E
S

AOI-2

PGW-MW-13
PGW-MW-23
PGW-MW-2A
PGW-MW-15
S-350
S-294D
2.42
S-294
S-73
S-351
PGW-MW-8S
PGW-MW-8D
2.52
S-72D
2.34
S-72
S-295
S-354
S-292
S-355
S-423
S-297
S-357
S-298
S-71
S-70
S-299
S-335
S-336
S-300
S-302
S-302D
-0.40
S-406
S-318
S-328
S-301
S-420
S-138
S-317
S-314
S-313
S-140
S-143
S-253
S-254
S-316
S-315
S-252
S-251
S-93
S-141
RW-100
RW-101
S-139
S-303
PZ-100
S-128
S-129
RW-103
S-348
S-142
S-349
S-159
RW-102
S-62
PZ-101
S-133
S-131
S-130
S-156
S-53
S-61
S-135
S-136
S-137
S-157
S-132
S-304
C-HEADER
S-134
S-92
S-176
S-175
S-174
S-177
S-346
S-167
S-48
S-178
S-347
S-168
S-166
S-169
S-165
S-305
S-305D
0.26
S-306
S-63
S-64
RW-108
RW-109
S-359
S-422
S-360
S-307
S-61
S-361
S-54
S-363
S-362
S-309
S-310
S-311
S-308
RW-104
S-65
S-249
RW-105
RW-115
S-247
S-248
S-333
RW-106
S-246A
RW-117
RW-126
RW-107
RW-124
RW-128
RW-129
RW-113
RW-125
RW-114
RW-127
RW-121
RW-120
RW-116
RW-119
RW-118
RW-123
RW-122
S-146
S-148
S-145
S-109
S-153
S-154
S-149
S-147
S-337
S-106
RW-601
S-105
S-108
RW-600
S-107
S-110
S-151
S-152
RW-602
S-150
S-155
SD-1
S-338
HW-1
HW-2
HW-3
0
1
2

Legend

- S-294D 2.42 — Lower Aquifer Moniotring Well and Groundwater Elevation (ft. amsl)
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Horizontal Well
- Lower Aquifer Groundwater Contours (ft. amsl)
- Inferred Lower Aquifer Groundwater Contours (ft. amsl)
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary

Notes:
1. Aerial imagery provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. Groundwater elevations were obtained from the October 2016 gauging event performed by Aquaterra Technologies, Incorporated.
4. ft. amsl = feet above mean sea level

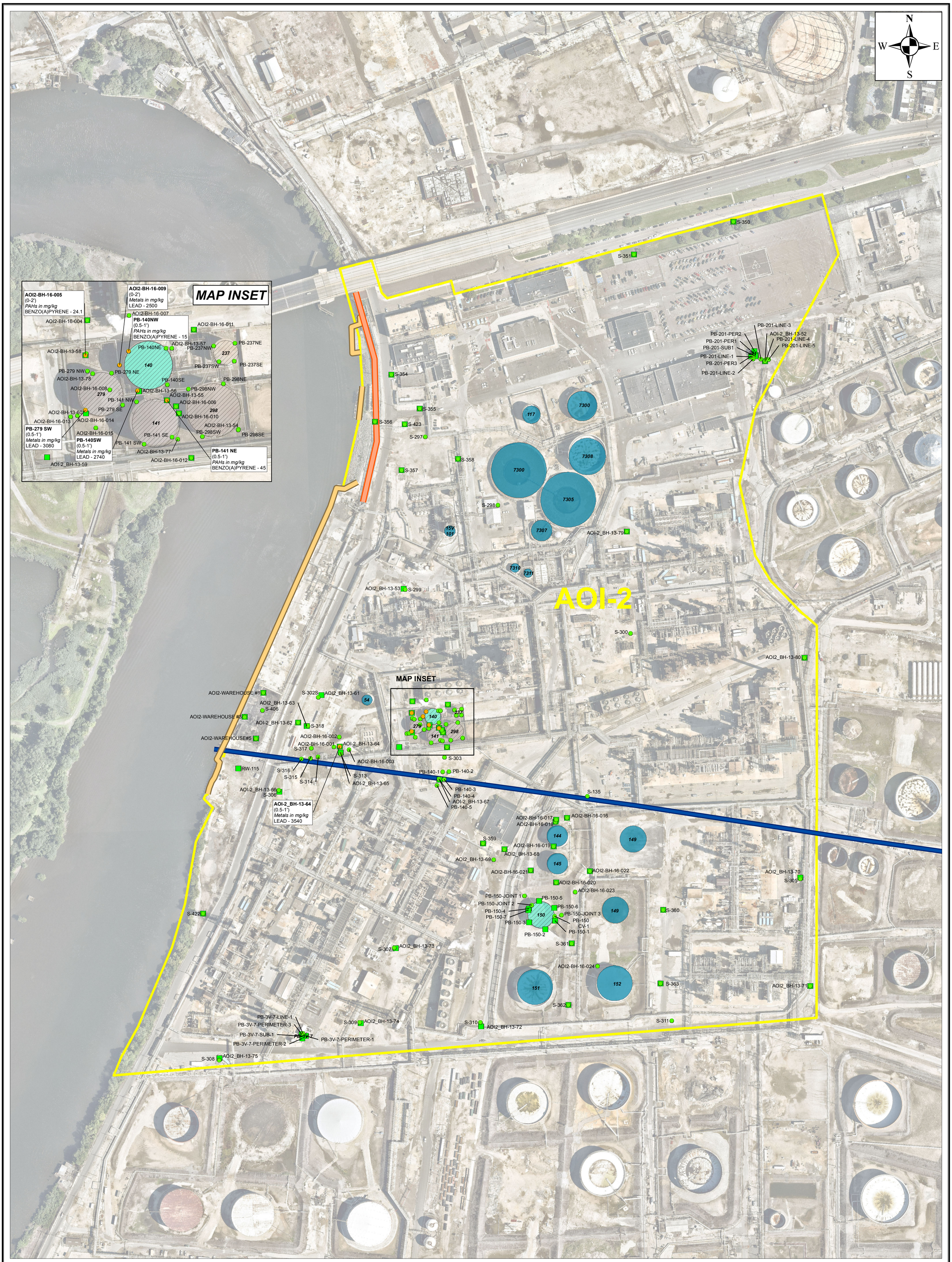
Figure 10: Groundwater Elevations (October 2016)
Lower Aquifer Wells
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 3, 2017
DRN. BY: HD
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 10 Lower Aquifer Groundwater Elevations (October 2016).mxd Date: 7/13/2017 User: hnunn Time: 10:04:41 AM



Legend

Exceedance, Depth

- Surface Soil Boring Location with Exceedance of Direct Contact MSCs or SSS for Lead
- Surface Soil Boring Location with No Exceedance of Direct Contact MSCs or SSS for Lead
- Subsurface Soil Boring Location with No Exceedance of Direct Contact MSCs
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Tank Closed in Place
- Tank in Service
- Closed in Place Following Release
- AOI Boundary

Site Specific Standards (SSS)
Lead - 2,240 mg/kg

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. All soil results are displayed in milligrams per kilogram (mg/kg).
4. MSCs = Medium Specific Concentration.

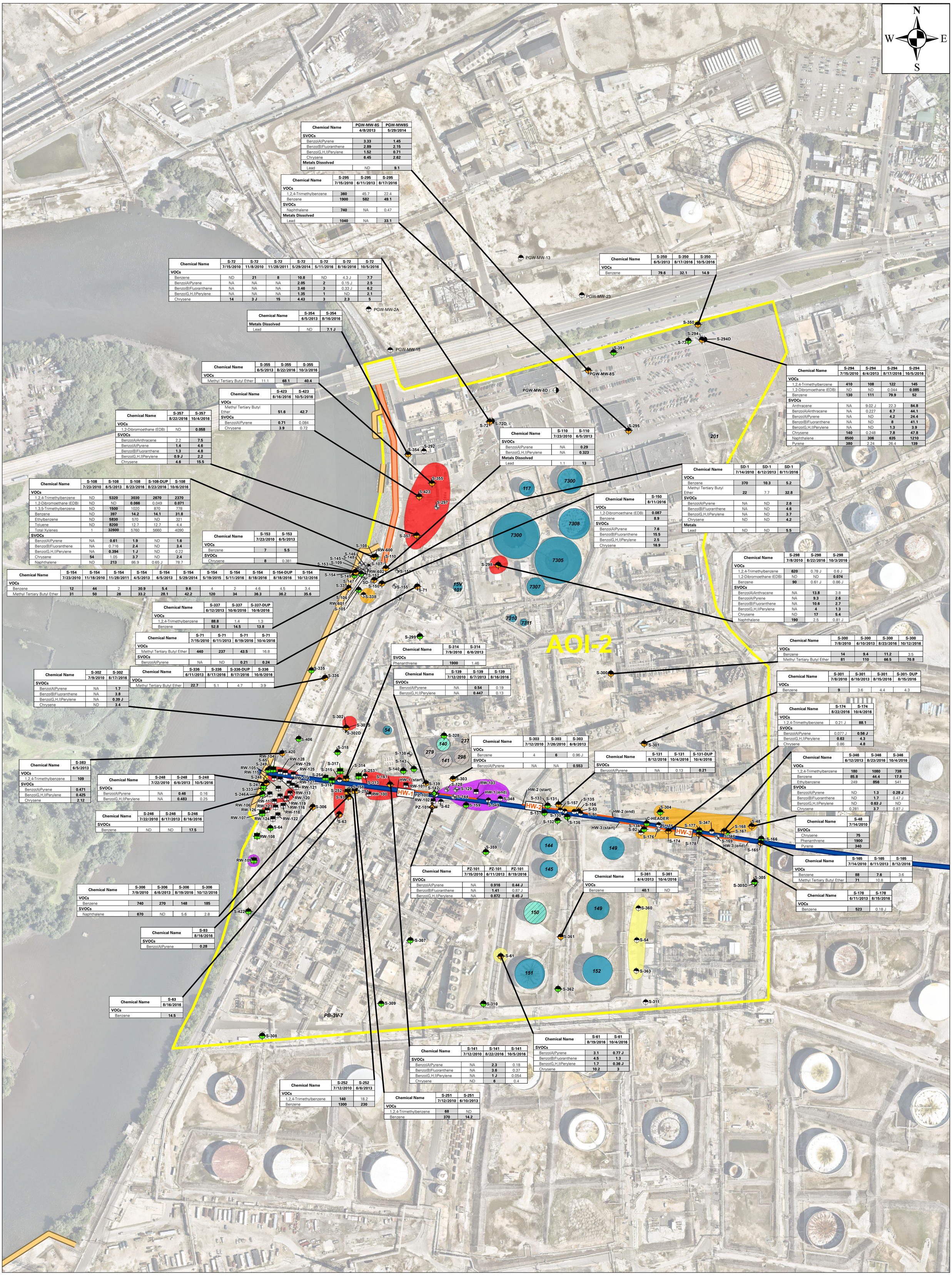
Figure 11: Summary of Soil Sample Exceedances
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 11 - Summary of Soil Sample Exceedances.mxd Date: 5/24/2017 User: MMking Time: 12:26:23 PM



Chemical Name	PGW-MW-8S	PGW-MW8S
	4/8/2013	5/29/2014
SVOCs		
Benzo(A)Pyrene	**3.33**	**1.45**
Benzo(B)Fluoranthene	**2.89**	**2.15**
Benzo(G,H,I)Perylene	**1.52**	**0.71**
Chrysene	**6.45**	**2.62**
Metals Dissolved		
Lead	ND	**9.1**

Chemical Name	S-295	S-295	S-295
	7/15/2010	6/11/2013	8/17/2016
VOCs			
1,2,4-Trimethylbenzene	**360**	45.7	22.4
Benzene	**1900**	**582**	**49.1**
SVOCs			
Naphthalene	**740**	NA	0.47
Metals Dissolved			
Lead	**1040**	NA	**33.1**

Chemical Name	S-72	S-72	S-72	S-72	S-72	S-72	S-72
	7/15/2010	11/8/2010	11/28/2011	5/29/2014	5/11/2016	8/16/2016	10/5/2016
VOCs							
Benzene	ND	**21**	**8**	**10.8**	ND	4.3 J	**7.7**
SVOCs							
Benzo(A)Pyrene	NA	NA	NA	**2.05**	**2**	0.15 J	**2.5**
Benzo(B)Fluoranthene	NA	NA	NA	**3.46**	**3**	0.33 J	**6.2**
Benzo(G,H,I)Perylene	NA	NA	NA	**1.35**	**1**	ND	**2.1**
Chrysene	**14**	**3 J**	**15**	**4.43**	**3**	**2.3**	**5**

Chemical Name	S-354	S-354
	6/5/2013	8/16/2016
Metals Dissolved		
Lead	ND	**7.1 J**

Chemical Name	S-355	S-355	S-355
	6/5/2013	8/22/2016	10/3/2016
VOCs			
Methyl Tertiary Butyl Ether	11.1	**68.1**	**40.4**

Chemical Name	S-423	S-423
	8/16/2016	10/5/2016
VOCs		
Methyl Tertiary Butyl Ether	**51.6**	**42.7**
SVOCs		
Benzo(A)Pyrene	**0.71**	0.084
Chrysene	**3.9**	0.72

Chemical Name	S-357	S-357
	8/22/2016	10/4/2016
VOCs		
1,2-Dibromoethane (EDB)	ND	**0.058**
SVOCs		
Benzo(A)Anthracene	2.2	**7.5**
Benzo(A)Pyrene	**1.4**	**4.6**
Benzo(B)Fluoranthene	**1.3**	**4.8**
Benzo(G,H,I)Perylene	**0.9 J**	**2.2**
Chrysene	**4.6**	**15.5**

Chemical Name	S-108	S-108	S-108	S-108-DUP	S-108
	7/23/2010	6/5/2013	8/23/2016	8/23/2016	10/6/2016
VOCs					
1,2,4-Trimethylbenzene	ND	**5320**	**3030**	**2670**	**2370**
1,2-Dibromoethane (EDB)	ND	ND	**0.066**	0.049	**0.071**
1,3,5-Trimethylbenzene	ND	**1500**	1020	870	778
Benzene	ND	**397**	**14.2**	**14.1**	**31.8**
Ethylbenzene	ND	**5830**	570	ND	321
Toluene	ND	**8200**	12.7	12.7	4.4
Total Xylenes	1	**32600**	5760	5660	4090
SVOCs					
Benzo(A)Pyrene	NA	**0.61**	**1.9**	ND	**1.6**
Benzo(B)Fluoranthene	NA	0.716	**2.4**	ND	**3.4**
Benzo(G,H,I)Perylene	NA	**0.394**	**1 J**	ND	0.22
Chrysene	**54**	1.05	**3.7**	ND	**2.4**
Naphthalene	ND	**213**	86.9	0.65 J	78.7

Chemical Name	S-153	S-153
	7/23/2010	6/5/2013
VOCs		
Benzene	**7**	**5.5**
SVOCs		
Chrysene	**8**	0.381

Chemical Name	S-154	S-154	S-154	S-154	S-154	S-154	S-154	S-154	S-154	S-154-DUP	S-154
	7/23/2010	11/18/2010	11/28/2011	4/5/2013	6/5/2013	5/29/2014	5/19/2015	5/11/2016	8/18/2016	8/18/2016	10/12/2016
VOCs											
Benzene	**12**	**44**	2	**30.9**	**5.4**	**9.6**	4	2	4.6	4.5	3.4
Methyl Tertiary Butyl Ether	**31**	**50**	**26**	**33.2**	**28.1**	**42.2**	**120**	**34**	**36.3**	**36.2**	**35.6**

Chemical Name	S-337	S-337	S-337-DUP
	6/12/2013	10/6/2016	10/6/2016
VOCs			
1,2,4-Trimethylbenzene	**88.8**	1.4	1.3
Benzene	**52.8**	**14.5**	**13.8**

Chemical Name	S-71	S-71	S-71	S-71
	7/15/2010	6/11/2013	8/19/2016	10/4/2016
VOCs				
Methyl Tertiary Butyl Ether	**440**	**237**	**43.5**	16.8
SVOCs				
Benzo(A)Pyrene	NA	ND	**0.21**	**0.24**

Chemical Name	S-336	S-336	S-336-DUP	S-336
	6/11/2013	8/17/2016	8/17/2016	10/6/2016
VOCs				
Methyl Tertiary Butyl Ether	**22.7**	5.1	4.7	3.9

Chemical Name	S-302	S-302
	7/9/2010	8/17/2016
SVOCs		
Benzo(A)Pyrene	NA	**1.7**
Benzo(B)Fluoranthene	NA	**3.8**
Benzo(G,H,I)Perylene	NA	**0.39 J**
Chrysene	ND	**3.4**

Chemical Name	S-314	S-314
	7/9/2010	6/6/2013
SVOCs		
Phenanthrene	**1900**	1.46

Chemical Name	S-139	S-139	S-139
	7/12/2010	6/7/2013	8/16/2016
SVOCs			
Benzo(A)Pyrene	NA	**0.54**	0.19
Benzo(G,H,I)Perylene	NA	**0.447**	0.13

Chemical Name	S-303	S-303	S-303
	7/12/2010	7/26/2010	6/6/2013
VOCs			
Benzene	4	**6**	0.96 J
SVOCs			
Benzo(A)Pyrene	NA	NA	**0.553**

Chemical Name	S-131	S-131	S-131-DUP
	8/12/2016	10/4/2016	10/4/2016
SVOCs			
Benzo(A)Pyrene	NA	0.13	**0.21**

Chemical Name	S-383
	6/5/2013
VOCs	
1,2,4-Trimethylbenzene	**109**
SVOCs	
Benzo(A)Pyrene	**0.471**
Benzo(B)Fluoranthene	**0.425**
Chrysene	**2.12**

Chemical Name	S-248	S-248	S-248
	7/22/2010	6/6/2013	10/5/2016
SVOCs			
Benzo(A)Pyrene	NA	**0.46**	0.16
Benzo(G,H,I)Perylene	NA	**0.483**	0.25

Chemical Name	S-246	S-246	S-246
	7/22/2010	6/17/2013	8/16/2016
SVOCs			
Benzene	ND	ND	**17.5**

Chemical Name	S-306	S-306	S-306	S-306
	7/9/2010	6/6/2013	8/19/2016	10/12/2016
VOCs				
Benzene	**740**	**270**	**148**	**185**
SVOCs				
Naphthalene	**670**	ND	5.6	2.8

Chemical Name	S-93
	8/16/2016
SVOCs	
Benzo(A)Pyrene	**0.28**

Chemical Name	S-63
	8/16/2016
VOCs	
Benzene	**14.5**

Chemical Name	S-110	S-110
	7/23/2010	6/5/2013
SVOCs		
Benzo(A)Pyrene	NA	**0.29**
Benzo(G,H,I)Perylene	NA	**0.323**
Metals Dissolved		
Lead	1.1	**13**

Chemical Name	S-150
	8/11/2016
VOCs	
1,2-Dibromoethane (EDB)	**0.087**
Benzene	**8.9**
SVOCs	
Benzo(A)Pyrene	**7.6**
Benzo(B)Fluoranthene	**15.5**
Benzo(G,H,I)Perylene	**2.5**
Chrysene	**16.9**

Chemical Name	PZ-101	PZ-101	PZ-101
	7/15/2010	6/11/2013	8/19/2016
SVOCs			
Benzo(A)Pyrene	NA	**0.916**	**0.44 J**
Benzo(B)Fluoranthene	NA	**1.41**	0.87 J
Benzo(G,H,I)Perylene	NA	**0.872**	**0.45 J**

Chemical Name	S-141	S-141	S-141
	7/12/2010	8/22/2016	10/5/2016
SVOCs			
Benzo(A)Pyrene	NA	**2.3**	0.18
Benzo(B)Fluoranthene	NA	**3.6**	0.37
Benzo(G,H,I)Perylene	NA	**1 J**	0.054
Chrysene	ND	**6**	0.4

Chemical Name	S-252	S-252
	7/12/2010	6/6/2013
VOCs		
1,2,4-Trimethylbenzene	**140**	18.2
Benzene	**1300**	**230**

Chemical Name	S-251	S-251
	7/12/2010	6/10/2013
VOCs		
1,2,4-Trimethylbenzene	**68**	ND
Benzene	**370**	**14.2**

Chemical Name	S-61	S-61
	8/19/2016	10/4/2016
SVOCs		
Benzo(A)Pyrene	**3.1**	**0.77 J**
Benzo(B)Fluoranthene	**4.5**	**1.3**
Benzo(G,H,I)Perylene	**1.7**	**0.36 J**
Chrysene	**10.2**	**3**

Chemical Name	S-361	S-361
	6/4/2013	10/4/2016
VOCs		
Benzene	**40.1**	ND

Chemical Name	S-350	S-350	S-350
	6/5/2013	8/17/2016	10/5/2016
VOCs			
Benzene	**79.6**	**32.1**	**14.9**

Chemical Name	S-294	S-294	S-294	S-294
	7/15/2010	6/4/2013	8/17/2016	10/5/2016
VOCs				
1,2,4-Trimethylbenzene	**410**	**108**	**122**	**145**
1,2-Dibromoethane (EDB)	ND	ND	0.044	**0.085**
Benzene	**130**	**111**	**79.9**	**52**
SVOCs				
Anthracene	NA	9.02 J	22.3	**84.8**
Benzo(A)Anthracene	NA	0.227	**6.7**	**44.1**
Benzo(A)Pyrene	NA	ND	**4.2**	**24.4**
Benzo(B)Fluoranthene	NA	ND	**8**	**41.1**
Benzo(G,H,I)Perylene	NA	ND	**1.3**	**3.9**
Chrysene	**140**	0.248	**7.8**	**47.8**
Naphthalene	**8500**	**306**	**635**	**1210**
Pyrene	**380**	2.24	26.4	**139**

Chemical Name	SD-1	SD-1	SD-1
	7/14/2010	6/12/2013	8/11/2016
VOCs			
Benzene	**370**	**10.3**	**5.2**
Methyl Tertiary Butyl Ether	**22**	7.7	**32.8**
SVOCs			
Benzo(A)Pyrene	NA	ND	**2.6**
Benzo(B)Fluoranthene	NA	ND	**4.6**
Benzo(G,H,I)Perylene	NA	ND	**3.7**
Chrysene	ND	ND	**4.2**
Metals			
Lead	ND	ND	**5.5**

Chemical Name	S-298	S-298	S-298
	7/8/2010	8/22/2016	10/3/2016
VOCs			
1,2,4-Trimethylbenzene	**620**	0.78 J	0.6 J
1,2-Dibromoethane (EDB)	ND	ND	**0.074**
Benzene	**90**	0.61 J	0.86 J
SVOCs			
Benzo(A)Anthracene	NA	**13.8**	3.8
Benzo(A)Pyrene	NA	**9.3**	**2.6**
Benzo(B)Fluoranthene	NA	**10.6**	**2.7**
Benzo(G,H,I)Perylene	NA	**4**	**1.3**
Chrysene	ND	**17**	**5.4**
Naphthalene	**190**	2.5	0.81 J

Chemical Name	S-300	S-300	S-300	S-300
	7/8/2010	6/10/2013	8/23/2016	10/12/2016
VOCs				
Benzene	**14**	**9.4**	**11.2**	3.5
Methyl Tertiary Butyl Ether	**81**	**110**	**66.5**	**70.8**

Chemical Name	S-301	S-301	S-301	S-301- DUP
	7/8/2010	6/10/2013	8/15/2016	8/15/2016
VOCs				
Benzene	**9**	3.6	4.4	4.3

Chemical Name	S-174	S-174
	8/22/2016	10/4/2016
VOCs		
1,2,4-Trimethylbenzene	0.21 J	**88.1**
SVOCs		
Benzo(A)Pyrene	0.077 J	**0.56 J**
Benzo(G,H,I)Perylene	**0.63**	**4.3**
Chrysene	0.86	**4.8**

Chemical Name	S-346	S-346	S-346
	6/12/2013	8/23/2016	10/4/2016
VOCs			
1,2,4-Trimethylbenzene	**180**	**1080**	**738**
Benzene	**85.8**	**44.4**	**17.8**
Ethylbenzene	249	**856**	541
SVOCs			
Benzo(A)Pyrene	ND	**1.3**	**0.28 J**
Benzo(B)Fluoranthene	ND	**1.7**	0.47 J
Benzo(G,H,I)Perylene	ND	**0.63 J**	ND
Chrysene	0.281	**3.7**	0.87 J

Chemical Name	S-48
	7/14/2010
SVOCs	
Chrysene	**75**
Phenanthrene	**1900**
Pyrene	**340**

Chemical Name	S-165	S-165	S-165
	7/14/2010	6/11/2013	8/12/2016
VOCs			
Benzene	**88**	**7.6**	3.6
Methyl Tertiary Butyl Ether	**71**	10.8	6

Chemical Name	S-178	S-178
	6/11/2013	8/15/2016
VOCs		
Benzene	**523**	0.18 J

Legend

- Unconfined Aquifer Piezometer Groundwater Sample with Exceedance between 2015 - 2016
- Unconfined Aquifer Recovery Well Groundwater Sample with Exceedance between 2015 - 2016
- Unconfined Aquifer Monitoring Well Groundwater Sample with Exceedance between 2015 - 2016
- Unconfined Aquifer Piezometer Groundwater Sample with No Exceedance between 2015 - 2016
- Unconfined Aquifer Recovery Well Groundwater Sample with No Exceedance between 2015 - 2016
- Unconfined Aquifer Monitoring Well Groundwater Sample with No Exceedance between 2015 - 2016
- Well Abandoned/Destroyed/Unable to
- Lower Aquifer Monitoring
- Unconfined Aquifer Monitoring
- Unconfined Aquifer Recovery
- Unconfined Aquifer Piezometer
- Horizontal Well
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary
- Tank Closed in Place
- Tank in Service
- Closed in Place Following Release

LNAPL Types

- Light Distillate
- Mixes of Light/Middle Distillate
- Middle Distillate
- Heavy Distillate

Notes:
1. Aerial imagery provided by Nearmap.com as is dated 07/29/15.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. LNAPL presence based on November 2016 groundwater gauging.
4. All groundwater results are displayed in micrograms per liter(µg/L).
5. S-383 was remanes to S-420.
6. S-246 was renamed to S-246A.

Figure 12A: Summary of Unconfined Aquifer Groundwater Sample Exceedances
AOI-2 Remedial Investigation Report
PES Philadelphia Refinery
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 90 180 360 Feet

SCALE: 1" = 180'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 12A - Summary of Unconfined Aquifer Groundwater Sample Exceedances.mxd Date: 7/12/2017 User: hnunn Time: 2:17:47 PM

Chemical Name	S-72D 7/23/2010	S-72D 4/7/2011	S-72D 6/28/2011	S-72D 5/29/2012	S-72D 8/17/2012	S-72D 10/25/2012	S-72D 3/27/2013	S-72D 8/23/2016	S-72D 10/6/2016
Metals Dissolved									
Lead	ND	ND	ND	ND	ND	**8.4**	ND	ND	ND

Chemical Name	S-294D 7/23/2010	S-294D 4/6/2011	S-294D 6/28/2011	S-294D 8/17/2012	S-294D 5/30/2012	S-294D 10/26/2012	S-294D 4/1/2013	S-294D 8/23/2016
VOCs								
1,2,4-Trimethylbenzene	15	ND	ND	ND	3	ND	**96**	ND
Benzene	ND	ND	ND	ND	ND	ND	**88.6**	ND
SVOCs								
Benzo(A)Pyrene	NA	NA	NA	0.1 J	NA	ND	**0.282**	ND
Naphthalene	**140**	ND	ND	0.4 J	48	20.6	**521**	ND

Chemical Name	S-302D 7/26/2010	S-302D 4/7/2011	S-302D 6/28/2011	S-302D 5/29/2012	S-302D 8/17/2012	S-302D 10/25/2012	S-302D 3/28/2013	S-302D 8/23/2016	S-302D 10/12/2016
Metals Dissolved									
Lead	ND	ND	ND	ND	ND	**5.6**	5	ND	ND

Chemical Name	S-305D 7/26/2010	S-305D 4/6/2011	S-305D 6/29/2011	S-305D 5/25/2012	S-305D 8/17/2012	S-305D 10/25/2012	S-305D 3/27/2013	S-305D 8/23/2016	S-305D 10/7/2016
Metals Dissolved									
Lead	ND	ND	ND	ND	ND	**7.4**	ND	ND	ND

AOI-2

PB-3V-7

Legend

- Lower Aquifer Monitoring Well Groundwater Sample with Exceedance between 2015 - 2016
- Lower Aquifer Monitoring Well Groundwater Sample with No Exceedance between 2015 - 2016
- Well Abandoned/Destroyed/Unable to
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer

- Horizontal Well
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Tank Closed in Place
- Tank in Service
- Closed in Place Following Release

LNAPL Types

- Light Distillate
- Mixes of Light/Middle Distillate
- Middle Distillate
- Heavy Distillate
- AOI Boundary

Notes:
1. Aerial imagery provided by Nearmap.com as is dated 07/29/15.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. LNAPL presence based on November 2016 groundwater gauging.
4. All groundwater results are displayed in micrograms per liter(µg/L).

Figure 12B: Summary of Lower Aquifer Groundwater Sample Exceedances AOI-2 Remedial Investigation Report PES Philadelphia Refinery Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 90 180 360 Feet

SCALE: 1" = 180'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 12B - Summary of Lower Aquifer Groundwater Sample Exceedances.mxd Date: 7/13/2017 User: hnunn Time: 10:31:27 AM

N
W E
S

AOI 2 Sample 39
AOI 2 Sample 40
AOI 2 Sample 29-36
AOI 2 Sample 43
AOI 2 Sample 37
AOI 2 Sample 38
AOI 2 Sample 42
AOI 2 Sample 41
AOI2-AA-16-002
AOI2-AI-16-002
AOI2-AA-16-005
AOI2-AI-16-001
AOI2-AI-16-006
AOI2-AA-16-001
AOI2-AA-16-004
AOI2-AA-16-006
AOI2-AA-16-003
AOI2-AI-16-003
AOI2-AI-16-004
AOI2-AI-16-005

Point Breeze Refinery Hall (5917)
Point Breeze Main Office Bldg (4210)
Point Breeze Lab (3316)
Point Breeze Maintenance Shop with Offices (2448)
New Block House(6628)
Bio/BFW Unit (5920)
Short Pier (11)
HDS #864 Blockhouse (2435)
869/870 Block House (6624)
Old Control Room (2520) 859/860-862

AOI-2

HW-1
HW-2
HW-3

Legend

- Sampled Occupied Buildings
- GHD Indoor Air Sample
- Stantec Indoor Air Sample
- Ambient or Outdoor Worker Air Sample
- Horizontal Well
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- AOI Boundary

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).

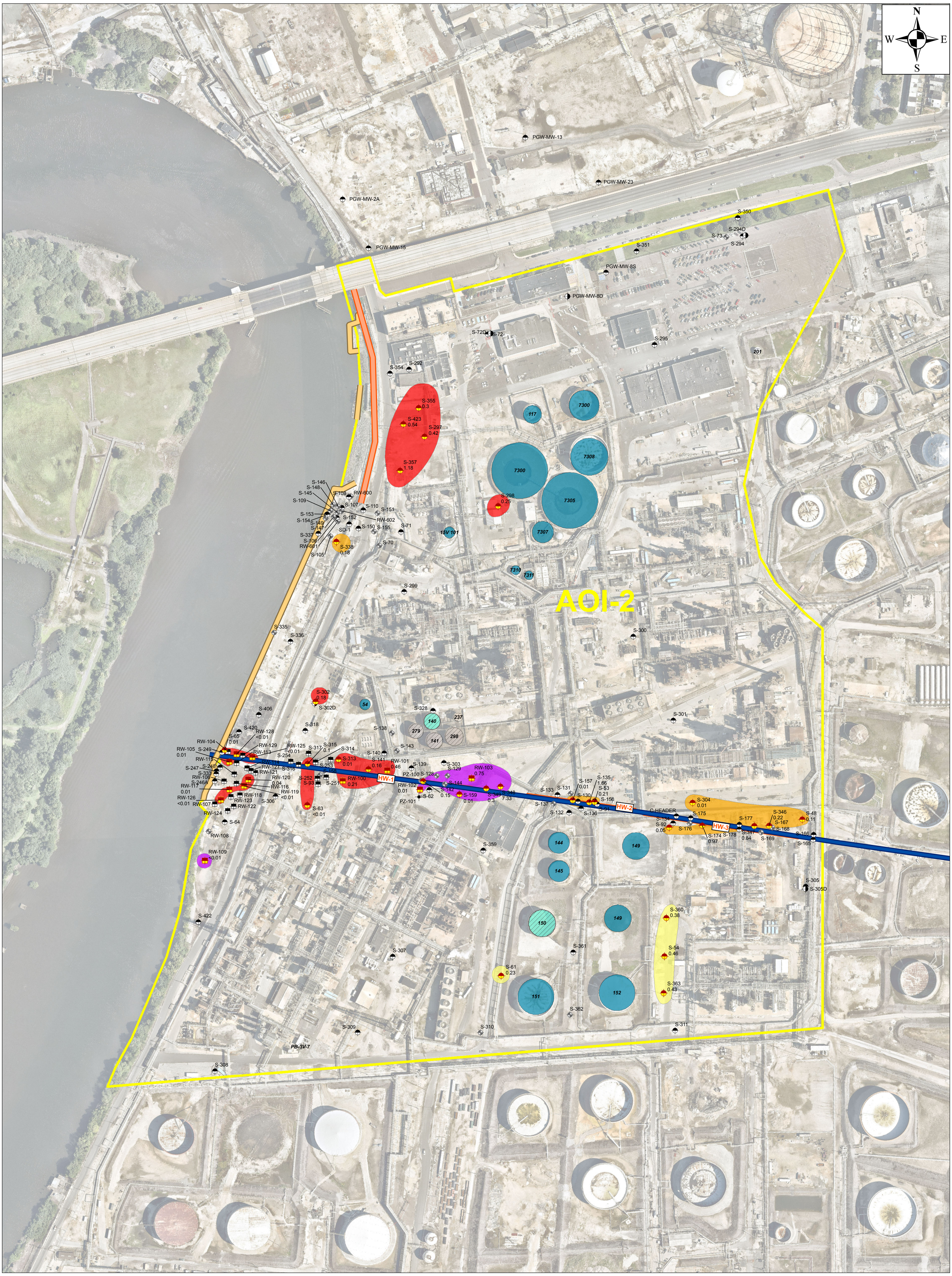
Figure 13: Summary of Indoor Air and Outdoor Worker Ambient Air Sample Locations
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\Langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 13 - Summary of Indoor Air and Outdoor Worker Ambient Air Sample Locations.mxd Date: 7/14/2017 User: acostello Time: 1:10:11 PM



Legend

- Unconfined Aquifer Monitoring Well with Apparent LNAPL Thickness (feet) (S-141 0.16)
- Unconfined Aquifer Recovery Well with Apparent LNAPL Thickness (feet)
- Well Abandoned/Destroyed/Unable to Locate
- Lower Aquifer Monitoring Well
- Unconfined Aquifer Monitoring Well
- Unconfined Aquifer Recovery Well
- Unconfined Aquifer Piezometer
- Vertical Wall
- Bulkhead
- Pollock Street Sewer
- Horizontal Well
- Tank Closed in Place
- Tank in Service
- Closed in Place Following Release

LNAPL Types

- Light Distillate
- Mixes of Light/Middle Distillate
- Middle Distillate
- Heavy Distillate
- AOI Boundary

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).
3. LNAPL presence based on November 2016 groundwater gauging.
4. LNAPL = Light Non-Aqueous Plase Liquid.

Figure 14: Apparent LNAPL Thickness and Type
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania

Philadelphia Refinery Operations
A Series of Evergreen Resources Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: March 1, 2017
DRN. BY: MMK
CKD. BY: ED
JOB#: 2574602

Path: \\langan.com\data\DYL\data6\2574601\ArcGIS\MapDocuments\AOI 2 RIR 2016\Figure 14 - Apparent LNAPL Thickness and Type.mxd Date: 7/12/2017 User: hnunn Time: 2:19:40 PM