# Remedial Investigation Report

AOI 6
Girard Point Refinery
3144 Passyunk Avenue
Philadelphia Energy Solutions Complex
Philadelphia, Pennsylvania

PADEP PF ID: 769099
EPA ID: PAD 049791098

Colleen Costello, PG.
Pennsylvania Licensed Geologist No. PG-003736-G

**GHD** | 1140 Welsh Road Suite 120 North Wales Pennsylvania 19454

11109613 | 10 | Report No 2 | November 21, 2017

# Table of Contents


1. Introduction ..... 1

1.1 Facility Description ..... 1

1.2 Facility Operational History and Current Use ..... 1

1.3 Regulatory History/Overview ..... 3

1.4 Selection of Constituents of Concern ..... 5

1.5 Selection of Applicable Standards and Screening Levels ..... 6

1.5.1 Soil ..... 6
1.5.2 Groundwater ..... 7
1.5.3 Potential Vapor Intrusion into Indoor Air ..... 7

2. Environmental Setting ..... 7

2.1 Hydrology and Topography ..... 8

2.1.1 Historical Topography and Natural Depositional Environments ..... 8
2.1.2 Post-Industrialization ..... 9

2.2 Regional Geology and Hydrogeologic Conditions ..... 9

2.2.1 Coastal Plain Deposits ..... 9
2.2.1.1 Anthropogenic Fill ..... 9
2.2.1.2 Quaternary Deposits ..... 10
2.2.1.2.1 Recent (Holocene) Alluvium ..... 10
2.2.1.2.2 Pleistocene Alluvium ("Trenton Gravel") ..... 11
2.2.1.3 Cretaceous Deposits ..... 12
2.2.1.3.1 Upper Clay Unit ..... 13
2.2.1.3.2 Upper Sand Unit ..... 13
2.2.1.3.3 Middle Clay Unit ..... 13
2.2.1.3.4 Middle Sand Unit ..... 14
2.2.1.3.5 Lower Clay Unit ..... 14
2.2.1.3.6 Lower Sand Unit ..... 15
2.2.2 Bedrock ..... 16

3. Soil Investigation ..... 16

3.1 Summary of Previous Soil Analytical Results ..... 17

3.2 Historic Product Handling/Storage Areas ..... 18

3.3 Open Storage Tank Incidents ..... 18

3.3.1 GP T81 (Former PADEP Tank 121A, Incident 45692) ..... 19
3.3.2 GP 676 (Former Tank GPU 676, PADEP Tank 130A, Incident 4844) ..... 19
3.3.3 GP 797 (Former PADEP Tank 097A, Incident 29122) ..... 19

3.4 Historic Releases ..... 20

3.4.1 ‘Area West of’ GP 676, or ‘2000 Surface Release’ ..... 20
3.4.2 1733 Unit ..... 21
3.4.3 Transfer Line Located Northeast of No. 4 Boiler House ..... 21
3.4.4 1332 Line ..... 21
3.4.5 Main Office ..... 21

# Table of Contents


3.5 Delineation of Direct Contact MSC/SSS Exceedances ..... 22

3.6 Site Characterization in the 0-2 ft. bgs interval, 2-15 ft bgs Interval and Beneath LNAPL22

4. Groundwater Investigation ..... 23

4.1 Historic Groundwater Investigations ..... 23

4.2 Well Installation Activities ..... 23

4.3 Groundwater Sampling Events ..... 24

4.4 Well Gauging Activities ..... 25

5. Site-Specific Hydrogeologic Conditions ..... 25

5.1 Geologic Formations and Units Observed ..... 26

5.1.1 Anthropogenic Fill ..... 26
5.1.2 Recent (Holocene) Alluvium ..... 26
5.1.3 Trenton "Gravel" ..... 26
5.1.4 Upper Clay Unit/Upper Sand Unit/Middle Clay/Middle Sand/Lower Clay ..... 26
5.1.5 Lower Sand Unit ..... 27
5.1.6 Crystalline Bedrock ..... 27

5.2 Aquifer Hydraulic Properties ..... 27

5.2.1 Methodology for Evaluation of Hydraulic Data ..... 27
5.2.2 Unconfined (Water-Table) Aquifer ..... 27
5.2.2.1 Hydraulic Heads and Groundwater Flow ..... 28
5.2.3 Semi-confined (Lower) Aquifer ..... 28

6. LNAPL Investigation ..... 29

6.1 LNAPL Characterization Sampling ..... 29

6.2 LNAPL Distribution ..... 30

7. Vapor Investigation ..... 30

7.1 Indoor Air Sampling ..... 30

7.2 Air Sampling over LNAPL Plumes ..... 32

8. Quality Assurance/Quality Control ..... 32

8.1 Equipment Decontamination ..... 33

8.2 Equipment Calibration ..... 33

8.3 Sample Preservation ..... 33

8.4 Documentation ..... 33

9. Conceptual Site Model ..... 33

9.1 Description and Site Use ..... 33

9.2 Geology and Hydrogeology ..... 34

9.2.1 Geologic Framework ..... 34
9.2.2 Unconfined (Water-Table) Aquifer ..... 34
9.2.3 Lower Aquifer (Semi-Confined) ..... 35

# Table of Contents


9.3 Compounds of Concerns ..... 35
9.3.1 Soil ..... 35
9.3.2 Groundwater ..... 35
9.3.3 Indoor/Ambient Air ..... 36
9.4 LNAPL Distribution and Mobility ..... 36
9.5 Qualitative Fate and Transport of Selected Compounds ..... 36
9.6 Potential Migration Pathways and Site Receptors ..... 37
10. Qualitative Fate and Transport Assessment ..... 37
10.1 Geologic Framework ..... 38
10.2 Hydrogeology ..... 38
10.2.1 Unconfined (Water-Table) Aquifer ..... 38
10.2.2 Lower Aquifer (Semi-Confined) ..... 38
10.3 Hydrogeology and Topography ..... 39
10.4 Anthropogenic Features ..... 39
10.4.1 Historic Fill ..... 39
10.4.2 Former Remediation Systems ..... 40
10.5 Groundwater Constituents of Concern ..... 40
10.5.1 Unconfined (Water Table) Aquifer ..... 40
10.5.2 Lower Aquifer ..... 40
10.6 Potential Onsite and Offsite Receptors ..... 40
10.7 Plans for Quantitative Fate and Transport Analysis ..... 41
11. Ecological Assessment ..... 41
12. Community Relations Activities ..... 42
13. Conclusions and Recommendations ..... 42
13.1 Soil ..... 42
13.2 Groundwater ..... 43
13.2.1 Unconfined (Water-Table) Aquifer ..... 43
13.2.2 Lower Aquifer ..... 43
13.3 Vapor Intrusion ..... 43
13.4 LNAPL ..... 43
14. References ..... 43

# Figure Index


| | |
|---|---|
| Figure 1 | Site Location Map |
| Figure 2 | AOI 6 Site Plan |
| Figure 3 | Historic Stream and Marsh Locations (Circa 1898) |
| Figure 4 | Geographic Setting |
| Figure 5 | High Resolution Land Cover Dataset (2008) – City of Philadelphia |
| Figure 6 | Generalized Bedrock Geologic Map |
| Figure 7 | Stratigraphic Profile Location Map |
| Figure 8 | Stratigraphic Profile |
| Figure 9 | Summary of Available Aquifer Testing Data for the Unconfined Aquifer |
| Figure 10 | Summary of Published Aquifer Testing Data for the Unconfined and Lower Aquifers |
| Figure 11 | Bedrock Structure Contour Map – Top of Bedrock |
| Figure 12a | Surface Soil Sample Results |
| Figure 12b | Sub-surface Soil Sample Results |
| Figure 13 | Stantec Water Table Aquifer Groundwater Elevation Map - May 2016 |
| Figure 14 | Water Table Groundwater Elevations May 2016 |
| Figure 15 | Stantec Deep Groundwater Elevation Map, May 2016 |
| Figure 16 | LNAPL Occurrence and Remedial Systems, May 2016 |
| Figure 17 | LNAPL Occurrence, September 2016 |
| Figure 18 | Indoor Air and Ambient Air Sampling Locations, AOI 6 |
| Figure 19 | Water Table Groundwater Results |
| Figure 20 | Deep Groundwater Results |


# Table Index


| | |
|---|---|
| Table 1 | Constituents of Concern, Evergreen Petroleum Short List |
| Table 2 | Characterization Activities |
| Table 3a | Surface Soil Analytical Results Summary (0-2 feet), Statewide Health Standards |
| Table 3b | Subsurface Soil Analytical Results Summary (>2 feet), Statewide Health Standards |
| Table 4a | Historical Soil Analytical Results Summary AOI 6 (0-2 feet) |
| Table 4b | Historical Soil Analytical Results Summary AOI 6 (>2 feet) |
| Table 5 | Summary of PADEP Open Storage Tank Incidents AOI 6 |
| Table 6 | Existing Well Summary |
| Table 7a | Groundwater Analytical Results Summary, Shallow Aquifer |
| Table 7b | Groundwater Analytical Results Summary, Semi-Confined (Lower) Aquifer |

# Table Index


| | |
|---|---|
| Table 8 | Historical Groundwater Analytical Results Summary AOI 6 - 2013 to present |
| Table 9 | 2016 Gauging Data for AOI 6 |
| Table 10 | Generalized Stratigraphic Section and Interpreted Hydrostratigraphic Units |
| Table 11 | Summary of LNAPL Characterization Results |
| Table 12 | Vapor Intrusion Screening Building Information |
| Table 13 | Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling |
| Table 14 | Summary of Outdoor Air Sampling Over LNAPL |


# Appendix Index


| | |
|---|---|
| Appendix A | Notice of Intent to Remediate, Report Notifications, and Proofs |
| Appendix B | Quality Assurance/Quality Control Plan and Field Procedures Manual (on CD) |
| Appendix C | Soil Boring and Monitoring Well Logs |
| Appendix D | Laboratory Analytical Reports (on CD) |
| Appendix E | PADEP Correspondence |
| Appendix F | LNAPL Conceptual Site Model |
| Appendix G | Remediation Systems Summary |
| Appendix H | Data Usability Assessment |
| Appendix I | Ecological Assessment Documentation |
| Appendix J | Copies of Referenced Consultant Reports (on CD) |
| Appendix K | Historical Data |
| Appendix L | Indoor Air Sampling Information |
| Appendix M | Potable Well Search |

# 1. Introduction

This Remedial Investigation (RI) Report (RIR) has been prepared for Area of Interest (AOI) 6, also known as Girard Point Chemicals Processing Area, at the Philadelphia Energy Solutions Refining and Marketing LLC (PES) Philadelphia Refining Complex (facility). Sunoco Inc. (R&M) (Sunoco) transferred the facility 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 facility is ongoing as part of previously-established programs and the 2012 Buyer Seller Agreement. The facility has operated, and is planning to continue operating, as an oil refinery, marketing terminal, and petrochemical complex.

## 1.1 Facility Description

The facility is located along the banks of the Schuylkill River in the City of Philadelphia, Philadelphia County, Pennsylvania. Portions of the facility occupy both the eastern and western Schuylkill River banks. The facility, which is located on industrial property, covers approximately 1,300 acres of land with access restricted by fencing and security measures. The area surrounding the property is characterized by a mixture of residential, commercial, and industrial properties. Current operations at the facility consist of the production of basic petrochemicals for the chemical industry.

AOI 6, also known as the Girard Point Chemicals Processing Area, encompasses approximately 100 acres and is located on the east side of the Schuylkill River. AOI 6 is a wedge-shaped property bordered by Lanier Avenue/AOI 3 to the east, Penrose Avenue (Route 291)/Platt Memorial Bridge/AOI 5 to the south and Pennypacker Avenue/AOI 7 to the north (Figures 1 and 2). The entire western boundary of AOI 6 along the Schuylkill River is bound by a sheet pile wall. The extent of the sheet pile wall (“bulkhead”) is shown on Figure 2.

## 1.2 Facility Operational History and Current Use

The facility has a long history of petroleum transportation, storage, and processing. The oldest portion of the facility started petroleum related activities in the 1860s, when the Atlantic Refining Company was established as an oil distribution center. In the 1900s, crude oil processing began and full-scale gasoline production was initiated during World War II. In addition to refining crude oil, various chemicals, such as acids and ammonia, were also produced at the facility for a time. The facility has operated continuously as a refining, product distribution, and storage facility. Use of the facility has remained similar following the transfer of ownership to PES.

Historically, AOI 6 consisted of numerous above ground storage tanks (ASTs) containing benzene, toluene, naphtha and other fuel stocks. A sulfuric acid plant was located along the northern boundary of the AOI. A gasoline treating unit, two reformer units, a BDDA (soap) unit, and a thermal hydro-dealkylation unit were also located in this area.

Currently, AOI 6 consists of Udex and cumene units, reformer with associated naphtha hydrotreater, diesel hydrotreater, tankage, boiler house and associated feed water treatment, maintenance buildings, lay-down yards, control rooms, office buildings, the # 2 oil-water separator, remote Laboratory and new Scale House. On October 13, 2017, an updated building survey for AOI 6 was completed. During this survey 16 structures were identified as routinely occupied or potentially occupied. These buildings included: Building 6636, 24 Gate Building 295, Lab/Bottle Washing Building 163, Girard Point Training Building 651, Girard Point Main Office Building 650, Capital Projects Tank Group Trailers, Control Room 739, Trade Shops 178, Carpenter Shop 726, North Tank Field Blockhouse 475, WTP Control Room 745, Control Room 6627, Control Room south of Boiler House #3, Former Locker House associated with former Boiler House #2, and Office near Separator. The characteristics of several of these buildings, refinery lab/bottle washing, Capital project tank group trailers, control room south of Boiler House #3 and former Locker House near former Boiler House #2/Process Building were such that vapor intrusion is not considered a complete pathway as is further discussed in Section 7.1. The building-specific conditions are as follows:

- Refinery Lab/Bottle Washing Building 163 – broken windows visible throughout that allows outdoor air flow
- Capital Projects Tank Group Trailers – elevated trailers with perforated soffit-style skirt that allows outdoor air flow
- Control Room south of Boiler House #3 – elevated without a skirt
- Former Locker House near former Boiler House #2/Process Building – locked and inaccessible, not occupied
- Office near Separator – blast resistant building sitting on ground and fork truck holes at the surface (to facilitate relocation)
- Paint Shop Building 701 – accessible but unoccupied
- Insulation Building 265 – unoccupied building used for storage

There are two leaded tank bottom SWMUs (SWMU Nos. 92 and 95) located in AOI 6 (Figure 2) that were addressed in several previous Resource Conservation and Recovery Act (RCRA) investigations as part of the United States Environmental Protection Agency (USEPA) Corrective Action process and during the Act 2 site characterization activities.

The 27 Pump House Total Fluids Recovery System was installed in November 2001, the system included 12 total fluid recovery wells in the vicinity of the former 27 Pump House. The 27 Pump House Total Fluids Recovery system was turned off September 20, 2010 due to absence of recoverable LNAPL. Passive remediation began on October 10, 2010 with the installation of absorbent socks in wells B-124, B-132, B-137, B-139, B-142, B-143, and B-147. Based on limited recoverable LNAPL in the proximal wells, passive remediation was discontinued on January 26, 2015. Groundwater gauging of select monitoring wells in AOI 6 occurs on an annual basis during the second quarter of each year by Stantec Consulting Corporation (Stantec). Annual gauging activities and results are reported to the PADEP and EPA in Quarterly Reports prepared by Evergreen.

## 1.3 Regulatory History/Overview

Sunoco and the PADEP entered into a Consent Order & Agreement (CO&A) in December 2003 with respect to the facility. Sunoco's Phase I Remedial Plan (Phase I Plan), dated November 2003, was included as an attachment to the CO&A. In accordance with the CO&A and Phase I Plan, a Current Conditions Report and Comprehensive Remedial Plan (CCR) was prepared by Sunoco in June 2004. The Phase I Plan and the CCR divided the facility into 11 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 performed site characterization activities at all 11 AOIs in accordance with the 2003 CO&A. Sunoco has prepared and submitted a corresponding Site Characterization Report (SCR) for each AOI 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 facility, entering the facility into the Act 2 program. This NIR was later updated and submitted to the PADEP in November 2014 in order to revise the ownership identity to PES and the remediator identity to Evergreen. In November 2011, the facility was formally entered into the PA One Cleanup Program with the USEPA 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). As previously discussed, characterization and remediation work at the facility is currently being performed under the September 2012 Buyer Seller Agreement signed by Sunoco, PES, and the PADEP.

The following provides a timeline of major events and submissions for the facility and AOI 6:

***2004***

- The PADEP and USEPA signed an agreement entitled "One Cleanup Program Memorandum of Agreement (MOA or One-Cleanup Program)," which clarifies how sites remediated under Pennsylvania's Voluntary Cleanup Program may satisfy RCRA corrective action requirements through characterization and attainment of remediation standards established under the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2).
- Langan prepared the CCR for the Philadelphia Refinery and the Sunoco Logistics Belmont Terminal.

***2005***

- PADEP, USEPA, 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.

***2006***

- Sunoco submitted an NIR to the PADEP for the Philadelphia Refinery thereby entering the facility into the Act 2 program.

- A Site Characterization Work Plan (Work Plan) for AOI 6 was submitted in February 2006 to the PADEP and the Environmental Protection Agency (EPA). This Work Plan summarized proposed activities to be completed to characterize AOI 6 in accordance with the objectives of the 2004 CCR.
- The Work Plan was implemented between March and June 2006 and the results were summarized in the Site Characterization Report that was submitted to PADEP and EPA in September 2006.

### *2011*

- On November 8, 2011, the USEPA provided an acknowledgment letter to Sunoco formally accepting the Sunoco Facility into the One Cleanup Program.
- Sunoco submitted the Work Plan for Site Wide Approach to document the site-wide remedial approach extending beyond the requirements of the 2003 CO&A. The PADEP and USEPA reviewed and provided input to this report. Sunoco submitted a letter of commitment stating the facility would be remediated according to the Work Plan for Site Wide Approach.

### *2012*

- Sunoco transferred the facility to PES.
- Sunoco, PES, and PADEP signed the Buyer-Seller Agreement that established the environmental remediation and management obligations of Sunoco and PES following the sale of the facility.

### *2013*

- The legacy remediation liability for environmental impacts existing prior to the conveyance of the facility to PES was transferred from Sunoco to Evergreen.
- Sunoco prepared and submitted a SCR/RIR in September 2013 to formerly satisfy the requirements Act 2. This SCR/RIR describe site characterization work included in the 2006 AOI 6 SCR, as well site characterization work completed in 2012 to supplement the 2006 work.
- The PADEP provided Evergreen comments on the 2013 SCR/RIR.

### *2014*

- Evergreen submitted an updated NIR to the PADEP for the facility.

### *2015*

- Langan, on behalf of Evergreen, submitted a Human Health Risk Assessment (HHRA) Report to establish a site-specific standard (SSS) for lead in soil at the facility, the Sunoco Logistics Belmont Terminal, and the Sunoco Partners Marcus Hook Industrial Complex (Langan, 2015).
- The HHRA was approved by the PADEP in a letter dated May 6, 2015 establishing a SSS of 2,240 milligrams per kilogram (mg/kg) for lead in soil.

On February 19, 2016 the PADEP, Evergreen, Aquaterra and GHD met to discuss the Work Plan. The PADEP provided comments to the Work Plan via email on February 25, 2016. In accordance with the Work Plan for Site Wide Approach, Evergreen is submitting this RIR for AOI 6 to formally

satisfy the requirements of Act 2 as specified in 25 PA Code §250.408. This RIR describes site characterization work conducted following the last submittal (2013 SCR/RIR). Activities that have been performed in order to complete characterization as required by an RIR under Act 2 include:

- Additional characterization of surface soil (0 to 2 feet below ground surface [ft. bgs] interval) and subsurface soil (2 to 15 ft. bgs) including targeted soil investigations in potential contaminant source areas, such as historic product handling and storage locations, open storage tank incident areas, and known product releases.
- Horizontal and vertical delineation of impacts in soils.
- Additional soil sampling in areas with light non-aqueous phase liquid (LNAPL).
- Additional groundwater sampling from monitoring wells not containing light non-aqueous phase liquid LNAPL.
- Collection of groundwater samples beneath LNAPL samples.
- Delineation of LNAPL.
- Evaluation of LNAPL mobility.
- Investigation of the potential vapor intrusion to indoor air pathway at occupied buildings.
- Collection of air samples above LNAPL plumes.
- Qualitative evaluation of contaminant fate and transport.

As discussed with the PADEP, Stantec, and Evergreen during a meeting conducted in September 2015, Evergreen is in the process of developing a site-wide MODFLOW model to perform quantitative fate and transport modeling. Evergreen also intends to submit a site-wide human health risk assessment report. Following the approval of these site-wide reports and other RIRs, Evergreen intends to submit a site-wide Cleanup Plan, pursuant to 25 PA Code §250.410, which will present remedies chosen to allow attainment of the selected remediation standards in soil and groundwater.

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 facility NIR, the updated facility NIR, as well as the report notices and their proof of receipt/publication.

## 1.4 Selection of Constituents of Concern

A list of the constituents of concern (COCs) in soil and groundwater for AOI 6 is included as Table 1. This list is an updated listing of the compounds identified in the Work Plan as the COCs for the facility under Pennsylvania One Cleanup Program and will be referred to as the petroleum short list. This list includes all current constituents from the Pennsylvania Corrective Action Process (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. In May 2009, two additional COCs, 1,2,4- trimethylbenzene (1,2,4-TMB) and 1,3,5-trimethylbenzene (1,3,5-TMB), were added to the list of COCs 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. 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.

No additional compounds were added to Evergreen short list during the 2016 sampling events, but pH was added to the analyses for samples collected in the vicinity of a former tank (Tank 81).

## 1.5 Selection of Applicable Standards and Screening Levels

The media of concern for AOI 6 include soil and groundwater. The potential vapor intrusion into indoor air exposure pathway was also evaluated through the collection of the indoor air samples. The approach for attaining Act 2 remediation standards for the media of concern is described below by media. As the current and anticipated future use of the facility is industrial, standards for non-residential properties were selected for comparison.

### 1.5.1 Soil

All soil results were screened using a multi-step process, as described in this section. Soil results were first screened against the PADEP non-residential, used aquifer (total dissolved solids [TDS] <2,500 micrograms per liter [µg/L]) medium specific concentrations (MSCs) developed by the PADEP to implement the Statewide Health Standard (SHS). The following process was used to select the soil SHS for each COC:

- The highest value of either 100 times the groundwater MSC or the generic value MSC was selected to represent the soil to groundwater numeric value.
- The selected used aquifer, non-residential soil to groundwater (NRSGW) numeric value was then compared with the non-residential direct contact value (NRDC) (0 to 2 feet or 2 to 15 ft. bgs, as applicable).
- The more stringent of the soil to groundwater value and the direct contact value was selected as the soil MSC, otherwise referred to as the SHS, for initial comparison of soil sample results.

The SHS value is usually driven by the soil-to-groundwater MSC, and the soil-to-groundwater pathway will be addressed in the groundwater investigation presented in this report. In order to further evaluate the risk posed by the concentrations of COCs which were detected above their respective SHS, the next step is to compare all of the soil analytical results to the non-residential direct contact MSCs. Soil sample locations that will require further pathway evaluation or require a remedial measure in order to attain a standard under Act 2 were identified through comparison to the non-residential direct contact MSCs.

An exception to this soil screening process exists for lead. On February 24, 2015, Evergreen submitted a Human Health Risk Assessment Report to PADEP which presented the development of a risk-based site-specific standard (SSS) for lead in soil. In a letter dated May 6, 2015, PADEP approved the report, and a non-residential direct contact site-specific numerical standard for lead of 2,240 mg/kg was established. This SSS is used in place of the default 0 to 2 ft. bgs direct contact standard for lead.

### 1.5.2 Groundwater

Groundwater sample analytical results were screened against the PADEP MSCs for non-residential properties overlying used aquifers with TDS less than or equal to 2,500 µg/L (SHS). Where constituent concentrations are above the SHS, Evergreen evaluated application of the site-specific remediation standard using the pathway elimination option.

### 1.5.3 Potential Vapor Intrusion into Indoor Air

Indoor and ambient air sample results collected in AOI 6 were screened against the USEPA Region 3 Regional Screening Levels (RSLs) for Industrial Air Target Risk (TR)=1E-6, Target Hazard Quotient (HQ)=0.1 (updated November 2015); the PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (November 2016); and the Occupational Safety and Health Association (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 Value (TLVs) were used for compounds without established OSHA PELs. In accordance with the PADEP Vapor Guidance, since indoor air is the only potential exposure pathway, the results were also screened against the USEPA Region 3 Regional Screening Levels (RSLs) for Industrial Air based on the lower of the Target Risk (TR)=1E-5 and HQ = 0.1 and the PADEP SHS Indoor Air values divided by a factor of 10. These values were used as the threshold to indicate whether additional controls will be necessary to address vapor intrusion. Any such controls will be presented in the Cleanup Plan.

# 2. Environmental Setting

This section summarizes the geologic framework and general hydrogeologic properties of sedimentary deposits and bedrock underlying the south Philadelphia area, with emphasis near the facility. A brief discussion of historical and present-day topography and hydrology is also included. This section provides a regional context from which sedimentary deposits observed beneath AOI 6 are classified and characterized for the purposes of this RIR. Much of the information presented in this section was summarized during conceptualization of a site geologic model that is being used in the development of a numerical groundwater flow model by Stantec as presented in the AOI 1 RIR (Stantec, 2016).

In general, the groundwater resources and stratigraphic framework of the facility area have been well-documented through a variety of data sources, including previous groundwater resource investigations dating back to the early 1900s, state and federal geologic mapping projects, groundwater modeling studies, and consultant site characterization and remedial investigation reports. Those data sources are summarized herein. In large part, available well and test boring logs from previous on-site and local subsurface investigations were the most valuable resource in evaluating the local subsurface stratigraphy. As such, subsurface information from approximately 750 well and test boring logs was considered in the evaluation of regional conditions. A database of stratigraphic "picks" on interpreted vertical lithologic unit boundaries (and, where possible, geologic formations) was also developed and includes all identified records of boreholes completed to bedrock at and near the facility. The purpose of the "picks" database was to archive interpretation of

individual borehole lithologies to bedrock, so that stratigraphic profiles could be developed for this RIR and the Schreffler lithologic model (Schreffler, 2001) could be refined and updated for site-specific use at the facility (Stantec, 2016). One stratigraphic profile was developed for use in this RIR and is presented herein to support evaluation of the lithologic character, geographic extent, and thickness of each geologic unit identified. A structure contour map of the bedrock surface was also developed and used to support the discussion presented below.

## 2.1 Hydrology and Topography

The facility occupies a large area adjacent to the Schuylkill River near its confluence with the Delaware River. This region has a long history of human influence and disturbance, dating back to the early 17th Century when European settlers first arrived. The following sections present a brief discussion of the significant land surface morphologic changes that are apparent when comparing modern environments and topography to that shown on historical maps.

### 2.1.1 Historical Topography and Natural Depositional Environments

The City of Philadelphia Archives and several online archival resources have catalogued and provide free access to copies of many historical maps of Philadelphia. Based on a review of many of those maps, much of the land area occupied by the present-day Philadelphia Refinery was formerly tidal marsh and lowlands that once fringed the Schuylkill River. Figure 3 presents a geo-referenced United States Geological Survey (USGS) topographic map from 1898 (20-foot contour interval). The map indicates that several small tributary streams, digitized on-screen and shown as blue lines, formerly dissected that marshland and presumably would have exchanged water with the tidal Schuylkill River on a semi-diurnal basis. Several islands were also present throughout the lowlands, most notably League Island, which are interpreted as erosional remnants of uplands that formed sometime after deposition of the Trenton "gravel" sediments (discussed in detail below).

At that time, relatively higher topography was apparent north and west of the Schuylkill River, near Gibson's Point. South and east of that general area, the Schuylkill River coursed through a distinctive meander around Point Breeze, and appeared to have formed an erosive cut bank along present-day AOI 2 where higher elevations were present (and favoring point bar deposition north of AOI 10). A southwest/northeast trending ridge of higher elevation was also present south of Point Breeze near AOI 4 (see 20-foot contour on Figure 3), and between those two areas of higher elevation a stream was mapped to have been present. That stream appears to have originated in southern AOI 1 and flowed southwest through AOIs 3 and 7, towards its confluence with the Schuylkill River. Numerous other small streams and ditches draining the lowlands surrounding Hollander Creek were also noted. Additional historic maps indicate that by 1900, an earthen dike had been constructed along the banks of the lower Schuylkill River, and sluices were present at each stream/ditch confluence. Other maps show wooden pilings in places along the Schuylkill River. In general, the construction of containment dikes, sluices, and shoreline hardening would have altered the natural tidal exchange between the Schuylkill River and these historic creeks, thereby limiting the natural accretion of sediment in the marshes that once fringed the river. Moreover, the modifications indicated on these maps would have altered the pre-existing tidal regime and dynamic equilibrium of the Schuylkill River.

### 2.1.2 Post-Industrialization

Figure 3 indicates that by 1898, storage of petroleum near Point Breeze and Gibson Point had already begun. According to archived records, much of the remaining tidal marsh and lowland environments nearby were reclaimed and routinely dewatered for farming practices around this same time period (mostly on the west side of the Schuylkill River). Industrialization warranted further land filling activity and shoreline hardening, including bulk-heading and filling of the tributary streams that modified and generally raised the antecedent topography into its present-day configuration. Farms were displaced in favor of industrial and commercial land uses. Although some clusters of residential property and open space exist or have existed near the facility, most land in south Philadelphia is presently and has been used for industrial and commercial purposes for over 100 years (IST, 1998).

Light Detection and Ranging (LiDAR) data obtained from the USGS (USGS, 2010) and topographic contours published in 2007 by the City of Philadelphia indicate that present-day topography is relatively flat in the study area, and land surface elevations generally range from a few feet below sea-level near Mingo Creek to approximately 30 feet above sea level near the eastern boundary of the Philadelphia Refinery in AOIs 1 and 8 (referenced to the North American Vertical Datum of 1988 [NAVD 88]) (Figure 4). Although subtle, the high-resolution LiDAR model displays topographically low areas that based on location, likely correlate to the locations of former stream valleys (e.g., Franklin Delano Roosevelt Park). In addition to raising the land surface, much of the filled areas were either paved and/or rendered relatively impervious (Figure 5), which decreased rates of recharge to the water table and necessitated the construction of numerous sewers to convey stormwater runoff (and also sewage) to the Schuylkill and Delaware Rivers.

## 2.2 Regional Geology and Hydrogeologic Conditions

The facility occurs within the up-dip limits of the Atlantic Coastal Plain, generally within 2 miles of the "Fall Line," where crystalline bedrock of the Appalachian foothills intersects the ground surface (outcrops) (Figure 6). 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, 1992). In general, the resulting sedimentary record in the vicinity of the Philadelphia Refinery is complex, largely incomplete, and under-represented by only Cretaceous and Quaternary deposits, separated by a regional disconformity (Stantec, 2012). A summary of those deposits is presented below.

### 2.2.1 Coastal Plain Deposits

#### 2.2.1.1 Anthropogenic Fill

For reasons discussed, much of the facility and surrounding area is underlain by historical fill material, which was placed for the purpose of reclaiming lowlands along the banks of the tidal

Delaware and Schuylkill Rivers during industrialization. These fill materials are heterogeneous in nature and have been described on borehole logs by others as a mixture of compacted soil and anthropogenic debris, including sand, clay, silt, gravel, cinders, concrete, asphalt, crushed stone, ash, glass, brick fragments, and wood. Apparent fill thickness ranges from a veneer where antecedent topography was highest to greater than 50 feet where it was used as railroad ballast just east of the Philadelphia Refinery. Within the locations of former stream valleys and marshes (Figure 3), the historical fill material is generally 20 feet or greater in thickness.

The fill materials may contain isolated lenses of groundwater (perched groundwater) where coarse or granular materials are separated from the underlying water table by low permeability sediments. The fill may also be saturated and/or in hydraulic connection with the water table along the axes of former stream channels, where the water-table appears to intersect the fill, or where the fill was placed on marshland. However, at most locations across the Philadelphia Refinery, the fill layer occurs above the regional water-table under average head conditions.

#### 2.2.1.2 Quaternary Deposits

Quaternary sedimentary deposits are present beneath the Philadelphia Refinery and are generally representative of geologically-recent cycles of deposition and erosion that occurred within the last 200,000 years. These cycles of sedimentation were the result of a series of glacial and interglacial periods, namely the Illinoian and Wisconsin glaciations, separated by an intervening interglacial period and followed by the present interglacial period through the Holocene (Sevon et al., 1999). Depositional environments through this Period were primarily controlled by sea-level and the successive down-cutting and infilling of ancestral river valleys, primarily that of the Schuylkill and Delaware Rivers (Owens and Minard, 1979). Details of the Quaternary deposits present at the Philadelphia Refinery are described below.

##### *2.2.1.2.1 Recent (Holocene) Alluvium*

Predominantly gray, muddy deposits with occasional sandy, gravelly, and organic-rich lenses comprise the most-recent alluvium present at the Philadelphia Refinery. These sediments were deposited in dynamic floodplain, channel, and marsh environments through the Holocene. As noted, the upper surface of alluvium, in most places covered by fill, defines the antecedent topography that pre-dated development of the Philadelphia Refinery area. This geologic unit is generally present below an elevation of approximately 20 feet NAVD 88. The alluvium ranges in thickness from a few feet at higher elevations, away from the present Schuylkill and Delaware River estuaries, to approximately 15 feet within the former floodplains of buried tributary streams. However, adjacent to and fringing these major river estuaries, apparent marsh deposits accreted in freshwater environments to as much as 60 feet thick (to elevations as low as approximately -60 feet NAVD 88) as sea-level transgressed and flooded the incised river valleys through the Holocene. Figure 3 provides some estimation of how extensive the tidal marshes once were prior to development, generally along the Schuylkill River south of and surrounding Point Breeze. A stratigraphic profile location map is presented on Figure 7. Stratigraphic profile E-E' supports this interpretation and distribution of the most recent alluvial deposits across the Philadelphia Refinery (Figure 8).

Similar to the fill described above, most recent alluvium at the facility has limited water-bearing capacity due to its fine-grained texture. However, heterogeneities within the alluvium may allow for

the presence of localized seasonal perched groundwater resulting from the percolation of recharge water. Within former marsh areas along the Schuylkill and Delaware River estuaries, the regional water-table occurs within the Holocene alluvium. At locations distal to the rivers and where the Schuylkill River appears to have eroded older alluvial deposits (e.g., along the western periphery of AOI 2), the Holocene alluvium occurs above the regional water-table and is unsaturated.

#### *2.2.1.2.2 Pleistocene Alluvium ("Trenton Gravel")*

Geologically-recent glacial outwash deposits, commonly referred to informally as the Trenton "gravel", have long been recognized in the vicinity of southeastern Pennsylvania along the Delaware River valley. Sevon and Braun (2000) provide a comprehensive map of glacial deposits in Pennsylvania, including the presence of sand and gravel outwash, interpreted as stratified drift, along the present Delaware River. Owens and Minard (1979) published a comprehensive summary of previous research into these deposits and subdivided the "Trenton gravel" into two distinct deposits (the Spring Lake and Van Sciver Lake beds) based on topographical position and lithology at those type sections. Low et al. (2002) indicate that in most places the Trenton gravel rests directly atop Cretaceous sediments and is overlain by younger alluvium of Holocene age near the Schuylkill River.

Based on literature review presented in the AOI 1 RIR (Stantec, 2016), the Trenton gravel was interpreted as a heterogeneous, stratified alluvial deposit of primarily sand and gravel, with occasional beds of clay and silt (the Van Sciver Lake beds), that resulted from glacial outwash through the Delaware River valley sometime after the Illinoian glacier receded. At the Philadelphia Refinery, the Trenton gravel is commonly described on boring logs as a brown, reddish-brown or, where stained, black, fine to coarse sand with lenses of gravel. The gravel fraction is often multicolored and comprised of a mixture of sub-angular to sub-rounded, sedimentary and metamorphic rocks derived from the Appalachian Piedmont. The Trenton gravel generally ranges in thickness from a few feet up to approximately 30 feet near the Philadelphia Refinery. It appears to be laterally continuous and its thickness depends on the antecedent Cretaceous topography that it filled and on the degree of erosion from above (Stantec, 2016). Along the Schuylkill River at the George C. Platt and Penrose Avenue bridges, and in places beneath the Delaware River, Greenman et al. (1961) mapped the Trenton gravel to be present beneath thick sections of Holocene alluvium to elevations near -60 feet NAVD 88, and those interpretations are shown on Figure 8.

The regional water-table at the Philadelphia Refinery most often occurs within the Trenton gravel, and, as a result of its stratigraphic position, this geologic unit forms the bulk of the unconfined aquifer (along with localized areas of saturated alluvium and fill). Published well records indicate that the Trenton gravel can be a prolific aquifer (Paulachok, 1991). Nevertheless, due to lateral changes in Trenton gravel thickness and to its heterogeneous character, hydraulic properties and groundwater yields can vary widely. Stantec reviewed published data and available on-site aquifer testing data regarding the hydraulic properties of the Trenton gravel and presented those data in the AOI 1 RIR (Stantec, 2016) which are included on Figures 9 and 10 in this report.

A nearly 7-day groundwater extraction test was conducted at recovery well RW-2 at the Philadelphia Refinery (IST, 1998). During testing, RW-2 was pumped at a constant rate of 225 gallons per minute (gpm). Distance-drawdown data analyzed along transects of observation

wells suggested that the area of influence extended approximately 1,680 feet from the pumping well under relatively isotropic conditions. The hydraulic conductivity (k) was estimated to be greater than 400 feet per day (ft/d). More recently, a 24-hour pumping test was conducted at the former DSCP property at monitoring well DSCP-MW-65, a well that appears to be screened across the Trenton gravel and underlying sandy Cretaceous deposits (ARCADIS, 2013). Analysis of that data provided in the referenced report supports comparable aquifer properties at that site. However, it is noted that during the test, the Trenton gravel was dewatered and individual aquifer k values could not be calculated/resolved. Other, in-situ, single well instantaneous displacement tests and short-duration pumping tests for remedial system design suggest a much lower k for the Trenton gravel, on average, but test results vary widely, from less than 1 ft/d to over 600 ft/d. The observed wide range in k values over relatively short distances is consistent with this geologic unit's lithologic heterogeneity.

#### 2.2.1.3 Cretaceous Deposits

Many studies of the Atlantic Coastal Plain near the Philadelphia Refinery have identified the presence of Cretaceous age sediments in the subsurface. These are the oldest sedimentary deposits in the area and are configured in a southeasterly-thickening wedge, overlain by the much younger Quaternary deposits described above and underlain by Piedmont crystalline bedrock. Greenman et al. (1961) detailed the age, character, configuration, and hydraulic properties of these deposits in southeastern Pennsylvania. At the time of that publication, the Cretaceous deposits were assigned primarily to the Raritan Formation and noted to represent three distinct, fining-upward cycles of non-marine sedimentation. Similarities to lithologic sequences identified on borehole logs were correlated to previously-identified strata at their type locality in New Jersey, where the deposits are much thicker and more easily distinguished. Other similar, near time-equivalent geologic formations of Cretaceous age were elsewhere identified in Maryland and Delaware (Jordan, 1962), and more recently authors began wholly referring to the Cretaceous deposits in south Philadelphia as the Potomac-Raritan-Magothy (PRM) aquifer system.

In south Philadelphia, the PRM aquifer system is subdivided into six geologic units in order of increasing age:

- The upper clay unit
- Upper sand unit
- Middle clay unit
- Middle sand unit
- Lower clay unit
- Lower sand unit (Schreffler, 2001)

Near the Philadelphia Refinery, it is generally true that these units thin, intercalate, and exhibit gradual facies changes that make separation of individual units difficult. Total thickness of PRM deposits at the facility ranges from 0 feet, where Quaternary deposits are present atop bedrock, to more than 100 feet within paleochannels incised into bedrock. A structure contour map of the top of the bedrock surface is included on Figure 11. Details of the individual units based on boring log

records and published descriptions as presented in the AOI 1 RIR (Stantec, 20016) are presented below.

#### *2.2.1.3.1 Upper Clay Unit*

The upper clay unit is a variegated clay/silt that is sometimes discernible from older clay units of the PRM where sandy and gravelly. In general, it is thin when compared to the other PRM clay units in south Philadelphia, and in places distal to the Delaware River the upper clay may be entirely absent (Greenman et al., 1961). On the basis of geophysical log signature, others have mapped the upper clay to be at least 0.5 feet thick and up to 30 feet thick at the Philadelphia Refinery, exhibiting its greatest thickness in northern portions of the study area while pinching out to the south (IST, 1998). At the Philadelphia Refinery, Stantec assigned the upper clay to first occurrences of light brown, tan, mauve, yellow, gray, and less-commonly, red sandy, silty clay beneath the Quaternary alluvium. However, overall stratigraphic correlation of the PRM across the facility supports the upper clay unit pinching out or being truncated by younger deposits throughout most of the AOIs (Figure 8).

The upper clay unit by nature acts as a confining or leaky confining bed. Where present, it creates hydraulic separation between the upper sand unit and water-table aquifer.

#### *2.2.1.3.2 Upper Sand Unit*

The upper sand unit is a varicolored but predominantly brown to gray sand with varying amounts of gravel, clay, and silt (Greenman et al., 1961). Nearer the Philadelphia Refinery, it has been described as mostly silty and/or clayey fine to medium sand (IST, 1998). Where the upper clay is absent, the upper sand occurs directly beneath, and is typically discernable, from the coarser and more heterogeneous Trenton gravel above. Stantec used color and lithologic changes, in addition to subtle changes in drilling conditions including Standard Penetration Test (SPT) blow counts, to make "picks" on upper sand occurrences (Stantec, 2016) to create the current geologic interpretation for the facility. In general, the upper sand appears restricted to northern portions of the refinery (AOIs 1, 2, 4, and 8) where it subcrops the Trenton gravel. The upper sand unit, where present, rarely exceeds 10 to 20 feet in total thickness.

The upper sand unit is an excellent aquifer where its thickness and extent are sufficient (Greenman et al., 1961). Aquifer testing of the upper sand unit in New Jersey has indicated that the aquifer has similar hydraulic properties to the middle and lower sand units where discrete (Navoy and Carleton, 1995). At the Philadelphia Refinery, Stantec did not identify any existing testing data for wells discretely screened across the upper sand unit from which to infer sole hydraulic properties (Stantec, 2016). The upper sand generally occurs in pockets beneath the Philadelphia Refinery and comprises a portion of the unconfined aquifer. Most wells that fully penetrate the unconfined aquifer in northern areas of the refinery may intersect and be influenced by the hydraulic properties of the upper sand.

#### *2.2.1.3.3 Middle Clay Unit*

Whereas other clay units of the PRM are described as being sandy and gravelly in places, the middle clay unit is generally regarded as being a laterally extensive and uniformly massive confining

bed of thick, red and white clay with very little sand (Greenman et al., 1961). Near the Philadelphia Refinery, others have found the middle clay to be nearly continuous in the subsurface (IST, 1998). Thicknesses of the middle clay unit generally range from approximately 20 feet, near the Belmont Terminal area, to just over 1 foot in southeastern AOI 1. While the middle clay appears to be everywhere present, at least on the eastern side of the Schuylkill River, its characteristically muddy texture can vary and become finely-laminated/bedded and intercalated with muddy sand. West of the Schuylkill River and particularly under areas north of Point Breeze, the middle clay unit (in addition to most if not all of the PRM) appears to have been incised and completely removed by erosion. Downgradient, nearer AOI 9 and the George C. Platt Bridge, some pockets or thin lenses of middle and/or lower clay may be present under a thick section of Quaternary alluvium. At other locations beneath the Philadelphia Refinery, the middle and lower clay units appear to be in direct contact with each other, where the middle sand is absent (Stantec, 2016).

The middle clay unit, in places resting directly on and combining with the lower clay unit, acts as a significant confining bed at the Philadelphia Refinery. In a regional context, it creates hydraulic separation between the unconfined aquifer and deeper, confined to semi-confined aquifer(s) of the middle and/or lower sand units.

#### *2.2.1.3.4 Middle Sand Unit*

The middle sand unit is a light-colored, stratified, fine to coarse sand with occasional gravel and clay that was generally deposited in lenticular masses along the axes of troughs carved into the lower clay unit (Greenman et al., 1961). As such, it is by nature discontinuous in the subsurface. Stantec has mapped the presence of middle sand at the Philadelphia Refinery based on stratigraphic position and where present, is commonly described on boring logs as brown or orange sand and gravel. In some areas where the lower clay was entirely removed, it may be indistinguishable from and rest unconformably atop the lower sand unit. At those locations, Stantec used subtle changes in sample descriptions, including color and/or texture, of the sequences of sand below the middle clay to infer the contact between those units. The middle sand unit, where discernable from the lower sand, has been observed at thicknesses up to approximately 15 feet beneath the Philadelphia Refinery and is generally thickest in lenticular or tabular bodies.

Much like the other sand units of the PRM, the middle sand unit can be a prolific aquifer where it is laterally continuous and of sufficient thickness. Aquifer testing of the middle sand in New Jersey has indicated that the aquifer has similar hydraulic properties to the lower sand unit (Navoy and Carleton, 1995). At the Philadelphia Refinery, Stantec did not identify any wells discretely screened across the middle sand unit from which to infer sole hydraulic properties (Stantec, 2016). Most deep refinery wells are screened in the lower sand, or potentially across the lower and middle sand units, where hydraulically connected.

#### *2.2.1.3.5 Lower Clay Unit*

Published descriptions of the lower clay unit indicate that it appears very similar to, and is sometimes inseparable from, the middle clay unit where the middle sand is absent. The lower clay is generally tough, red clay but is known from drilling records to contain softer zones of gray clay stratified with fine sand. The lower clay tends to exhibit its greatest thickness along the lateral margins of paleochannels in underlying bedrock, and can be thin to absent along the axes of

paleochannels where eroded prior to deposition of the middle sand unit (Greenman et al., 1961). Of the PRM clay units, Stantec has interpreted the lower clay unit to be the least significant at the Philadelphia Refinery in terms of both its lateral extent and vertical thickness. (Stantec, 2016) This is based on stratigraphic correlation and likely the result of erosion prior to deposition of the middle sand. Generally gray and red, commonly sandy clay and muddy sand zones were assigned to the lower clay if observed below and distinguishable from the middle clay. Where present, the lower clay was observed at thicknesses ranging from less than 1 foot to no greater than 10 feet. The lower clay appears to thicken and become more continuous to the south and east of the Philadelphia Refinery.

Where physically connected, the lower and middle clay units combine to form a significant confining bed at the Philadelphia Refinery. In a regional context, they create hydraulic separation between the unconfined aquifer and deeper, confined to semi-confined aquifer of the lower sand unit. The lower clay can also create localized areas of hydraulic separation between the lower and middle sands, where discretely present.

#### *2.2.1.3.6 Lower Sand Unit*

The lower sand unit is a varicolored but predominantly white to yellow sand with gravel, usually fining upward to a cap of fine to medium sand with occasional yellow and gray clay lenses. As further described below, the lower sand unit is the oldest of the PRM deposits and rests unconformably atop bedrock. The lower sand is generally thickest (up to 87 feet thick) along the axial troughs of paleochannels carved into bedrock by discharge through former positions of the Schuylkill and Delaware Rivers (Greenman et al., 1961). At the Philadelphia Refinery, the lower sand unit is present as a nearly continuous deposit, with the exception of some areas west of the Schuylkill River where it appears that the river entirely removed the PRM. Where present, the lower sand unit is observed to range in thickness from approximately 20 feet to a maximum of just over 50 feet, where it fills a bedrock paleochannel beneath a portion of AOI 1. Philadelphia Refinery borehole logs indicate that the lower sand unit is commonly yellow, white, and pale gray in color and predominantly medium to coarse sand with gravel, or gravel with sand. The lower sand's gravelly texture beneath the refinery has been well documented on drilling logs.

Of the PRM aquifer system, it can be argued that the lower sand unit was historically the most important groundwater resource in south Philadelphia. Figure 10 summarizes hydraulic information available for the lower sand unit, based on published aquifer testing results. Proximal to the Philadelphia Refinery at the Philadelphia Naval Shipyard (PNSY), a wealth of historical testing data is available for the lower sand unit and indicates an average k value of approximately 134 ft/d. Across the Delaware River in New Jersey, k values seem to be slightly higher. At the Philadelphia Refinery, there are several wells that appear to be discretely screened within the lower sand unit. However, Stantec did not identify any aquifer testing data derived from testing of onsite lower sand wells (Stantec, 2016). It is noted that Stantec recently installed two new AOI 4 monitoring wells screened within the lower sand unit aquifer. Those wells will be utilized for the collection of slug test data and for two short-duration, constant-rate pumping tests to estimate lower sand hydraulic properties at the Philadelphia Refinery. The data from this testing will be submitted in future Act 2 submittals.

### 2.2.2 Bedrock

Bedrock beneath the Coastal Plain near south Philadelphia has been inferred from surface outcroppings above the "Fall Line," and has been described in the subsurface where penetrated by past drilling activities. Bosbyshell (2008) has mapped schist of the Wissahickon Formation to occur in Philadelphia along the "Fall Line" (Figure 6). Relatively small bodies of granitic gneiss, resulting from igneous intrusions into the country rock during metamorphism, can also be present. Most boring log records of deep holes drilled at the Philadelphia Refinery indicate that schist is present beneath the Coastal Plain, in agreement with published maps.

Available data pertaining to the bedrock surface beneath the Philadelphia Refinery suggests that the surface generally dips to the southeast but contains local complexity. Greenman et al. (1961) recognized the presence of four paleochannels incised into bedrock and attributed those features to previous positions of the Schuylkill River. Two of those channels, referred to as the Schuylkill River and League Island Troughs by those authors, occur beneath parts of the Philadelphia Refinery and influence the total thickness of the Coastal Plain sedimentary sequence above them (Figure 11). Through boring log review, Stantec has identified additional detail in the bedrock surface beneath the Philadelphia Refinery, including a small bedrock paleochannel beneath the southern portion of AOI 1 that appears to be an extension of the League Island Trough, and a few localized bedrock surface highs (pinnacles) (Stantec, 2016).

In general, bedrock can store and transmit groundwater primarily through secondary porosity structures (e.g., fractures, joints). Bosbyshell (2008) indicates that the Wissahickon Formation can yield up to 20 gpm to wells in the mapped area above the "Fall Line." Balmer and Davis (1996) indicate that in Delaware County, Pennsylvania, the Wissahickon Formation is the most productive of the consolidated rock aquifers present in that county and can yield anywhere from 0 gpm to 300 gpm to wells (data from 127 wells). However, the wells included in their report were generally located above the "Fall Line" and were not screened below significant accumulations of Coastal Plain sediments. In general, when compared to the permeability and thickness of the Coastal Plain deposits, the water-bearing properties of the Wissahickon Formation beneath the Philadelphia Refinery are considered de minimis.

# 3. Soil Investigation

The following sections summarize the soil investigation activities performed as part of the remedial investigation activities in AOI 6. The site characterization activities conducted for the RIR in 2016/2017 were completed by Stantec, GHD and Aquaterra, on behalf of Evergreen. The goal of the 2016/2017 activities was to characterize soil in potential source areas, such as historic product handling and storage locations, open storage tank incident areas, and known product releases. Investigations before 2016-2017 are summarized in Section 3.1.

All characterization fieldwork was performed in accordance with Evergreen's *Quality Assurance/Quality Control Plan and Field Procedures Manual (*Appendix B). Soil borings were advanced using a variety of methods including hand auger, backhoe, split spoons in conjunction with hollow stem augers, and split spoons driven using direct push methods. The general strategy for the investigation was to characterize soil in the 0 to 2 ft. bgs and greater than 2 ft. bgs intervals

(unsaturated soil). Generally, subsurface soil samples were collected at the depth exhibiting the highest photoionization detector (PID) response and/or above the water table. Delineation was performed to the highest of the Act 2 non-residential SHS, the non-residential direct contact MSC, and the numeric SSS (for lead). Soil samples from BH-16-014 through BH-16-16 and from well installations B-172 through 175 were initially sampled for volatile organic analyses (VOCs) and then were re-sampled for semi-VOCs (SVOCs). The soil sample from BH-16-041 was only analyzed for pH in accordance with Table 2.

Table 2 summarizes the soil boring rational and soil boring logs are included in Appendix C. All soil analytical results are summarized in Tables 3a and 3b, which compares the results to the 1) non-residential SHS (as previously defined in this report, the more stringent of the soil to groundwater MSC and the direct contact MSC), 2) the non-residential direct contact MSC, and 3) the numeric SSS (for lead) (Soil Screening Levels). Samples were analyzed for the COCs on Table 1. Analysis of soil samples was conducted by Lancaster Laboratories. All laboratory analytical reports from this investigation work are included in Appendix D.

## 3.1 Summary of Previous Soil Analytical Results

Soil data collected during previous soil investigations are summarized in Tables 4a and 4b and the locations are shown on Figures 12a and 12b. The soil data summarized on Tables 4a and 4b were collected from 2002 to 2016 during RCRA, Act 2 and Tank investigation activities. The majority of the previous data collection activities were completed in support of the 2006 SCR/RIR and the 2013 SCR/RIR. A total of 57 soil borings and 20 monitoring wells were installed during the 2006 and 2013 site characterization activities. Information from these investigations is presented in the 2006 SCR (Langan, 2006) and the 2013 SCR/RIR (Langan, 2013).

Soil sampling was completed from 20 borings within SWMU 92 and from six borings in SWMU 95 between 2006 and 2012. No leaded tank bottom materials were observed in SWMU 92 (Storage Tank Areas: Buried Lead Sludge Area 6). Therefore, Sunoco requested a Final Agency Determination for SWMU 92 in AOI 6 from USEPA in 2013. Potential leaded tank bottom materials were observed in four soil samples from SWMU 95 (Storage Tank Areas: Buried Lead Sludge Area 9). The lead results were below the SSS for all samples and the TCLP results collected for three samples were below the USEPA maximum concentration of lead for toxicity concentration of 5 mg/L. Therefore, Sunoco requested a Final Agency Determination for SWMU 95 in AOI 6 from USEPA in 2013. A SWMU closure request letter will also accompany the copy of this report to the USEPA.

A total of 31 soil borings with soil sampling were advanced outside of the SWMU areas. Soil sampling also occurred during the installation of 14 monitoring wells in 2006 and six monitoring wells in 2012. The soil borings locations are shown on Figures 12a and 12b, as historic soil borings, the soil data from these investigations is summarized in Tables 4a and 4b. The 2006 and 2013 SCR/RIRs are included in Appendix J.

AOI 6 includes ASTs and many soil samples have been collected for tank characterization and closure under 25 PA Code Chapter 245, in addition to the sampling completed as part of the Act 2/One Cleanup Plan activities. Although the rationale and results of all of these soil sampling projects are not discussed in detail in this RIR, as they have been submitted to PADEP under 25 PA

Code Chapter 245 reporting, they are relevant to the characterization of AOI 6 under Act 2. The analytical results for these tank-related assessments are included in Tables 4a and 4b, and the soil sample locations are shown on Figure 2 as historic sample locations. The investigation of select tank incidents was performed as part of the field effort for this RIR, and those results are discussed in the following sections.

## 3.2 Historic Product Handling/Storage Areas

In order to investigate areas of historic product handling and storage, soil borings were advanced within the area of former Tank 237, former Tank 238 and Tank 251 during the 2016 site characterization activities. These borings included boring BH-16-039 in the vicinity of Tank 237 and BH-16-010 and SB-16-011 in the vicinity of Tank 238. None of the soil results from these borings exceeded the SHS.

## 3.3 Open Storage Tank Incidents

Evergreen intends to address all open AOI 6 storage tank incidents for which it is responsible through the 25 PA Code Chapter 245 CAP Program under separate cover. In 2014, the PADEP provided Evergreen with a list of the open Evergreen tank incidents in the PADEP database for AOI 6. One of the tank releases, PADEP Release Incident Number 37546 for Tank 250, was originally listed as on open incident by the PADEP in their 2014 summary of open incidents but was changed to closed in accordance with Mr. David Brown's Technical Review Memo dated August 29, 2017 which is included in Appendix E. PADEP release incident 46762 was assigned to a tank containing Nalco which is a filming agent (cyclohexylamine) used as an additive for boiler feedwater. Discussions with Sunoco personnel confirmed that this material was held in small temporary plastic tanks and therefore their location can not be shown on the figures. Cyclohexylamine is very biodegradable (Handbook of Environmental Fate and Exposure Data for Organic Chemicals, 1990) and is not expected to have lasted in the environment. Based on these conditions, no impacts are expected for the incident and therefore no further investigation was completed for incident 46762.The remaining open tank incidents are summarized in Table 5.

Soil characterization activities were conducted to further investigate the open storage tank incidents within AOI 6. For borings associated with storage tank incidents that involve releases within tank berms, soil analytical results are presented in this RIR for informational purposes only, as they relate to overall AOI 6 soil characterization. These data will be used in separately prepared SCRs for the identified open storage tank incidents, which will be submitted under separate cover to the PADEP in order to satisfy the requirements of 25 PA Code Chapter 245. The following summarizes the incidents that the PADEP provided to Evergreen, available information for these tanks, completed investigation activities during the 2016 site characterization activities and whether this tank will have a separate SCRs submitted to fulfill the requirements of 25 PA Code Chapter 245.

This section also includes groundwater data from the 2016 site characterization activities, if applicable to the discussion of the Tank Incident. The groundwater results are further discussed in Section 4.

### 3.3.1 GP T81 (Former PADEP Tank 121A, Incident 45692)

On September 11, 1993, a split in a line caused the release of approximately 100 gallons of liquid caustic onto the ground. The release was reported to PADEP on September 12, 1993 and Incident No. 45692 was assigned by the PADEP. A confirmation letter was sent to PADEP on October 4, 1993. The letter stated the liquid caustic was vacuumed up and the contaminated soil was removed for treatment. During the 2016 site characterization activities, three borings, BH-16-040, BH-16-041, BH-16-043 were completed in the vicinity of Tank 81. Sampling during the AOI 6 RI was conducted to characterize this release incident by analyzing for pH. The results indicate a pH range of 7.86 to 9.15 standard units (s.u.). The calculated median is 8.12. A SHS does not exist for pH. The pH results indicate the soil is slightly alkaline; however, these levels do not create hazardous condition. The pH results in groundwater in B-39 during the groundwater sampling in 2016 ranged from 7.3 to 7.5.

Although not related to the release, samples from BH-16-040, BH-16-041, and BH-16-043 had exceedances of the SHS for benzene, naphthalene, 1,2,4 TMB, none of these sample results exceeded the NRDC. The soil samples in BH-16-041 collected from 0.75 to 1.25 feet exceeded the SSS for lead, but it was vertically delineated by the soil sample collected from BH-16-041 from 1.75 to 2.25 feet. This SSS exceedance was horizontally delineated by four additional borings which were completed in 2017, BH-17-003 to 005 and BH-17-009.

### 3.3.2 GP 676 (Former Tank GPU 676, PADEP Tank 130A, Incident 4844)

Tank 676 was used to store No. 6 fuel oil. On July 19, 1998, 60 barrels of No. 6 fuel oil were released into the tank dike. Sunoco immediately took corrective action and recovered 59.5 barrels of fuel from the tank dike area. Sunoco notified the PADEP of the incident on July 20, 1998 and submitted a Notification of Reportable Release on August 10, 1998. Incident No. 4844 was assigned to this release by the PADEP. Boring BH-12-104, completed during the 2012 site characterization activities, is located in the area of former Tank 676 and had no exceedances of the SHS. During the 2016 site characterization activities, one boring BH-16-006 was completed in the tank dike of former Tank 676 and none of the soil samples collected from this boring exceeded the SHS.

Stantec conducted closure sampling within the tank berm of Tank 676 for PES in December 2016. Nine samples were collected as part of this investigation, GP676-1 though GP676-9. No obvious contamination was observed during the soil sampling. None of the samples had exceedances of the SHS. Groundwater well B-95, located in area of Tank 676, had one slight exceedance of the SHS for an estimated concentration of benzo(a)pyrene. Stantec's AST Closure Report Form for Tank 676, dated December 16, 2016 is included in Appendix J.

### 3.3.3 GP 797 (Former PADEP Tank 097A, Incident 29122)

GP 797 was an above ground storage tank (AST) which contained process water that contained light-end hydrocarbons (e.g., benzene and cumene) that was closed-in-place. The in-place closure of tank GP 797 was completed on April 30, 2002, by Sunoco. As part of the closure activities, four hand augers borings (HA-1, HA-2, HA-3, and HA-4) were completed and shallow soil samples were collected at each location, with two samples collected at HA-3. Benzene was detected at

concentrations above the NRDC in two samples. The SHS was exceeded for benzene, ethyl benzene and toluene. Based on these results Sunoco notified the PADEP of a release on June 10, 2002. PADEP issued a Notice of Violation (NOV) dated July 29, 2002 and Incident No. 29122 was assigned. In the NOV, PADEP requested a characterization of the extent of soil contamination and impact submitted in an SCR.

Sunoco submitted a closure assessment report to the PADEP for AST 797 dated July 10, 2002. Sunoco subsequently submitted a SCR for AST 797 to the PADEP dated December 12, 2002, to further characterize the release from this tank. The SCR documented the collection of three soil samples from three locations, MW-1, MW-2, and MW-3 completed outside of the containment dike. Benzene (in MW-1, MW-2, and MW-3) and toluene (in MW-3) exceeded the SHS during this sampling. Benzene also exceeded the NRDC in the soil sample collected from MW-3. Wells MW-1 through MW-3 were renamed B-149 through B-150 respectively.

During the 2012 site characterization activities, five additional soil borings with the collection of six soil samples were completed to further characterize Tank 797. Four of the borings were installed in the locations of HA-1 through HA-4 to characterize soil greater than two feet below grade. Benzene and toluene exceeded the NRDC in four of the five soil samples. The surface soil sample from boring BH-12-125 had no exceedances of the SHS. PADEP requested delineation to the northwest, north, and northeast of tank GP 797 in SCR comments dated November 22, 2013. Nine soil borings (BH-16-030 through BH-16-038) were completed during the 2016 site characterization activities to delineate conditions near the tank area within the limits of the tank berm. These samples had exceedances of the SHS for benzene, isopropyl benzene and toluene. In addition, the sample from BH-16-037 also exceeded the NRDC for benzene.

Groundwater from well B-155 located downgradient of tank 797 had exceedances of the groundwater SHS for benzene and benzo(a)pyrene during the 2016 site characterization activities as summarized in Table 7a.

## 3.4 Historic Releases

The following section discusses known historic releases that were investigated as part of the AOI 6 characterization activities. As part of the remedial investigation under Act 2, historic releases that may have created sources for COCs in soil were identified based on the available information. In order to identify areas that would require further investigation, a review of internal facility files was completed by Evergreen. PADEP also reviewed its records and provided information on historic incidents. Specific release locations were determined based on document descriptions and interviews with refinery personnel. Based on information obtained, targeted soil investigations were performed as described in the following subsections. This section also includes groundwater data from the 2016 site characterization activities, if applicable. The groundwater results are also further discussed in Section 4.

### 3.4.1 'Area West of' GP 676, or '2000 Surface Release'

On September 29, 2000, approximately 15,000 gallons of No. 6 fuel oil from No. 3 Boiler House was released from a product line outside of the tank berm for Tank 676. Approximately 7,500 gallons of product was recovered by vacuum trucks, a boom was set up due to the proximity to the bulkhead

and the contaminated soil was excavated and sent for off-site disposal. Since the release occurred outside of a tank dike, this is considered a historic release even though the PADEP assigned incident number 6133 to this event. During the 2016 site characterization activities, five borings (BH-16-002 through BH-16-006) were completed to characterize conditions between the outside of the dike for Tank 676 and the bulkhead to characterize this area. None of the soil samples collected from BH-16-002 to BH-16-006 exceeded the SHS or the SSS for lead. Groundwater downgradient of these borings in monitoring wells B-170, B-153, B-168, and B-169 had no exceedances of the SHS with the exception of lead in B-169.

### 3.4.2 1733 Unit

Approximately 840 gallons of benzene were released at the 1733 unit (Bell Hood CUE 4B) on November 27, 1995 based on a review of Sunoco's records. Three borings were completed in this area during the 2016 site characterization activities (BH-16-007 through BH-16-009). None of the soil results from these borings exceeded the SHS.

### 3.4.3 Transfer Line Located Northeast of No. 4 Boiler House

Approximately 1,300 gallons of No. 2 fuel oil were released from a transfer line located north east of the No. 4 Boiler House and east of Tank 238 on September 3, 1993. Two borings were completed during the 2016 site characterization activities (BH-2016 -16-012 through BH-2016-16-013). None of the soil results from these borings exceeded the SHS.

### 3.4.4 1332 Line

Approximately 4,400 gallons of naphtha were released from the 8-inch line outside of the tank dike for GP-251 that lead to unit 1332 on February 2, 1994. Chevron personnel applied foam and then completed vacuum removal of the release. Three borings were completed in this area during the 2016 site characterization activities (BH-16-17, BH-16-018 and BH-16-023). None of the soil results from these borings exceeded the SHS. An additional three borings (BH-16-14 to BH-16-16) were completed inside the dike of Tank 251 during the 2016 field activities based on comments from former Sunoco employees. None of the soil results from these borings exceeded the SHS.

### 3.4.5 Main Office

Approximately 4,000 gallons of jet fuel were released from an underground line near the main office in September 1992. Three borings were completed during the 2016 site characterization activities (BH-16-019 to BH-16-022). None of the soil results from these borings exceeded the SHS, with exception of BH-16-019 which exceeded the SSS for lead. The lead detection in BH-16-019 was delineated by BH-17-001 and BH-17-002.

## 3.5 Delineation of Direct Contact MSC/SSS Exceedances

In order to complete horizontal and vertical characterization in soil, areas exhibiting exceedances of the non-residential direct contact MSC (and the SSS for lead) were delineated. These areas and associated investigations are described below:

- A historic soil sample (BH-30-09) from 0 to 2 ft. bgs had a lead detection above the SSS for lead and historic soil sample (BH-29-06) from 0 to 2 ft. bgs had a lead detection above the numeric SSS for lead and a BaP detection above the NRDC. Soil samples collected from B0152, BH-12-108, BH-32-09, BH-27-09, BH-28-09, BH-29-09, BH-31-09, and BH-27-06 delineate these NRDC.
- Historic soil samples GP-797-HA-1, GP-797-B-150, and GP-797-HA-3 in the GP-797 area from 0 to 2 ft. bgs had an exceedance of the NRDC for benzene. The soil samples from BH-16-029, BH-12-122, BH-12-119, B-149, BH-16-033, BH-16-32, BH-16-031, GP-797-HA-4, and BH-12-130 delineated these NRDC exceedances for benzene.
- Historic sample BH-12-128 had an exceedance of the NRDC for benzene. The soil samples from BH-16-032, BH-12-125, BH-16-031, and BH-16-033 delineated the NRDC for benzene.
- Historic soil samples BH-12-149, BH-12-129, BH-12-128, and BH-12-124 in the GP-797 area from >2 ft. bgs had an exceedance of the NRDC for benzene. The soil samples from BH-16-032, BH-16-033, BH-12-129, BH-16-036, BH-16-035, and BH-16-008 generally delineate this exceedance for benzene.
- Soil sample BH-16-037 from 0 to 2 ft. bgs exceeded the NRDC for benzene during the 2016 site characterization activities. This sample was delineated by BH-16-025, BH-16-026, BH-16-036, BH-16-038, and by BH-12-149.
- Soil sample BH-16-019 from 0 to 2 ft. bgs exceeded the SSS for lead during the 2016 site characterization activities. This sample was delineated by BH-16-021, BH-16-020, BH-17-002, and BH-17-001.
- Soil samples BH-16-041 and BH-17-004 from 0 to 2 ft. bgs exceeded the SSS for lead during the 2016/2017 site characterization activities. These samples were delineated by BH-17-003, BH-17-009, BH-17-005, BH-16-043, and BH-16-040.
- Soil samples BH-16-025 and BH-16-037 from greater than 2 ft. bgs exceeded the NRDC for benzene during the 2016 site characterization activities. These sample were delineated by BH-16-036, BH-16-034, BH-16-030, and BH-16-008. Additional sampling may be completed for BH-16-025 during risk assessment or remedial design activities.

## 3.6 Site Characterization in the 0-2 ft. bgs interval, 2-15 ft bgs Interval and Beneath LNAPL

In response to PADEP comments to previous site characterization activities and the February 19, 2016 meeting, additional soil sampling was completed to complete characterization in the 0-2 ft. bgs

interval, 2-15 ft. bgs. interval and beneath LNAPL. These results associated with the 2016/2017 site characterization activities are described below:

- As shown on Figure 12a, the following surface samples (0-2 ft. bgs) exceeded the NRDC (or numeric SSS for lead): BH-16-019 (lead), BH-16-041 (lead), BH-16-037 (benzene), BH-17-004 (lead) and BH-16-019 (lead) during the 2016/2017 site characterization activities.
- As summarized in Table 3a, Surface samples (0-2 ft. bgs) exceeded the soil to groundwater MSCs for benzene (BH-16-026, BH-16-029, BH-16-030, BH-16-031, BH-16-034, BH-16-036, BH-16-037, BH-16-038, BH-16-040, BH-16-043, and B-175), ethylbenzene (BH-16-037), isopropylbenzene (BH-16-037), toluene (BH-16-037) and lead (BH-16-003, BH-13-004, BH-16-007, BH-16-010, BH-16-011, BH-16-15, BH-17-003, BH-17-005) during the 2016/2017 site characterization activities.
- As shown on Figure 12b, the following subsurface samples (>2 ft. bgs) exceeded the NRDC for benzene: BH-16-025 and BH-16-037 during the 2016/2017 site characterization activities.
- As summarized in Table 3b subsurface samples (>2 ft. bgs) exceeded the soil to groundwater MSCs for benzene (BH-16-027, BH-16-029, BH-16-030, BH-16-031, BH-16-032, BH-16-034, BH-16-036, and BH-16-043), 1,2,4-trimethylbenzene (BH-16-025), isopropylbenzene (BH-16-037), naphthalene (BH-16-040) and toluene (BH-16-025 and BH-16-037) during the 2016/2017 site characterization activities.
- Soil samples from BH-17-003 and BH-16-040 were selected to be collected in the vicinity of well B-39 which has identified LNAPL to address the PADEP request for soil samples in LNAPL areas. None of the results from BH-17-003 exceeded the SHS. The soil results from BH-16-040 had an exceedance of the SHS for benzene, but none of the results exceeded the NRDC. In addition, soils from historical sampling events collected in LNAPL areas from 0-2 ft collected from BH-21-06, B-161, B-148, B-149, B-150, B-175 and BH-25-06 had no exceedances for the SHS with the exception of benzene (B-148, B-149, B-150, B-175 and BH-25-06) and toluene (B-150). The soil sample collected from 2-15 feet from B-175 did not exceed the SHS.

# 4. Groundwater Investigation

## 4.1 Historic Groundwater Investigations

Available well construction details are summarized in Table 6. Previous consulting reports in Appendix L describe the various historic groundwater sampling events that have been conducted within AOI 6. All of the available analytical data for wells located in AOI 6 from 2013 to present are presented in Table 8 and all available historic groundwater data are presented in Appendix K.

## 4.2 Well Installation Activities

This section describes well installation activities that were performed as part of the 2016 remedial investigation. Activities are discussed by purpose in order to clarify characterization goals. All fieldwork was performed in accordance with *Evergreen Field Procedures (*Appendix B). Monitoring well locations are shown on Figure 2. Well logs, including both lithologic information and well construction details, are included in Appendix C. Well construction details are also summarized in

Table 6. The following sections discuss the well installation strategy/rationale; however, a summary is also available in Table 2.

In order to better delineate LNAPL and dissolved benzene plumes interior to AOI 6, additional water-table monitoring wells B-172 through B-175 (WP9-1 replacement) were installed during the 2016 remedial investigation activities. An additional location, B-171 was attempted; however, the well was not installed due to the presence of a concrete floor in this area. Several attempts were made to install B-171, but the concrete flooring was encountered at each location. Prior to the installation of the monitoring wells, well locations were cleared for subsurface utilities to 8 ft. bgs using a vacuum truck. Monitoring well installation activities were performed using hollow stem auger methods by US Environmental of Mullica, New Jersey under the oversight of GHD in April 2016. During borehole advancement, surface and subsurface soil samples were collected for laboratory analysis of the COCs in Table 1. Continuous soil sampling using a split spoon sampler was performed. A GHD geologist screened soil with a PID and logged sample lithologies. LNAPL was not observed in B-172, B-173, B-174, or B-175.

## 4.3 Groundwater Sampling Events

A comprehensive characterization groundwater sampling event, consisting of 37 monitoring wells was conducted in May 2016. A second, more focused groundwater sampling event was conducted in August 2016 for B-39, B-43, B-116, B-117, B-125, B-126, B-132, B-133, B-145, B-150, B-158, B-164, B-169, U-4, URS-1, URS-2, URS-3, URS-4, URS-5, and the newly installed wells (B-172 to B-175). All fieldwork was performed in accordance with *Evergreen Field Procedures (*Appendix B). Monitoring well locations are shown on Figure 2. All samples were analyzed for the COCs (Table 1) by Lancaster Laboratories, located in Lancaster, Pennsylvania.

Analytical results for groundwater samples collected in 2016 and all historic results for AOI 6, are summarized in Tables 7a and b and in Appendix K, respectively. Concentrations of the following COCs were detected above the non-residential MSC during the 2016 groundwater sampling events: benzene, isopropyl benzene, 1,2-dibromoethane (EDB), toluene, 1,2,4-TMB, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)pyrene , benzo(b)fluoranthene, chrysene, naphthalene, and lead. The following observations can be made concerning the groundwater exceedances:

- The benzo(a)pyrene groundwater MSC exceedances in B-162 and B-117 are delineated by B-116 and B-115.
- As shown on Figure 19, there are several wells with exceedances of the groundwater MSC for benzene. As shown on Figure 19, these wells are delineated in the downgradient direction with the exception of benzene in URS-5, which intermittently has detections of LNAPL, and is located adjacent to the bulkhead.
- One additional well with a benzene exceedance of the MSCs is B-152. This well is delineated by wells B-43 and B-168.
- Wells B-145, U-4, B-175, B-125, URS-3, B-173, and B-126 had SHS exceedances of benzene, SVOCs or lead which were delineated by B-174, URS-1, URS-4, and B-164.
- Wells B-156 and B-172 had SHS exceedances of benzene and SVOCs generally delineated by B-170.

- Groundwater samples from B-39, B-132, B-134, B-144, and B-150 were collected beneath LNAPL. As shown on Figure 19 and in Tables 7a and 7b, all of these samples had at least one detection above the groundwater MSCs as discussed below:
  - B-39 had low level exceedances of the MSCs for ethyl dibromide, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b)fluoranthene, benzo(g, h, i)perylene, chrysene and lead.
  - B-132 had low level exceedances of the MSCs for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene which is delineated by URS-5 except for benzo(a)pyrene.
  - B-134 had low level exceedances of the MSCs of benzo(a)pyrene which is delineated by B-126 and URS-5.
  - B-144 had low level exceedances of 1,2,4-trimethylbenzene, benzene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene and chrysene which is delineated by B-126.
  - B-150 had elevated exceedances of the MSCs 1,2,4-trimethylbenzene, benzene, isopropyl benzene, and toluene and low levels of benzo(a)pyrene which is delineated by B-156 with the exception of benzo(a)pyrene which is delineated by URS-5.
- The remaining wells with groundwater MSC exceedances, B-43 and B-169, are located in close proximity to the bulkhead and will be evaluated through the site-wide fate and transport report.
- None of the monitoring wells screened in the lower aquifer had exceedances of the non-residential groundwater MSCs, as presented on Figure 20.

### 4.4 Well Gauging Activities

Stantec presently conducts annual groundwater and LNAPL gauging of all existing wells at the Philadelphia Refinery. The site-wide annual well gauging event, which is typically conducted during the second quarter of each year, is used to identify the presence of LNAPL and determine groundwater flow patterns. Liquid level measurements, groundwater contour figures, and product thickness figures are submitted to PADEP with the Philadelphia Refinery Remediation Program Groundwater Remediation Status Reports during the first half of each year. Groundwater elevation contours from the May 2016 annual gauging event is included on Figure 13. In addition to the annual events, the wells included in the September 2016 groundwater gauging event were gauged are shown on Figure 14.

# 5. Site-Specific Hydrogeologic Conditions

In Section 2 above, details regarding the methodology and interpretation of regional geologic conditions were presented. The purpose of this discussion of site-specific conditions is to refine the regional hydrogeologic framework to summarize conditions observed beneath AOI 6, with an emphasis on groundwater occurrence, groundwater flow, and hydraulic head potentials. It is understood that although this RIR is designed to address subsurface conditions beneath AOI 6, PADEP has previously requested that investigations of individual AOIs look beyond the boundary of the AOI being investigated. As such, GHD has utilized well gauging from AOIs 5, 6, and 7.

Groundwater contouring and evaluation of head conditions in the study area are included on Figures 13 and 14.

## 5.1 Geologic Formations and Units Observed

On the basis of available lithologic data from boring logs, the principle of stratigraphic position, results of past investigations, review of historical maps, attempted correlation of observed lithologies across the study area to a published geologic framework (e.g., Quaternary deposits and the PRM aquifer system) documented in the AOI 1 RIR (Stantec, 2016), GHD has interpreted the following stratigraphy in the subsurface beneath AOI 6. A generalized stratigraphic column is included as Table 10 and the cross section through the facility, including AOI 6, is shown on Figure 8.

### 5.1.1 Anthropogenic Fill

Apparent fill is present everywhere beneath the existing land surface in AOI 6 and has been identified averaging approximately 10 feet. Stratigraphic Profile E-E' (Figure 8) presents the interpreted fill thickness in AOI 6.

### 5.1.2 Recent (Holocene) Alluvium

Recent alluvial deposits that post-date the Trenton gravel are present beneath filled areas within AOI 6. In general, recent alluvium defines the antecedent topography that preceded industrialization at the Philadelphia Refinery. In large part, recent alluvium within the facility is fine-grained, brown to brownish gray silt/clay with occasional lenses of sand and gravel that commonly grades with depth to include some sand. In places, decomposing organic material has also been indicated. The thickness of the recent alluvium within AOI 6 has been observed to range from approximately 20 to 35 feet. The recent alluvium is the most significant units to occur beneath AOI 6, as shown on Figure 8.

### 5.1.3 Trenton "Gravel"

The Trenton "gravel" does not occur uniformly throughout AOI 6. The Trenton "gravel" ranges in thickness from approximately 10 feet to pinching out along the eastern boundary of AOI 6. Its predominant lithology appears to be silty, clayey, poorly-sorted sand with gravel, but includes secondary sandy gravel and clay/silt lithologies in lenses. As described site-wide, the Trenton gravel is a heterogeneous unit that is reflective of its depositional environment.

### 5.1.4 Upper Clay Unit/Upper Sand Unit/Middle Clay/Middle Sand/Lower Clay

The PRM upper clay/upper sand/middle clay/middle sand and lower clay units are not interpreted to be present beneath AOI 6. It appears that these units were truncated by erosion prior to or contemporaneous with deposition of the Trenton "gravel". The Trenton "gravel" or alluvium (where the Trenton "gravel" is absent) rests unconformably above the Lower Sand unit as shown on Figure 8.

### 5.1.5 Lower Sand Unit

In general, the lower sand coarsens with depth, from a dense fine to medium pale gray, pale yellow and white quartz sand to white and varicolored sandy gravel and gravelly sand. An area of sandy gravel has been mapped beneath AOI 6 in the Lower Sand Unit. The thickness of the lower sand in AOI 6 is approximately 20 feet.

### 5.1.6 Crystalline Bedrock

Bedrock where encountered, has been described as moderately to highly-weathered mica schist. As shown on Figure 6, bedrock elevations beneath AOI 6 range from a maximum of approximately -60 feet NAVD 88, near the AOI 7/AOI 3 boundary, to a minimum of approximately -80 feet NAVD 88 in the northwest portion of AOI 6.

## 5.2 Aquifer Hydraulic Properties

Two aquifers have been identified beneath AOI 6. In general, these are the water-table (unconfined) and lower (semi-confined) aquifers. Stantec identified and evaluated properties of those aquifers at the facility through review of approximately 300 well records as documented in the AOI 1 RIR (Stantec, 2016). Records reviewed included well gauging data and where available, lithologic logs, physical properties, and well/aquifer testing data. Hydrostratigraphic units were assigned by Stantec to wells where possible using the stratigraphic profiles and nearby and deep boreholes as control points. Overall, approximately 90 percent of existing monitoring wells used at the facility are screened across the unconfined aquifer and are designed to intersect the water table. Of the remaining 10 percent screened in the lower aquifer, approximately 9 percent partially penetrate the lower sand and 1 percent are screened in either the middle sand, or across the middle clay.

It is noted that intervening PRM upper sand and middle sand aquifers do not appear to be present beneath AOI 6. It is also noted that hydraulic head potentials between the unconfined and lower aquifers are downward across AOI 6. These site-specific hydrogeologic conditions are discussed further below and are supported by Figures 13 and 15 which show groundwater elevation contours for both aquifers for 2016.

### 5.2.1 Methodology for Evaluation of Hydraulic Data

For the purposes of evaluating hydraulic head, flow direction(s) and magnitudes of groundwater flow for the aquifers identified in this RIR, GHD reviewed 2015 and 2016 water levels from annual, site-wide gauging data within the facility. For wells gauged by GHD, depth-to-water measurements were collected with an optical interface probe and reported to the nearest hundredth of a foot. Water-table elevations were calculated using surveyed well top-of-casing elevations and, where necessary due to LNAPL accumulations, corrected using LNAPL density data from the nearest available LNAPL sample data (see Table 9) for density assignments and for gauging data)

### 5.2.2 Unconfined (Water-Table) Aquifer

Beneath AOI 6, the unconfined aquifer is primarily composed of saturated portions of the fill and alluvium and the Trenton "gravel." On average, the saturated thickness of the unconfined aquifer beneath AOI 6 is approximately 20 to 30 feet. As a part of the AOI 1 RIR, Stantec (Stantec, 2016)

mined existing data and has identified estimations of horizontal hydraulic conductivity ($k_h$) for the unconfined aquifer from 15 in-situ aquifer (slug) tests and two, short-duration pumping tests (see Figure 9). None of these tests were identified in AOI 6. From those tests, estimated values of unconfined aquifer $k_h$ vary two orders of magnitude across the facility. The wide range of estimated values of $k_h$ is reflective of the heterogeneous nature of the Trenton gravel. Anomalously low values of $k_h$ may also be the result of poor well-aquifer hydraulic communication related to inadequate well development, or fouling of the well screen. Stantec is presently evaluating potential values of reported unconfined aquifer $k_h$ as a part of site-wide numerical model calibration and sensitivity analysis.

#### 5.2.2.1 Hydraulic Heads and Groundwater Flow

As shown on Figure 14, water-table mounds are apparent in AOI 6. These mounds are found immediately adjacent to the bulkhead and one is in the southeastern portion of the site. The mounding along the bulkhead is due to the lower hydraulic conductivity of the bulkhead as compared to site soils. There are also two areas of groundwater depression in the eastern and central portion of AOI 6. Review of historic groundwater contours show that these contours are consistent with previous groundwater contours. Evaluation of groundwater mounding/depression is an important component of understanding horizontal hydraulic gradients since they strongly influence contaminant fate and transport in an analytical or numerical model.

Groundwater flows to the south west towards the river. The gradient towards the southwest is 0.0019 ft/ft. This pattern is consistent with the historical contours and supports that flow in AOI 6 is towards the river.

### 5.2.3 Semi-confined (Lower) Aquifer

Groundwater flow within the lower aquifer beneath AOI 6 has been contoured utilizing data from AOI 5, 6, and 7 wells, and the resultant potentiometric surfaces are shown on Figure 15 for synoptic well gauging events conducted in May 2016. The groundwater flow direction is to the southwest under a hydraulic gradient of approximately 0.002 ft/ft.

GHD evaluated the vertical hydraulic head gradients for May and August 2016 between the unconfined and lower aquifer throughout AOI 6. There is a downward gradient between the unconfined and lower aquifers. These gradients are consistent with previous data collected in AOI 6 (2013 RIR).

Beneath the study area, the lower aquifer is primarily composed of saturated portions of the lower sand unit. On average, the saturated thickness of the lower aquifer beneath AOI 6 is approximately 25 feet. There is no available aquifer testing data for the lower aquifer at the facility. Evergreen is planning on conducting slug and hydraulic tests on the lower aquifer in AOI 4 in support off the facility wide fate and transport modeling. At the time of this RIR however, the best available $k_h$ data for the lower aquifer is estimated from historical testing performed at the Philadelphia Naval Shipyard and has been summarized on Figure 10. From those tests, values of lower sand $k_h$ are estimated to vary from approximately 123 ft/d to 151 ft/d.

# 6. LNAPL Investigation

## 6.1 LNAPL Characterization Sampling

Various petroleum products have been stored and distributed within AOI 6. Historic testing has been completed to characterize the LNAPL at the Site. The results of the tests are summarized in Appendix F and are discussed below. Stantec has gone back through the historic LNAPL sampling and has reclassified some of the LNAPL types as summarized in Table 11, these re-classifications are also included below.

### *2004*

In 2004, LNAPL samples from wells B-129, B-130, B-144, B-39, B-43, and WP 9-2 were collected and submitted to Torkelson Geochemistry, Inc. (Torkelson) for analysis. Torkelson completed gas chromatograph analysis of the samples. LNAPL characterization data included product type, density, proportions of product, weathering, and similarities to other samples.

- Well B-129 is located near the eastern border of AOI 6. Torkelson characterized the sample from B-129 as being severe-extremely weathered middle distillate with heavier material and gasoline (Langan, 2004).
- Well B-130 is located near the western border of AOI 6 along the bulkhead. Torkelson characterized the sample from B-130 as being severely-extremely weathered middle distillate and residual oil (Langan, 2004).
- Well B-144 is located near 2nd Street. Torkelson characterized the sample from B-144 as being severely weathered gasoline and residual oil (Langan, 2004).
- Well B-39 is located in the southwestern corner of AOI 6. Torkelson characterized the sample from B-39 as being severely weathered middle distillate and gasoline (Langan, 2004).
- Well B-43 is located along the bulkhead in the northwestern area of AOI 6. Torkelson characterized the sample from B-43 as being extremely weathered middle distillate (Langan, 2004).
- WP 9-2 is located along 2$^{nd}$ street in the southwestern corner of AOI 6. Torkelson characterized the sample from WP 9-2 as being severely weathered aviation gasoline and middle distillate (Langan, 2004).

### *2006*

In 2006, LNAPL samples from wells B-47 and B-150 were collected and submitted to Torkelson Geochemistry, Inc. (Torkelson) for analysis. LNAPL characterization data included product type, density, proportions of product, weathering, and similarities to other samples.

- Well B-47 is located near the center of AOI 6. Torkelson characterized the sample from B-47 as being extremely weathered residual oil with a trace of unknown aromatics (Langan, 2006).
- Well B-150 is located west central of AOI 6. Torkelson characterized the sample from B-150 as being unknown aromatics with unknown weathering (Langan, 2006).

***2013***

- During the January 2013 groundwater sampling event, 19 monitoring wells had measureable (>0.01 feet) LNAPL.

## 6.2 LNAPL Distribution

Numerous monitoring wells across AOI 6 have been gauged for LNAPL over the course of implementing the investigation and remediation programs. Stantec completed LNAPL and groundwater elevation gauging events in May 2016. During this event, 76 wells were gauged in the unconfined and semi-confined zones. LNAPL was detected in 21 wells with a maximum thickness of 4.27 feet at well B-116 during the May 2016 gauging. Figure 16 presents the May 2 2016 apparent LNAPL thicknesses from a limited groundwater gauging event and Figure 17 presents the LNAPL thickness from the May 11 2017 annual gauging.

A shown on Figure 16, during the May 2016 event there was three main areas with LNAPL detections:

- LNAPL in wells B161, B-124, B-175 delineated by B-173 and B-125.
- LNAPL in wells B-143, B-142, Sump-1, B-138 and B-147 delineated by B-126, B-138, B-141, B-134 and B-133.
- LNAPL in wells B-150, B-149 and B-148 delineated by B-155, B-156, B-163and B-154.

LNAPL was also detected in isolated wells B-130, URS-3, B-152, RW-9, U-3, and B-129 delineated by adjacent wells.

Based on evaluation of multiple lines of evidence, as presented in Appendix F (LNAPL Evaluation), LNAPL is largely present as hydraulically immobile and unrecoverable residual that is stable in overall extent. The fact that the 27 Pump House Total Fluids Recovery System has been off since September 20, 2010 and passive remediation was discontinued on January 26, 2015, with no perceived rebound in LNAPL thicknesses, also lends support to this assertion.

# 7. Vapor Investigation

The vapor intrusion pathway in AOI 6 was evaluated for potential receptors of vapors originating from subsurface soil or groundwater, in accordance with the PADEP, Land Recycling Program; Technical Guidance Manual for Vapor Intrusion into Buildings from Groundwater and Soil under Act 2, January 2017 (VI Guidance).

## 7.1 Indoor Air Sampling

Evergreen and PES identified structures that could be occupied in AOI 6 during the initial building survey and the October 2017 building survey review, as shown in Table 12 and on Figure 18. During this survey 16 structures were identified as routinely occupied or potentially occupied. These buildings included: Building 6636, 24 Gate Building 295, Lab/Bottle Washing Building 163, Girard Point Training Building 651, Girard Point Main Office Building 650, Capital Projects Tank Group

Trailers, Control Room 739, Trade Shops 178, Carpenter Shop 726, North Tank Field Blockhouse 475, WTP Control Room 745, Control Room 6627, Control Room south of Boiler House #3, Former Locker House associated with former Boiler House #2, and Office near Separator. The characteristics of several of these buildings were such that vapor intrusion is not considered a complete pathway. The building-specific conditions are as follows:

- Refinery Lab/Bottle Washing Building 163 – broken windows visible throughout that allows outdoor air flow
- Capital Projects Tank Group Trailers – elevated trailers with perforated soffit-style skirt that allows outdoor air flow
- Control Room south of Boiler House #3 – elevated without a skirt
- Former Locker House near former Boiler House #2/Process Building – locked and inaccessible, not occupied
- Office near Separator – blast resistant building sitting on ground and fork truck holes at the surface (to facilitate relocation)
- Paint Shop Building 701 – accessible but unoccupied
- Insulation Building 265 – unoccupied building used for storage

Indoor air and outdoor ambient (background) air samples were collected in March 2016 and March 2017 from the occupied buildings where the vapor intrusion pathway is potentially complete. The numbers of samples collected for each building was based on a combined approach from Appendix Z of the PADEP VI Guidance and professional judgement. The data from these sampling events are summarized in Table 13 and the locations sampled are shown on Figure 18.

A building survey and inspection was conducted to identify any potential indoor air sources of volatile organic compounds (VOCs) possibly already present within the building (e.g., smoking, cleaning products, building products, manufacturing chemicals, etc.), the number and frequency of occupants within the various buildings, and potential preferential migration pathways through the building slab (e.g., utility conduits, slab cracking, etc.). At each building GHD completed an Indoor Air Sampling Field Sheet, which is included in Appendix K.

Indoor and ambient air samples were collected using 6-liter capacity Summa™ canisters in a suitable location(s) in each building at a representative breathing zone height (i.e., 3 to 5 feet above grade). Canisters were laboratory-certified clean in accordance with Appendix Z of the PADEP draft VI guidance. The canisters were fitted with a laboratory-calibrated critical orifice flow-regulation device sized to limit the indoor air sample collection flow rate to allow for 8-hour sample collection. Canisters maintained a minimum residual negative pressure of approximately 1 to 5 inches of mercury following sample collection. Written documentation of all field activities, conditions, and sampling processes, including names of field personnel, dates and times, etc. were recorded. Documentation included building designation, building use, occupant information, and weather conditions at the time of sampling (temperature, barometric pressure, wind direction and speed, and humidity).

Outdoor air sampling locations were selected for collection of an ambient air sample in AOI 6. The outdoor locations were set at the same general elevation of the samples in the buildings and were in a position that is generally upwind of the buildings being assessed.

Table 13 summarizes the indoor air and outdoor data and compares the detected concentrations to the generic screening criteria. As shown in Table 13, all detected concentrations of constituents in indoor air were below the Pennsylvania generic non-residential SHS for indoor air, except IA-AOI6-6627 (Building 6627 Control Room), which exceeded for benzene. As shown on Table 13, the benzene concentration at this locations also exceeded 1/10$^{th}$ of the SHS. The location of indoor and outdoor air samples is shown on Figure 18.

One additional round will be conducted and reported in a future submittal. If concentrations continue to be detected above the indoor air screening level in IA-AOI6-6627 (Building 6627 Control Room) or other locations, then it will be addressed through risk assessment or remedial activities as presented in the site-wide Risk Assessment report or site-wide Cleanup Plan.

## 7.2 Air Sampling over LNAPL Plumes

In March 2016, two air samples (two locations) were collected to evaluate outdoor air quality in locations over NAPL plumes within AOI 6, at the request of the PADEP. The locations of these samples are shown on Figure 18 and the results are summarized in Table 14. These samples were collected from the breathing zone (3 to 5 feet above ground level) using Summa© canisters with laboratory-provided regulators set to collect air over one continuous 8-hour period. The samples were packaged by field personnel and transported by FedEx to Lancaster Laboratories under Chain-of-Custody documentation for analysis of volatile organic compounds (VOCs) on the Act 2/One Cleanup program petroleum short list by EPA Method TO-15.

Table 14 summarizes the outdoor air data collected over NAPL plumes and compares the detected concentrations to background concentrations. PADEP operates a network of air toxics monitoring stations that analyze for VOCs. Regional ambient air quality in the Philadelphia area where the refinery is located is best represented by data from the Marcus Hook monitoring station (latitude 39.8178, longitude -75.4142). USEPA's background residential indoor air values are also included in Table 14 to determine whether detected concentrations are within background levels. As shown in Table 14, the results for the ambient air samples collected from over LNAPL in AOI 6 are within the background levels for this area. The location of indoor and outdoor air samples is shown on Figure 18. No additional sampling is proposed for the air quality over the LNAPL areas.

# 8. Quality Assurance/Quality Control

All fieldwork conducted as part of the site characterization activities was performed in accordance with the methods outlined in Appendix B, Evergreen Field Procedures. Methods established by Evergreen to examine data quality are outlined in the Evergreen Data Usability Standard Operating Procedure (SOP). An assessment of analytical data collected as part of this investigation under the SOP is also included in Appendix H in the data usability assessment. The following sections describe specific aspects of quality assurance/quality control procedures that pertain to the activities outlined in this report.

## 8.1 Equipment Decontamination

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

## 8.2 Equipment Calibration

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

## 8.3 Sample Preservation

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

## 8.4 Documentation

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

# 9. Conceptual Site Model

GHD's conceptual understanding of the present conditions identified at AOI 6 and nearby proximity is summarized as follows.

## 9.1 Description and Site Use

- The Philadelphia Refinery is located along the banks of the Schuylkill River in the City of Philadelphia, Philadelphia County, Pennsylvania. The facility, which is located on industrial property, covers approximately 1,300 acres of land with access restricted by fencing and security measures. Current operations at the facility consist of the production of fuels and basic petrochemicals for the chemical industry.
- The area surrounding the facility is characterized by a mixture of residential, commercial, and industrial properties.
- AOI 6, also known as the Girard Point Chemicals Processing Area, encompasses approximately 100 acres and is located on the east side of the Schuylkill River. AOI 6 is a wedge-shaped property bordered by Lanier Avenue/AOI 3 to the east, Penrose Avenue

(Route 291)/Platt Memorial Bridge/AOI 5 to the south and Pennypacker Avenue/AOI 7 to the north (Figures 1 and 2).

- The entire western boundary of AOI 6 along the Schuylkill River is bound by a sheet pile wall.
- AOI 6 formerly contained numerous above ground storage tanks (ASTs) containing benzene, toluene, naphtha and other fuel stocks. A sulfuric acid plant was located along the northern boundary of the AOI. A gasoline treating unit, two reformer units, a BDDA (soap) unit, and a thermal hydro-dealkylation unit were also located in this area.
- AOI 6 currently consists of Udex and cumene units, reformer and associated naphtha hydrotreater, a diesel hydrotreater, tankage, boiler-houses and associated feed water treatment, maintenance buildings, lay-down yards, office buildings, the # 2 oil-water separator and remote Laboratory.
- There are two leaded tank bottom SWMUs (SWMU Nos. 92 and 95) located in AOI 6 that were addressed in several previous RCRA investigations as part of the EPA Corrective Action Process (CAP).

## 9.2 Geology and Hydrogeology

### 9.2.1 Geologic Framework

- The Philadelphia Refinery occurs within the up-dip limits of the Atlantic Coastal Plain, generally within 2 miles of the "Fall Line".
- Beneath AOI 6, the following Coastal Plain deposits may be present, in order of increasing depth/age: apparent fill, Quaternary alluvium [including Holocene and Pleistocene (Trenton "gravel") deposits], and the Cretaceous Potomac-Raritan-Magothy (PRM) aquifer system lower sand unit.
- The PRM upper clay, upper sand, middle sand, and lower clay are interpreted to have been cut or laterally "pinch" out in AOI 6.

### 9.2.2 Unconfined (Water-Table) Aquifer

- Beneath AOI 6, the unconfined aquifer is primarily composed of saturated portions of unconsolidated materials primarily in the fill and alluvium, with lesser amount in the discontinuous Trenton "gravel".
- On average, the saturated thickness of the unconfined aquifer beneath AOI 6 is approximately 20 to 30 feet.
- No aquifer testing was identified in AOI 6. Evergreen is planning additional aquifer testing in AOI 4 as part of the facility wide fate and transport numerical model.
- Water-table mounds are apparent in AOI 6. These mounds are found immediately adjacent to the bulkhead portion of the site. The mounding along the bulkhead is due to the lower hydraulic conductivity of the bulkhead as compared to site soils. There is also an area of groundwater depression in the eastern and central portions of AOI 6. Review of historic groundwater contours show that these contours are consistent with previous groundwater contours.

- Groundwater flows to the southwest towards the river. The gradient towards the southwest is 0.002 ft/ft. This pattern is consistent with the historical contours and supports that flow in AOI 6 is towards the river.

#### 9.2.3 Lower Aquifer (Semi-Confined)

- Beneath AOI 6, the lower aquifer is primarily composed of saturated portions of the lower sand geologic unit.
- On average, the saturated thickness of the lower aquifer beneath AOI 6 is approximately 25 feet.
- Groundwater flow within the lower aquifer beneath AOI 6 has been contoured utilizing data from AOI 5, 6, and 7 wells, and the resultant potentiometric surfaces for synoptic well gauging events conducted in May 2016. The groundwater flow direction is to the southwest under a hydraulic gradient of approximately 0.0019 ft/ft.
- GHD evaluated the vertical hydraulic head gradients for the 2016 gauging events between the unconfined and lower aquifer throughout AOI 6. There is a downward gradient between the unconfined and lower aquifers. These gradients are consistent with previous data collected in AOI 6 (2010 RIR and 2012 RIR).
- There is no available aquifer testing data for the lower aquifer at the facility. Evergreen is planning on conducting slug and hydraulic tests on the lower aquifer in AOI 4 in support off the facility wide fate and transport modeling. At the time of this RIR however, the best available $k_h$ data for the lower aquifer is estimated from historical testing performed at the Philadelphia Naval Shipyard From those tests, values of lower sand $k_h$ are estimated to vary from approximately 123 ft/d to 151 ft/d.

### 9.3 Compounds of Concerns

#### 9.3.1 Soil

- Soil delineations were performed to the non-residential direct contact MSC for COCs on Table 1 and the numeric SSS (for lead), except along the bulkhead in AOI 6.
- Several soil samples collected during the 2016 site characterization activities exceeded the non-residential direct contact MSCs for lead and benzene and one sample for benzo(a)pyrene.

#### 9.3.2 Groundwater

- Two rounds of characterization groundwater sampling were completed in 2016 in addition to other sampling in 2006 and 2012 as a part of this RIR and groundwater samples were analyzed for the COCs on Table 1.
- Concentrations of the following COCs were detected above the non-residential MSC in the water table aquifer during the 2016 groundwater sampling events: benzene, isopropyl benzene, toluene, 1,2,4-TMB, benzo(a)anthracene, beno(a)pyrene, beno(g,h,i)pyrene , benzo(b)fluoranthene, chrysene, naphthalene, and lead.

- None of the monitoring wells screened in the lower, semi-confined aquifer had exceedances of the non-residential groundwater MSCs.

### 9.3.3 Indoor/Ambient Air

- An indoor and outdoor air sampling events were conducted in March 2016 and March 2017 to represent ambient air and indoor air conditions during two heating seasons when levels of VOCs inside buildings are expected to be higher than during warmer months.
- Only one COC, benzene (in 6627 Building Control Room), was detected in an indoor samples above the PADEP VI screening criteria and the USEPA RSLs.

## 9.4 LNAPL Distribution and Mobility

- Numerous monitoring wells across AOI 6 have been gauged for LNAPL over the course of implementing the investigation and remediation programs. Stantec completed LNAPL and groundwater elevation gauging events in May 2016. During this event, 76 wells were gauged in the unconfined and semi-confined zones. LNAPL was detected in 21 wells with a maximum thickness of 4.27 feet at well B-116 during the May 2016 gauging.
- Based on evaluation of multiple lines of evidence, as presented in Appendix F (LNAPL Evaluation), LNAPL is largely present as hydraulically immobile and unrecoverable residual that is stable in overall extent. The fact that the 27 Pump House Total Fluids Recovery System has been off since September 20, 2010 and passive remediation was discontinued on January 26, 2015, with no perceived rebound in LNAPL thicknesses, also lends support to this assertion.
- A shown on Figure 16, during the May 2016 event there was three main areas with LNAPL detections:
  - LNAPL in wells B161, B-124, B-175 delineated by B-173 and B-125.
  - LNAPL in wells B-143, B-142, Sump-1, B-138 and B-147 delineated by B-126, B-138, B-141, B-134 and B-133.
  - LNAPL in wells B-150, B-149 and B-148 delineated by B-155, B-156, B-163and B-154.

  LNAPL was also detected in isolated wells B-130, URS-3, B-152, RW-9, U-3, and B-129 delineated by adjacent wells.

## 9.5 Qualitative Fate and Transport of Selected Compounds

- A soil to groundwater model to evaluate the soil to groundwater pathway was not developed for the qualitative fate and transport assessment presented in this RIR. Rather, a qualitative-level assessment of groundwater data was warranted at this stage of the investigation.
- Of the COCs identified to be present in groundwater exceeding the non-residential MSC beneath AOI 6, the majority of the exceedances are for benzene as shown on Figure 19 which are associated, generally, with the occurrence of LNAPL which is immobile as discussed in Appendix F.

## 9.6 Potential Migration Pathways and Site Receptors

- AOI 6 encompasses approximately 100 acres and is located on the east side of the Schuylkill River and access is restricted by fencing and security measures.
- PES is responsible for overall facility security and oversight of contractor safety, and PES implements PPE and work plan/permitting protocols that mitigate the potential for worker exposure to impacted soil, groundwater, and/or LNAPL through the direct contact pathway.
- AOI 6 areas with identified soil exceedances of the direct-contact MSC for BaP and benzene, with the exception of BH-16-025, and SSS for lead have been delineated and remedies will be addressed in future Act 2 submissions, including a Facility-Wide Cleanup Plan. Additional delineation of benzene in BH-16-025 may be completed to support risk assessment or remedial activities.
- Concentrations of COCs identified through indoor and ambient air sampling met the PADEP indoor air criteria and the USEPA RSLs 1e-5 or HI of 0.1.
- Free-phase and residual LNAPL present beneath portions of AOI 6 appear to be contained within the property boundary and where present, of limited mobility.
- COCs are present in unconfined aquifer groundwater at concentrations above their respective SHS within AOI 6 and adjacent to the river.
- None of the COCs exceeded the groundwater MSCs in the lower aquifer.
- The Schuylkill River is adjacent to, AOI 6 but the bulkhead separates the water table aquifer and the river. The unconfined aquifer is not utilized for municipal or nearby communal, potable water supply in south Philadelphia. Results of the potable well search are presented in Appendix M.

# 10. Qualitative Fate and Transport Assessment

On September 28, 2015, Evergreen's team of consultants met jointly with the PADEP to discuss the groundwater fate and transport modeling approach under Act 2 at the Philadelphia Refining Complex. At that time, it was collaboratively decided that individual AOI RIR submissions would include qualitative assessments of contaminant fate and transport, including an evaluation of plume stability, COC trends, and potential impacts to surface water. Findings and conclusions of the AOI-specific, qualitative assessments of fate and transport will ultimately be used in a calibrated, steady-state MODFLOW model to perform quantitative fate and transport, including predictive simulations that will address cumulative mass loading to potential receptors.

The following discussion qualitatively summarizes factors that may influence contaminant fate and transport at AOI of the facility.

## 10.1 Geologic Framework

As discussed in detail in Sections 2 and 5 of this report, the geologic framework present beneath and in close proximity to AOI 1 can be summarized as follows:

- The Philadelphia Refinery occurs within the up-dip limits of the Atlantic Coastal Plain, generally within 2 miles of the "Fall Line".
- Beneath AOI 6, the following Coastal Plain deposits may be present, in order of increasing depth/age: apparent fill, Quaternary alluvium [including Holocene and Pleistocene (Trenton "gravel") deposits], and the Cretaceous Potomac-Raritan-Magothy (PRM) aquifer system lower sand unit.
- The PRM upper clay, upper sand, middle sand, and lower clay are interpreted to have been cut or laterally "pinch" out in AOI 6.

## 10.2 Hydrogeology

As summarized above and discussed in detail in Section 5 of this report, the geologic framework present beneath and in close proximity to AOI 6 supports the following hydrogeologic conditions:

- Two aquifers have been identified beneath the Philadelphia Refinery. In general, these are the water-table (unconfined) and a lower aquifer. Their properties are as follows.

### 10.2.1 Unconfined (Water-Table) Aquifer

- Beneath AOI 6, the unconfined aquifer is primarily composed of saturated portions of unconsolidated materials primarily in the fill and alluvium, with lesser amount in the discontinuous Trenton "gravel".
- On average, the saturated thickness of the unconfined aquifer beneath AOI 6 is approximately 20 to 30 feet.
- No aquifer testing was identified in AOI 6. Evergreen is planning additional aquifer testing in AOI 4 as part of the facility-wide fate and transport numerical model.
- Water-table mounds are apparent in AOI 6. These mounds are found immediately adjacent to the bulkhead. Groundwater depressions are found in the eastern and central portion of AOI 6.
- Groundwater flows southwest towards the river with a gradient of 0.002 ft/ft. This pattern is consistent with the historical contours and supports that flow in AOI 6 is towards the river.

### 10.2.2 Lower Aquifer (Semi-Confined)

- Beneath AOI 6, the lower aquifer is primarily composed of saturated portions of the lower sand geologic unit.
- On average, the saturated thickness of the lower aquifer beneath AOI 6 is approximately 25 feet.
- Groundwater flow within the lower aquifer beneath AOI 6 has been contoured utilizing data from AOI 5, 6, and 7 wells, and the resultant potentiometric surfaces are shown on Figure 15 for

synoptic well gauging events conducted in May 2016. The groundwater flow direction is to the southwest under a hydraulic gradient of approximately 0.002 ft/ft.

- GHD evaluated the vertical hydraulic head gradients for May and August 2016 between the unconfined and lower aquifer throughout AOI 6. There is a downward gradient between the unconfined and lower aquifers. These gradients are consistent with previous data collected in AOI 6 (2006 SCR and 2012 RIR).
- There is no available aquifer testing data for the lower aquifer at the facility. Evergreen is planning on conducting slug and hydraulic tests on the lower aquifer in AOI 4 in support off the facility wide fate and transport modeling. At the time of this RIR however, the best available $k_h$ data for the lower aquifer is estimated from historical testing performed at the Philadelphia Naval Shipyard From those tests, values of lower sand $k_h$ are estimated to vary from approximately 123 ft/d to 151 ft/d.

## 10.3 Hydrogeology and Topography

- LiDAR data collected in 2010 indicates that present-day topography is relatively flat within AOI 6 and proximity, where land surface elevations generally range from approximately 60 feet to just over 75 feet NAVD 88.
- Within AOI 6, much of the surface area present is impervious or assumed to be of limited permeability.
- The Schuylkill River is directly adjacent to AOI 6.
- National Weather Service Online Weather Data (NOWData) for Philadelphia, Pennsylvania, indicates that since 1872, mean annual precipitation is approximately 42 inches (ranging from approximately 29 to 64 inches).
- Stormwater runoff within AOI 6 is managed by an onsite storm sewer system that is sent to the facility's Girard Point Wastewater Treatment Plant.
- Natural recharge of the unconfined aquifer beneath AOI 6 and proximity is assumed to be spatially variable but limited in overall capacity as a result of: the high percentage of impervious surface coverage present; and, the fine-grained nature and extent of recent alluvial deposits above the water table.

## 10.4 Anthropogenic Features

### 10.4.1 Historic Fill

Apparent fill is present beneath the existing land surface at most locations in AOI 6 and has been identified to be approximately 10 feet. The fill is generally heterogeneous in nature and is composed of an admixture of sand and gravel, mud, and anthropogenic debris included cinders, ash, bricks, cinder block, and metal.

### 10.4.2 Former Remediation Systems

The 27 Pump House Total Fluids Recovery System was turned off September 20, 2010 due to absence of recoverable product. Passive remediation began on October 10, 2010 with the installation of absorbent socks in wells B-124, B-132, B-137, B-139, B-142, B-143, and B-147. These wells were gauged on a quarterly basis and any detected LNAPL was passively recovered and transferred to the system holding tank. Based on limited recoverable LNAPL in the proximal wells, passive remediation was discontinued on January 26, 2015. A summary of the remediation systems is presented in Appendix G.

## 10.5 Groundwater Constituents of Concern

### 10.5.1 Unconfined (Water Table) Aquifer

Concentrations of the following COCs were detected above the groundwater MSCs in unconfined aquifer groundwater during the 2016 characterization sampling events; benzene, isopropyl benzene, 1,2-dibromoethane (EDB), toluene, 1,2,4-TMB, benzo(a)anthracene, beno(a)pyrene, beno(g,h,i)pyrene , benzo(b)fluoranthene, chrysene, naphthalene, and lead. These results are consistent with historic sampling for COCs that have been previously analyzed in AOI 6.

The areas that are not proposed to be evaluated for remedial action in the Cleanup Plan have very low levels of semi-volatile compounds and are delineated by other monitoring wells or the bulkhead. These compounds will be evaluated by the site-wide Fate and Transport modeling.

### 10.5.2 Lower Aquifer

No concentrations of COCs were detected above the groundwater MSCs in lower aquifer groundwater during 2016 characterization sampling events. This is consistent with the results from previous sampling events.

## 10.6 Potential Onsite and Offsite Receptors

Based on the identified impacts to groundwater at AOI 6, GHD has evaluated the following as potential receptors:

- Vapor intrusion effecting potential occupants of buildings in AOI 6 was evaluated. The results did not exceed the PADEP VI screening levels with the exception of one detection of benzene.
- The Schuylkill River could receive AOI 6 groundwater discharging to the river. Although the bulkhead will limit migration of the groundwater from AOI 6 to the river.
- Potable consumption of impacted groundwater could affect human health. No known potable supply wells exist at or in proximity to AOI 6. Results of the potable well search are presented in Appendix M.
- The PRM aquifer system is heavily utilized for water supply in New Jersey. The aquifers of that system, chiefly the lower sand unit, receive recharge via vertical leakage through confining units and direct recharge from younger deposits along their subcrop area in south Philadelphia. None of the COCs were above the groundwater MSCs in the lower Aquifer in AOI 6.

## 10.7 Plans for Quantitative Fate and Transport Analysis

Stantec is presently developing a site-wide groundwater flow model using the USGS MODFLOW2000 computer code and Groundwater Vistas Version 6 software. The MT3DMS contaminant transport module will be utilized to simulate predictive scenarios of the fate and transport of selected COCs in groundwater. The modeling is being performed to meet and demonstrate compliance with the PADEP Site-Specific Standard for remediation of pre-existing contamination under Act 2, Pennsylvania's Land Recycling Program. Under Act 2 and in consideration of the One Cleanup Program, an analysis of the fate and transport of petroleum-related constituents is needed, in general, to assess risk to potential receptors, assess plume stability, and estimate time to project closure.

The site-wide flow model will focus on groundwater movement within the Coastal Plain of south Philadelphia, Pennsylvania, near the Philadelphia Refinery. The model domain was adopted from an earlier USGS model developed by Schreffler (2001), later updated by Sloto (2012), and has been updated by Stantec to more-closely simulate site-specific groundwater flow conditions beneath the facility. Updates to the Schreffler (2001) model have included model layer refinement, grid discretization, updates to the model layer hydraulic properties using site-specific testing data, and the inclusion of drains to simulate losses to the sewers and/or localized pumping centers (e.g., Mingo Creek Pump Station). It is anticipated that Stantec will present the site-wide flow model to PADEP for comment prior to utilization of the model in any fate and transport analyses at the refinery in support of a facility-wide Cleanup Plan, or a site-wide RIR to address cumulative loading of COCs to receptors.

# 11. Ecological Assessment

The majority of AOI 6 is covered with soil, gravel, and impervious surfaces. The soil and gravel-covered portions of AOI 6 are not likely to serve as a breeding area, migratory stopover, or primary habitat for wildlife. On September 23, 2016, a survey of endangered, threatened, and special concern wildlife and habitat was conducted by submitting a search request through the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Tool. The results of the PNDI search identified no known impacts by the PA Game Commission, the PA Department of Conservation and Natural Resources, and the U.S. Fish and Wildlife Service.

The PNDI search identified potential endangered and threatened species impacts that required further review by the PA Fish and Boat Commission. A no effect letter request was submitted to the PFBC on October 22, 2016. A response was received from the PFBC on November 3, 2016 indicating that no impact is anticipated to the species of special concern. Evergreen intends on completing a habitat assessment to document habitat types present and adjoining AOI 6 and the suitability of these habitats to support species of concern based on the results of the PNDI search even though a no effect letter was received from the PFBC. Evergreen will complete these assessments in accordance with PA Chapter 250.311 and the Pennsylvania Technical Guidance Manual (TGM) by a qualified biologist. The results of this assessment will be included in a future submittal. All ecological assessment documentation is included in Appendix I.

# 12. Community Relations 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 investigation activities at the Site. This plan incorporates aspects of public involvement under both PADEP's Act 2 program and USEPA's RCRA Corrective Action program. 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. As part of the CRP, Evergreen has held an initial public meeting in the City of Philadelphia to present the strategy and give status updates of the project at the CRP meeting on an as requested basis. A copy of the original NIR, the 2014 NIR and the Act 2 report notifications for this RIR are included in Appendix A.

# 13. Conclusions and Recommendations

GHD has prepared this RIR for AOI 6 of the Philadelphia Refinery Complex to satisfy the requirements of Act 2, as specified under 25 PA Code §250.408. The documented investigation activities were performed in general accordance with a 2011 revised Work Plan for Site-wide Approach Under the One Cleanup Program, and were conducted in support of Evergreen's commitment to remediate legacy environmental impacts that existed at the facility prior to its conveyance to PES in 2012 (Buyer-Seller Agreement). In support of those stated objectives, this report has described a comprehensive evaluation of available historical data pertaining to AOI 6, and has documented a remedial investigation strategy that included the collection of a significant amount of additional subsurface information in the time since previous AOI 6 Act 2 deliverables were submitted to PADEP (2013 SCR/RIR). Investigations performed as a part of this report also considered and where relevant, sought to address PADEP comments directed towards previous RIR submissions for the facility.

The following summarizes the conclusions and recommendations regarding AOI 6.

## 13.1 Soil

Some historical samples had exceedances of the direct-contact MSC for, BaP, lead and benzene. These historical samples have been delineated.

Limited soil samples collected in 2016 exceeded the numeric SSS for lead, the NRDC for benzene and BaP. Additional sampling may be completed to support site-wide Risk Assessment or site-wide Cleanup Plan Reports to delineate benzene in the vicinity of AOI 6-16-025.

## 13.2 Groundwater

### 13.2.1 Unconfined (Water-Table) Aquifer

Benzene, isopropyl benzene, 1,2-dibromoethane (EDB), toluene, 1,2,4-TMB, benzo(a)anthracene, beno(a)pyrene, beno(g,h,i)pyrene , benzo(b)fluoranthene, chrysene, naphthalene, and lead exceeded the current non-residential MSCs in the unconfined aquifer.

The concentrations of COCs exceeding the MSCs in the unconfined aquifer have generally been delineated. The following wells have groundwater MSC exceedances but are not explicitly delineated by other wells with concentrations below MSCs: B-39, B-43, B-169, U-4, and URS-5. These wells are located near the bulkhead and do not have any wells that can delineate these concentrations.

### 13.2.2 Lower Aquifer

None of the samples in the lower aquifer exceeded the non-residential MSCs, which is consistent with historic data in AOI 6 therefore no further assessment was completed for the Lower Aquifer in this RIR. As indicated above for the unconfined aquifer, a MODFLOW model will be utilized during quantitative fate and transport analyses to evaluate the Lower Aquifer for the facility.

## 13.3 Vapor Intrusion

Concentrations of COCs in indoor and outdoor ambient air were evaluated in the ten occupied buildings in AOI 6 where the vapor intrusion pathway is potentially complete. There were no exceedances of the PADEP VI criteria except IA-AOI6-6627 (Building 6627 Control Room), which exceeded for benzene. Evergreen is intending to complete an addition round of indoor air sampling within AOI 6. Results of the additional sampling event will be reported to PADEP in a future Act 2 deliverable. Indoor air concentrations in exceedance of the indoor air screening criteria will be addressed in a site-wide risk assessment or remedial activities as presented in the site-wide Risk Assessment report or site-wide Cleanup Plan.

## 13.4 LNAPL

LNAPL within AOI 6 has been delineated, except in areas along the bulkhead where delineation is not possible. The majority of LNAPL sampled was categorized as a light to middle distillates. LNAPL recovery has been suspended due to poor recovery and immobility of the LNAPL.

# 14. References

ARCADIS (2013). Second Quarter 2013 Report for the Former Defense Supply Center Philadelphia Facility, Philadelphia, PA.

Balmer, W.T., and Davis, D.K. (1996). Ground-Water Resources of Delaware County, Pennsylvania, Pennsylvania Geological Survey, 4th Series, Water Resources Report 66: 67p.

Bosbyshell, H. (2008). Bedrock Geologic Map of a Portion of the Philadelphia Quadrangle, Montgomery and Philadelphia Counties, Pennsylvania, Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey OFBM 08-05.0.

Greenman, D.W., Rima, D.R., Lockwood, W.N., and Meisler, H. (1961). Groundwater Resources of the Coastal Plain Area of Southeastern Pennsylvania, Pennsylvania Geological Survey Bulletin W13.

Integrated Science & Technology (IST), Inc. (1998). Non-Aqueous Phase Liquid (NAPL) Source Study at Defense Supply Center Philadelphia, Philadelphia, PA.

Langan (2004) Current Conditions Report, Sunoco Philadelphia Refinery, Philadelphia, PA.

Langan (2006) Site Characterization Report AOI 6, Sunoco Philadelphia Refinery, Philadelphia, PA.

Langan (2013) SCR/RIR, Sunoco Philadelphia Refinery, Philadelphia, PA.

Langan (2015) Human Health Risk Assessment Report, PES, Belmont Terminal and MHIC, Philadelphia, PA.

Low, D.J., Hippe, D.J., and Yannacci, D. (2002). Geohydrology of Southeastern Pennsylvania, U.S. Geological Survey Water-Resources Investigations Report 00-4166: 347p.

Navoy, A.S. and Carleton, G.B. (1995). Ground-Water Flow and Future Conditions in the Potomac-Raritan-Magothy Aquifer System, Camden Area, New Jersey, New Jersey Geological Survey Report 38: 184p.

Owens, J.P., and Minard, J.P. (1979). Upper Cenozoic Sediments of the Lower Delaware Valley and Northern Delmarva Peninsula, New Jersey, Pennsylvania, Delaware and Maryland, U.S. Geological Survey Professional Paper 1067-D: 47p.

Pennsylvania Department of Environmental Protection, Bureau of Waste Management (2002). Pennsylvania Code, Title 25. Environmental Protection, Chapter 245. Administration of the Storage Tank and Spill Prevention Program. Commonwealth of Pennsylvania, p. 48-66.2.

Pennsylvania Department of Environmental Protection, Bureau of Land Recycling and Waste Management (2002). Pennsylvania Code, Title 25. Environmental Protection, Chapter 250. Administration of Land Recycling Program. Commonwealth of Pennsylvania.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 1 – Medium Specific Concentrations (MSCs) for Organic Regulated Substances in Groundwater. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 2 – Medium Specific Concentrations (MSCs) for Inorganic Regulated Substances in Groundwater. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 3a – Medium-Specific Concentrations (MSCs) For Organic Regulated Substances In Soil: Direct Contact Numeric Values. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 3b – Medium-Specific Concentrations (MSCs) For Organic Regulated Substances In Soil: Soil To Groundwater Numeric Values. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 4a – Medium-Specific Concentrations (MSCs) for Inorganic Regulated Substances in Soil: Direct Contact Numeric Values. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection, Land Recycling Program (2013). Statewide Health Standards, Table 4b – Medium-Specific Concentrations (MSCs) for Inorganic Regulated Substances in Soil: Soil to Groundwater Numeric Values. http://www.portal.state.pa.us/portal/server.pt/community/land_recycling_program/20541/statewide_health_standards/1034862.

Pennsylvania Department of Environmental Protection (2015). Land Recycling Program Technical Guidance Manual for Vapor Intrusion into Buildings from Soil and Groundwater under Act 2 (Draft).

Paulachok, G.N. (1991). Geohydrology and Ground-Water Resources of Philadelphia, Pennsylvania, U.S. Geological Survey Water-Supply Paper 2346: 79p.

Schreffler, C.L. (2001). Simulation of Ground-Water Flow in the Potomac-Raritan-Magothy Aquifer System Near the Defense Supply Center Philadelphia, and the Point Breeze Refinery, Southern Philadelphia County, Pennsylvania, U.S. Geological Survey Water-Resources Investigations Report 01-4218: 48p.

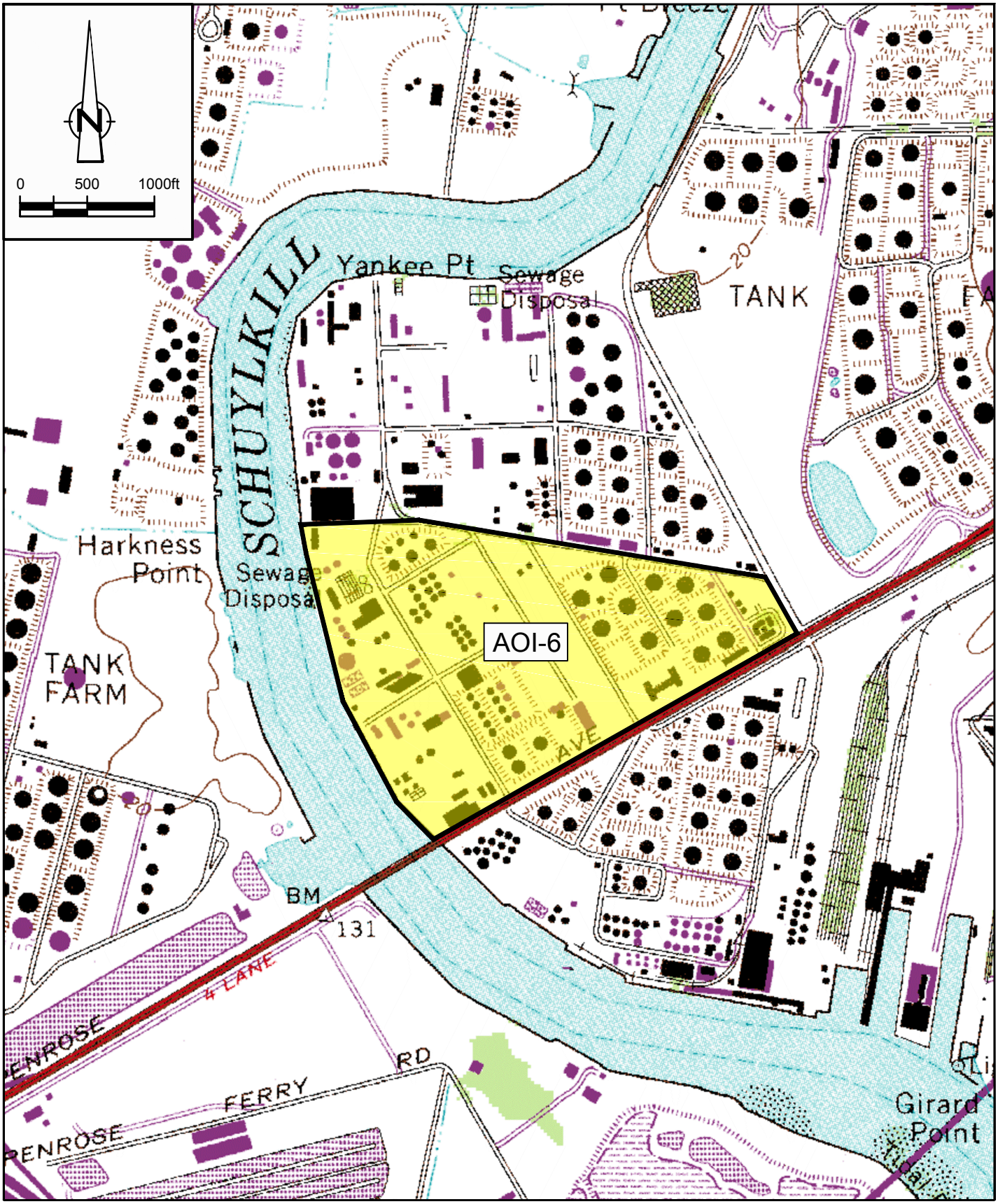
Sevon, W.D. and Braun, D.D. (2000). Glacial Deposits of Pennsylvania, Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey Map Series No. 59 (2200-MP-DCNR3027).

Sevon, W.D., Fleeger, G.M., and Shepps, V.C. (1999). Pennsylvania and the Ice Age (2nd Edition), Pennsylvania Geological Survey, 4th Series, Educational Series 6: 30p.

Sunoco (2006). Work Plan for Site Characterization Area of Interest 6, Sunoco Philadelphia Refinery, Philadelphia, PA.

Trapp, H. (1992). Hydrogeologic Framework of the Northern Atlantic Coastal Plain in Parts of North Carolina, Virginia, Maryland, Delaware, New Jersey, and New York, Regional Aquifer-System Analysis – Northern Atlantic Coastal Plain, U.S. Geological Survey Professional Paper 1404-G: 59p.

USGS (2010). National Elevation Dataset, 1/9 Arc Second Raster Elevation Data, The National Map (download platform).




SOURCE: USGS QUADRANGLE MAP, PHILADELPHIA, PENNSYLVANIA, 1995

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

11109613-01
Dec 1, 2016

# SITE LOCATION MAP

FIGURE 1

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA001.DWG


GHD Limited
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com

Source: Aerial: Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

0 150 300 450
Feet

Coordinate System:
NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

**Legend**

- 2016 RI Groundwater Sample
- Water Table Monitoring Well
- Recovery Well
- Deep Monitoring Well
- Damaged Monitoring Well
- Destroyed Monitoring Well
- Monitoring Well (Unable to Locate)
- Piezometer
- 2016 RI Soil Sample
- 2017 RI Soil Sample
- Historical Soil Sample
- 2016 RI (Not Sampled)
- 2016 RI (Attempted Sample Location)
- Air Sample
- Bulkhead
- Tank
- Tank Addressed in SCR/RACR 2017
- Solid Waste Management Unit
- Area Of Interest

Original Size
**ANSI D**

Bar is one inch on original size drawing
0 1"

Project : 11109613

Date: Nov 20, 2017

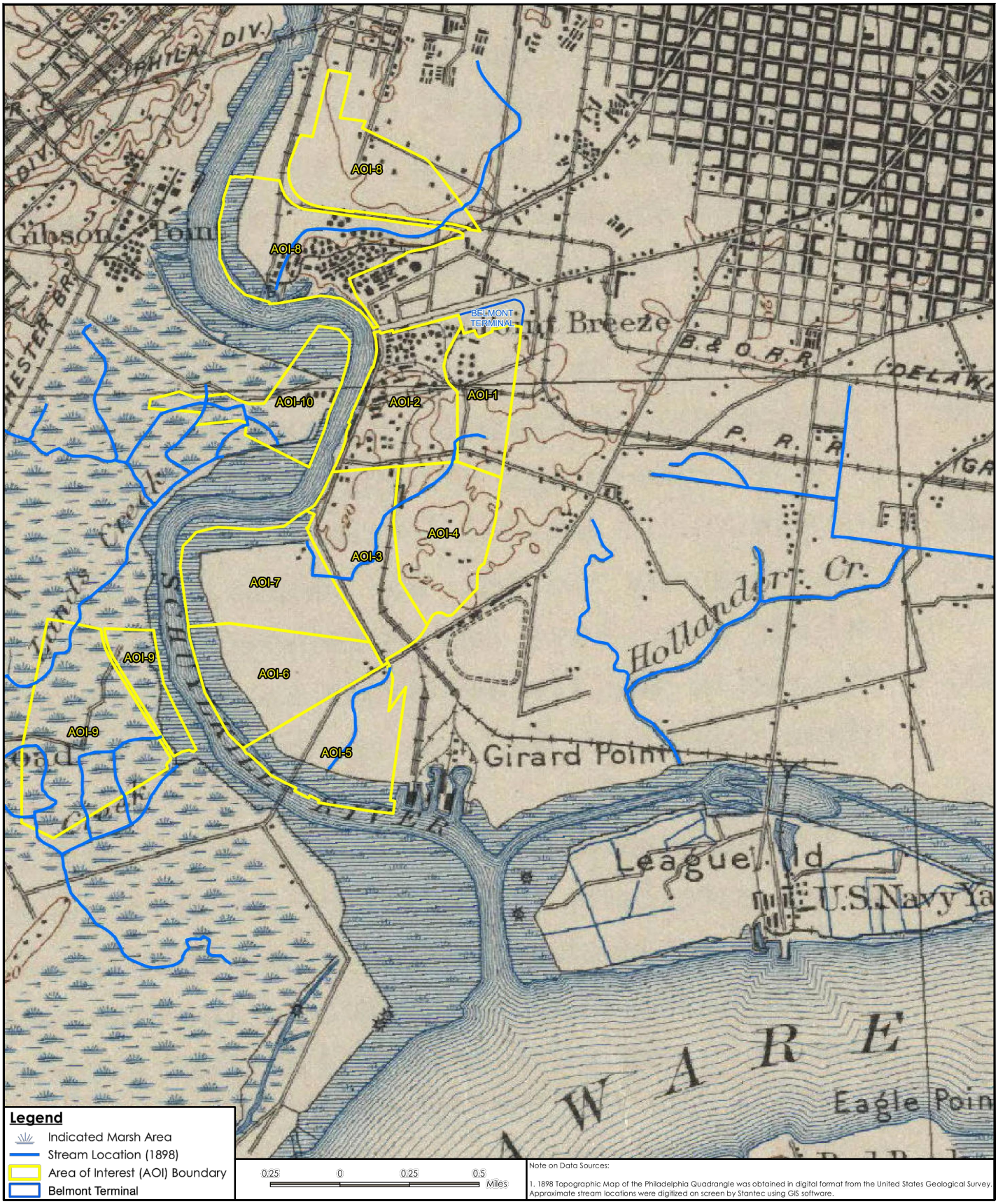
# EVERGREEN RESOURCES MANAGEMENT AOI-6 PHILADELPHIA REFINERY OPERATIONS

## AOI 6 SITE PLAN

Figure No.

**FIGURE 2**

GIS File: Q:\GIS\PROJECTS\11109000s\11109613\Layouts\002\11109613-00(002)GIS-OT002.mxd




SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

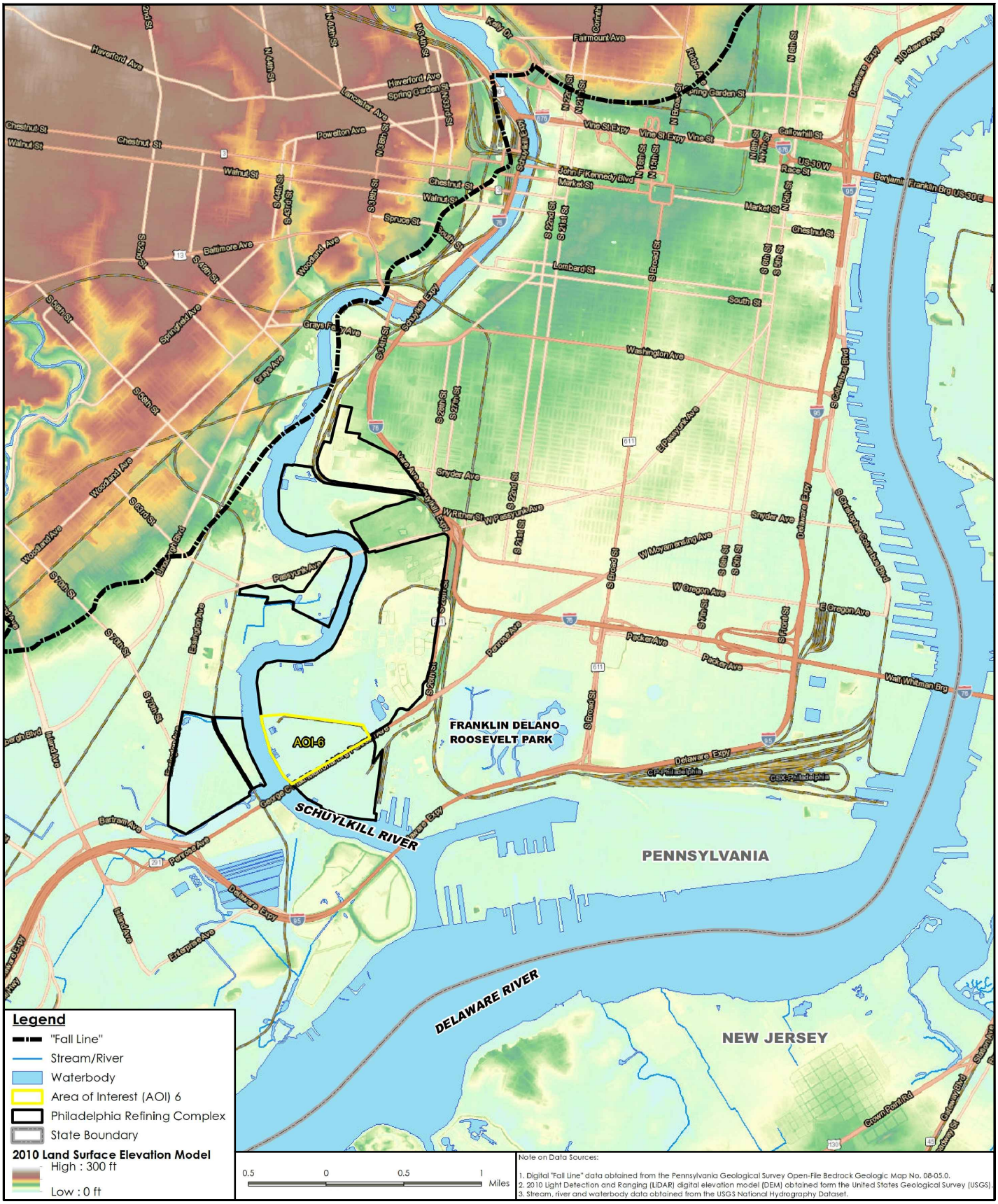
11109613-01

Dec 1, 2016

# HISTORIC STREAM AND MARSH LOCATIONS (CIRCA 1898)

FIGURE 3

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA002.DWG




SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

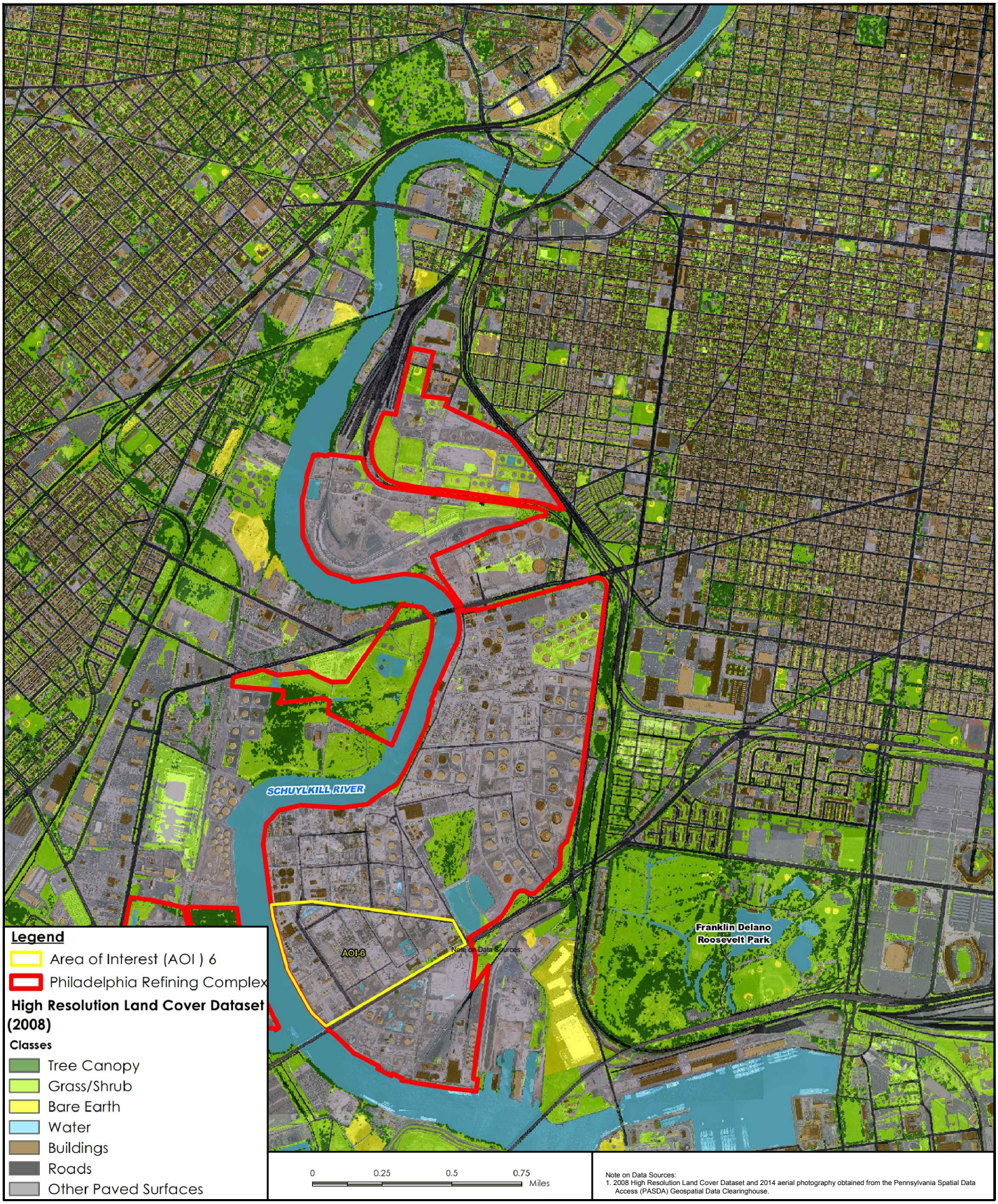
11109613-01

Dec 20, 2016

# GEOGRAPHIC SETTING

# FIGURE 4

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA003.DWG




SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

11109613-01

Dec 20, 2016

# HIGH RESOLUTION LAND COVER DATASET (2008) - CITY OF PHILADELPHIA

FIGURE 5

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA004.DWG


SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

11109613-01

Dec 20, 2016

# GENERALIZED BEDROCK GEOLOGIC MAP

FIGURE 6

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA005.DWG


GHD Limited
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
**T** 519 884 0510 **F** 519 884 0525 **W** www.ghd.com

Source: Aerial: Microsoft product screen shot(s) reprinted with permissionfrom Microsoft Corporation

0 150 300 450
Feet

Coordinate System:
NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

**Legend**

- Stratigraphic Profile Boring Location
- 2016 RI Groundwater Sample
- 2016 RI Soil Sample
- Water Table Monitoring Well
- Recovery Well
- Deep Monitoring Well
- Damaged Monitoring Well
- Destroyed Monitoring Well
- Monitoring Well (Unable to Locate)
- Piezometer
- Tank
- Stratigraphic Profile Location
- Area Of Interest

Original Size
**ANSI D**

Bar is one inch on original size drawing
0 1"

Project : 11109614

Date: Nov 20, 2017

# EVERGREEN RESOURCES MANAGEMENT
# AOI-6 PHILADELPHIA REFINERY OPERATIONS

## STRATIGRAPHIC PROFILE LOCATION MAP

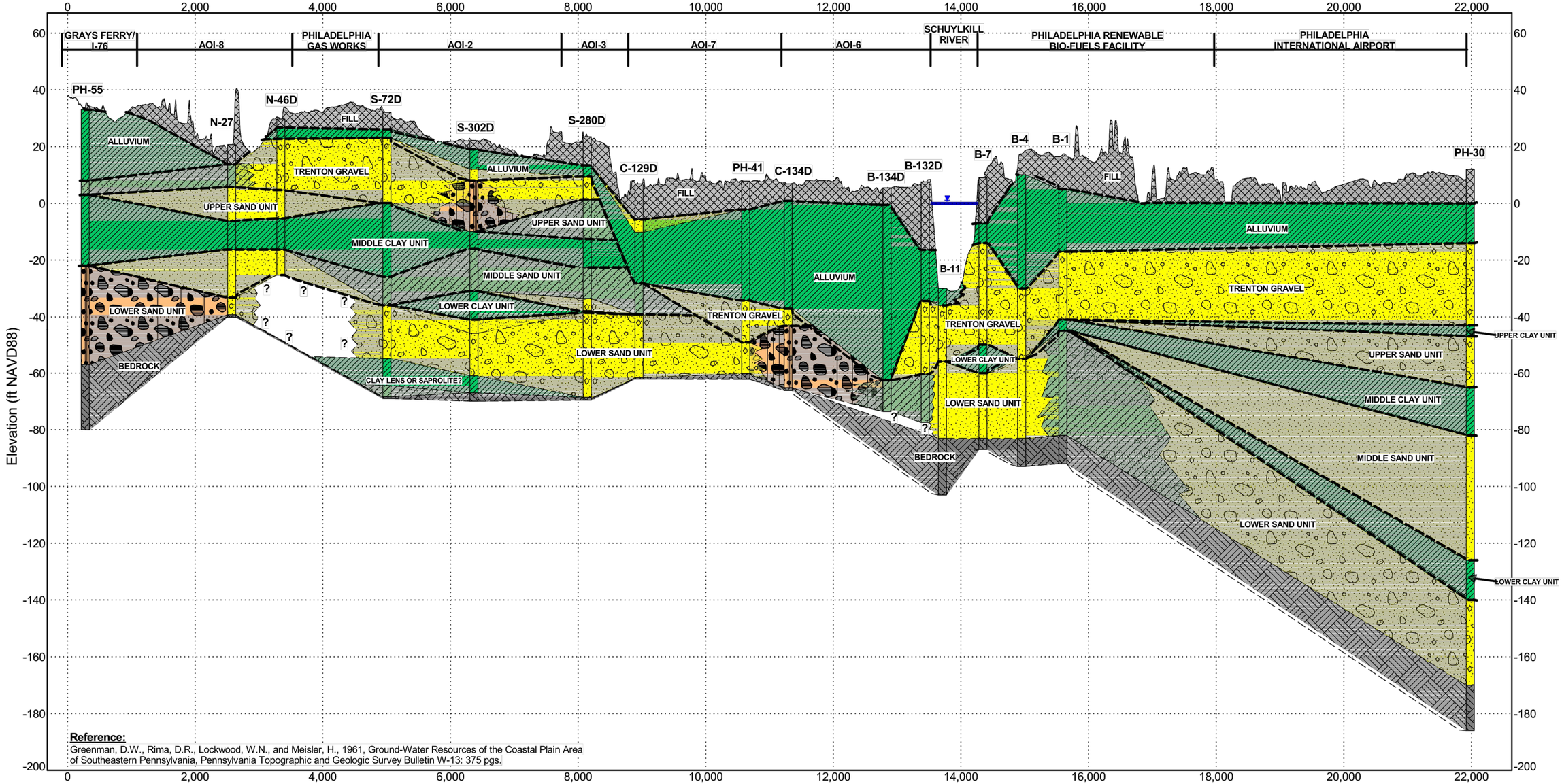
Figure No.

**FIGURE 7**

GIS File: Q:\GIS\PROJECTS\11109000s\11109613\Layouts\002\11109613-00(002)GIS-OT007.mxd

E
NORTHEAST

E'
SOUTHWEST




**Reference:**
Greenman, D.W., Rima, D.R., Lockwood, W.N., and Meisler, H., 1961, Ground-Water Resources of the Coastal Plain Area of Southeastern Pennsylvania, Pennsylvania Topographic and Geologic Survey Bulletin W-13: 375 pgs.

SOURCE: PHILADELPHIA REFINERY REMEDIATION PROGRAM GROUNDWATER REMEDIATION STATUS REPORT, FIRST HALF 2016, STANTEC, 2016.

## GENERALIZED LITHOLOGY GRAPHICS

- Fill
- Sand (incl. trace to little silt/clay/gravel)
- Mud
- Sandy Gravel
- Muddy Sand
- Bedrock (incl. saprolite where indicated)
- Gravelly Sand
- Sand with Lignite

Notes:

1. Land surface profile obtained from a 2010 light detection and ranging (LiDAR) elevation model available from the United States Geological Survey (USGS).
2. Lithologic logs for borings PH-55, PH-41, B-11, B-7, B-4, B-1 and PH-30 were obtained from Tables 13 and 14 of Greenman et al., 1961. Geographic locations for those historic borings were estimated by Stantec in a GIS using a georeferenced image of Plate 1 of that report. Fill thicknesses interpreted by Stantec
3. PH-55 terminal boring depth deeper than shown.
4. Water depths for the Schuylkill River were estimated using soundings provided on the National Oceanic and Atmospheric Administration (NOAA) navigation chart for the Delaware River, Philadelphia and Camden Waterfronts (Chart 12313). Mean lower low water (MLLW) depths were transformed to the North American Vertical Datum of 1988 (NAVD 88).
5. Stantec generalized lithologic data from available borehole logs into 8 categories as indicated for interpretive purposes.
6. Correlation between lithologies and, where applicable, geologic units is based on the straight-line method. Actual conditions between boreholes may vary from what is shown on this profile. Contacts dashed where inferred.
7. Vertical Exaggeration ~ 45 X

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

11109613-01

Dec 1, 2016

# STRATIGRAPHIC PROFILE

FIGURE 8

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA011.DWG


SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

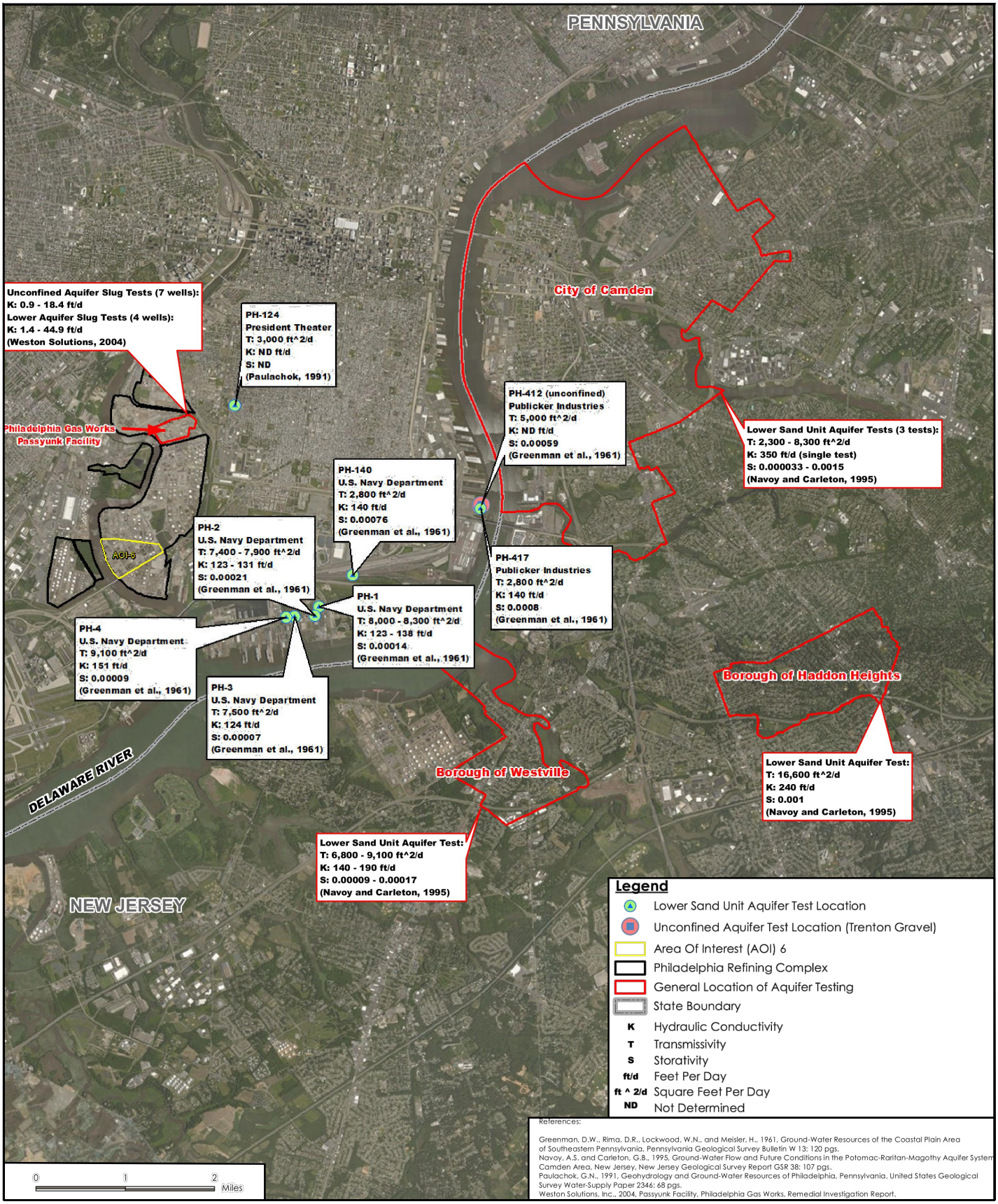
11109613-01

Jan 19, 2017

# SUMMARY OF AVAILABLE AQUIFER TESTING DATA FOR THE UNCONFINED AQUIFER

FIGURE 9

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA006.DWG




SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

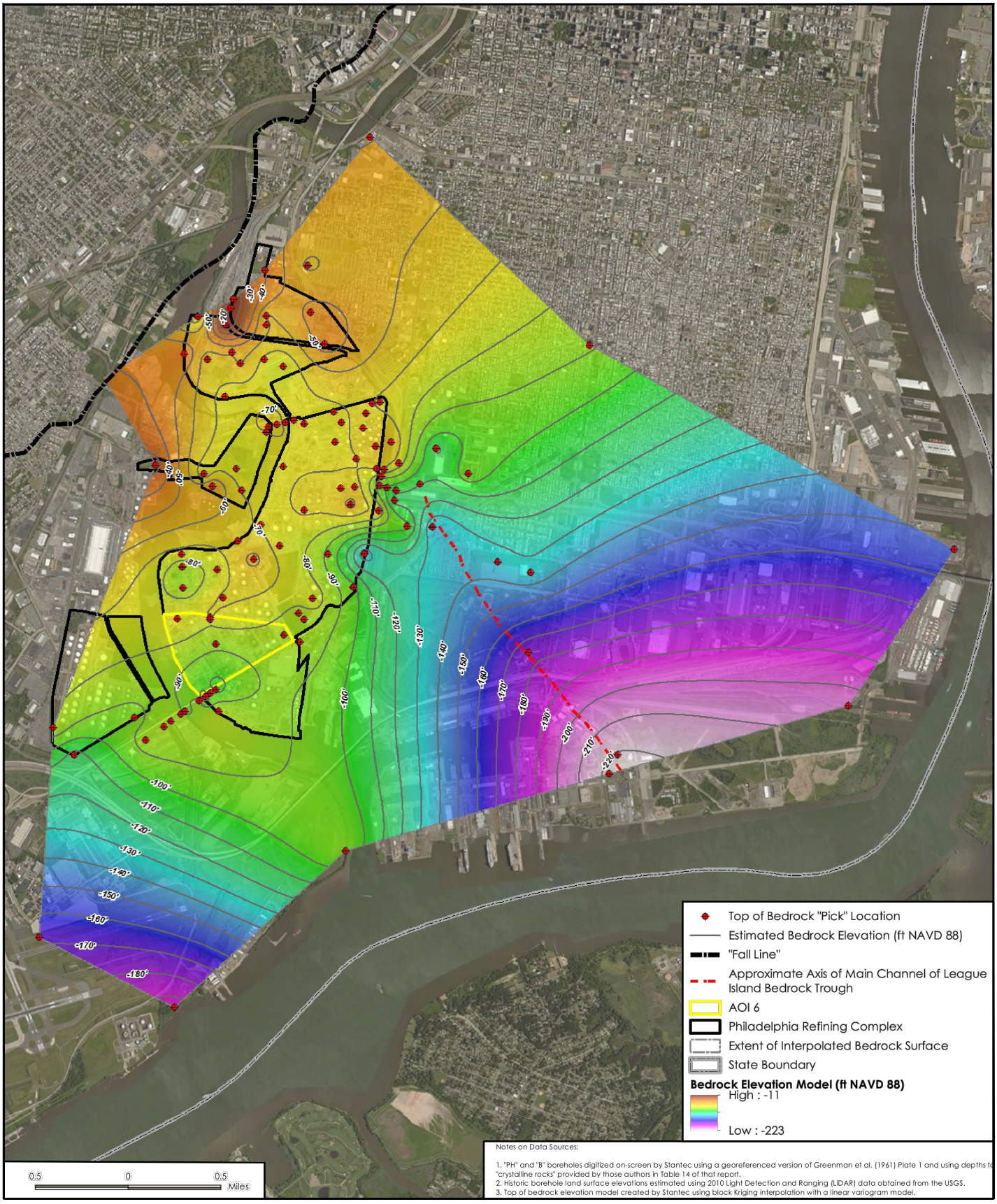
11109613-01

Jan 19, 2017

# SUMMARY OF PUBLISHED AQUIFER TESTING DATA FOR THE UNCONFINED AND LOWER AQUIFERS

FIGURE 10

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA007.DWG




SOURCE: REMEDIAL INVESTIGATION REPORT, AREA OF INTEREST 1, PHILADELPHIA REFINERY COMPLEX, STANTEC 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

11109613-01

Jan 19, 2017

# BEDROCK STRUCTURE CONTOUR MAP - TOP OF BEDROCK

FIGURE 11

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA008.DWG

| BH-29-06 | 3/21/2006 1.5-2.0 ft |
|---|---|
| Benzo(a)pyrene | 59 |

| AOI6-BH-16-037 | 4/14/2016 1.0-1.8 ft |
|---|---|
| Benzene | 710 |

| BH-30-09 | 4/8/2009 0.0-2.0 ft |
|---|---|
| Lead | 2,310 |

| B-150 | 9/16/2002 1.0-1.5 ft |
|---|---|
| Benzene | 610 |

| AOI6-BH-16-019 | 4/21/2016 0.8-1.8 ft |
|---|---|
| Lead | 2920/6690 |

| AOI6-BH-17-004 | 1/06/2017 0.0-2.0 ft |
|---|---|
| Lead | 7,490 |

| GP 797-HA-3 | 5/24/2002 1.0-1.5 ft |
|---|---|
| Benzene | 310 |

| AOI6-BH-16-041 | 4/7/2016 0.8-1.3 ft |
|---|---|
| Lead | 3820 |

| GP 797-HA-1 | 8/29/2002 1.0-1.5 ft |
|---|---|
| Benzene | 920 |

PENNY PACKER AVENUE

#3 BOILER HOUSE

#4 BOILER HOUSE

1733 UNIT

1332 UNIT

SWMU 92

SWMU 95

1332 LINE

MAIN OFFICE


GHD Limited
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com


1. MSC is PADEP-non-residential medium specific criteria.
2. Data in boxes represent soil concentrations in excess of PADEP direct contact criteria MSC.

Source: Aerial: USDA FSA NAIP August 2015

0 150 300 450
Feet

Coordinate System:
NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

**Legend**

- 2016 RI Soil Sample (Exceeded MSC) or the SSS for Lead
- 2016 RI Soil Sample (Did Not Exceed MSC)
- 2016 RI (Attempted Sample Location)
- Historical Soil Sample (Exceeded Direct Contact)
- Historical Soil Sample (Exceeded MSC)
- Historical Soil Sample (Did Not Exceed MSC)
- 2016 RI Groundwater Sample
- Water Table Monitoring Well
- Recovery Well
- Deep Monitoring Well
- Damaged Monitoring Well
- Destroyed Monitoring Well
- Monitoring Well (Unable to Locate)
- Piezometer
- Bulkhead
- Tank
- Solid Waste Management Unit
- Area Of Interest

Original Size
**ANSI D**

Bar is one inch on original size drawing
0 1"

Project : 11109613

Date: Nov 21, 2017

# EVERGREEN RESOURCES MANAGEMENT AOI-6 PHILADELPHIA REFINERY OPERATIONS

## SURFACE SOIL SAMPLE RESULTS

Figure No.

**FIGURE 12a**

GIS File: Q:\GIS\PROJECTS\11109000s\11109613\Layouts\002\11109613-000(002)GIS-OT012a.mxd

| AOI6 BH-12-149 | 12/4/2012 2.5-3.0 ft |
|---|---|
| Benzene | 517 |

| AOI6 BH-12-124 | 12/4/2012 3.0-3.5 ft |
|---|---|
| Benzene | 1380 |

| AOI6-BH-16-025 | 4/22/2016 1.9-2.2 ft |
|---|---|
| Benzene | 1400 J J |

| AOI6-BH-16-037 | 4/14/2016 1.8-2.3 ft |
|---|---|
| Benzene | 850 |

| AOI6 BH-12-129 | 12/4/2012 2.5-3.0 ft |
|---|---|
| Benzene | 1850 |

| AOI6 BH-12-128 | 12/4/2012 3.0-3.5 ft |
|---|---|
| Benzene | 535 |

PENNY PACKER AVENUE

SWMU 92

SWMU 95

#3 BOILER HOUSE

#4 BOILER HOUSE

3733 UNIT

1332 UNIT

1332 LINE

MAIN OFFICE

GHD

GHD Limited
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com

Source: Aerial: USDA FSA NAIP August 2015

0 150 300 450
Feet

Coordinate System:
NAD 1983 StatePlane Pennsylvania South FIPS
3702 Feet

**Legend**

- 2016 RI Soil Sample (Exceeded MSC)
- 2016 RI Soil Sample (Did Not Exceed MSC)
- 2016 RI Groundwater Sample
- Water Table Monitoring Well
- Recovery Well
- Deep Monitoring Well
- Damaged Monitoring Well
- Destroyed Monitoring Well
- Monitoring Well (Unable to Locate)
- Piezometer
- Bulkhead
- Tank
- Solid Waste Management Unit
- Area Of Interest

1. MSC is PADEP-non-residential medium specific criteria.
2. Data in boxes represent soil concentrations in excess of PADEP direct contact criteria MSC.

Original Size
**ANSI D**

Bar is one inch on original size drawing
0 1"

Project : 11109613

Date: Nov 20, 2017

# EVERGREEN RESOURCES MANAGEMENT
# AOI-6 PHILADELPHIA REFINERY OPERATIONS
## SUB-SURFACE SOIL SAMPLE RESULTS

Figure No.

**FIGURE 12b**

GIS File: Q:\GIS\PROJECTS\11109000s\11109613\Layouts\002\11109613-000(002)GIS-OT012b.mxd


**Legend**

- WATER TABLE MONITORING WELL
- RECOVERY WELL
- DAMAGED MONITORING WELL
- DESTROYED MONITORING WELL
- UNABLE TO LOCATE WELL
- PIEZOMETER
- GROUNDWATER ELEVATION CONTOUR (FEET NAVD 88)
- AOI 9 WATER-LEVEL ELEVATION (1 FOOT INTERVAL)
- POLLOCK STREET HORIZONTAL WELL
- SEWER LINE
- AREA OF INTEREST (AOI)
- 2.04 GROUNDWATER ELEVATION (FEET NAVD 88)
- NM NOT MEASURED OR GROUNDWATER ELEVATION NOT CALCULATED DUE TO LACK OF SURVEYED REFERENCE ELEVATION
- WP-9 6.64 WELLS NOT USED FOR GROUNDWATER CONTOURING (FEET NAVD 88)

0 400 800 Feet

SOURCE: PHILADELPHIA REFINERY REMEDIATION PROGRAM GROUNDWATER REMEDIATION STATUS REPORT, FIRST HALF 2016, STANTEC, 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

# STANTEC WATER TABLE GROUNDWATER ELEVATION MAP, MAY 2016

11109613-01
Dec 1, 2016

FIGURE 13

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA009.DWG


Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2014, Accessed: 2017

0 100 300ft

LEGEND

- B-39 SAMPLE LOCATION
- 3.40 WATER TABLE ELEVATION (ft. AMSL)
- 0.0 WATER TABLE CONTOUR (ft. AMSL)

GHD

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

# WATER TABLE CONTOURS
# MAY 2, 2016

11109613-01

Nov 11, 2017

FIGURE 14

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA017.dwg


SOURCE: PHILADELPHIA REFINERY REMEDIATION PROGRAM GROUNDWATER REMEDIATION STATUS REPORT, FIRST HALF 2016, STANTEC, 2016.

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

# STANTEC DEEP GROUNDWATER ELEVATION MAP, MAY 2016

11109613-01

Nov 11, 2017

FIGURE 15

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA010.DWG


Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2014, Accessed: 2017

0 100 300ft

N

LEGEND

- B-174 SAMPLE LOCATION
- 0.00 LNAPL APPARENT THICKNESS (ft.)
- LNAPL PRESENT

GHD

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

# LNAPL APPARENT THICKNESS
MAY 2, 2016

11109613-01

Nov 11, 2017

FIGURE 16

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA016.dwg


Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2014, Accessed: 2017

0 100 300ft

LEGEND

- B-174 SAMPLE LOCATION
- 0.00 LNAPL APPARENT THICKNESS (ft.)
- LNAPL PRESENT

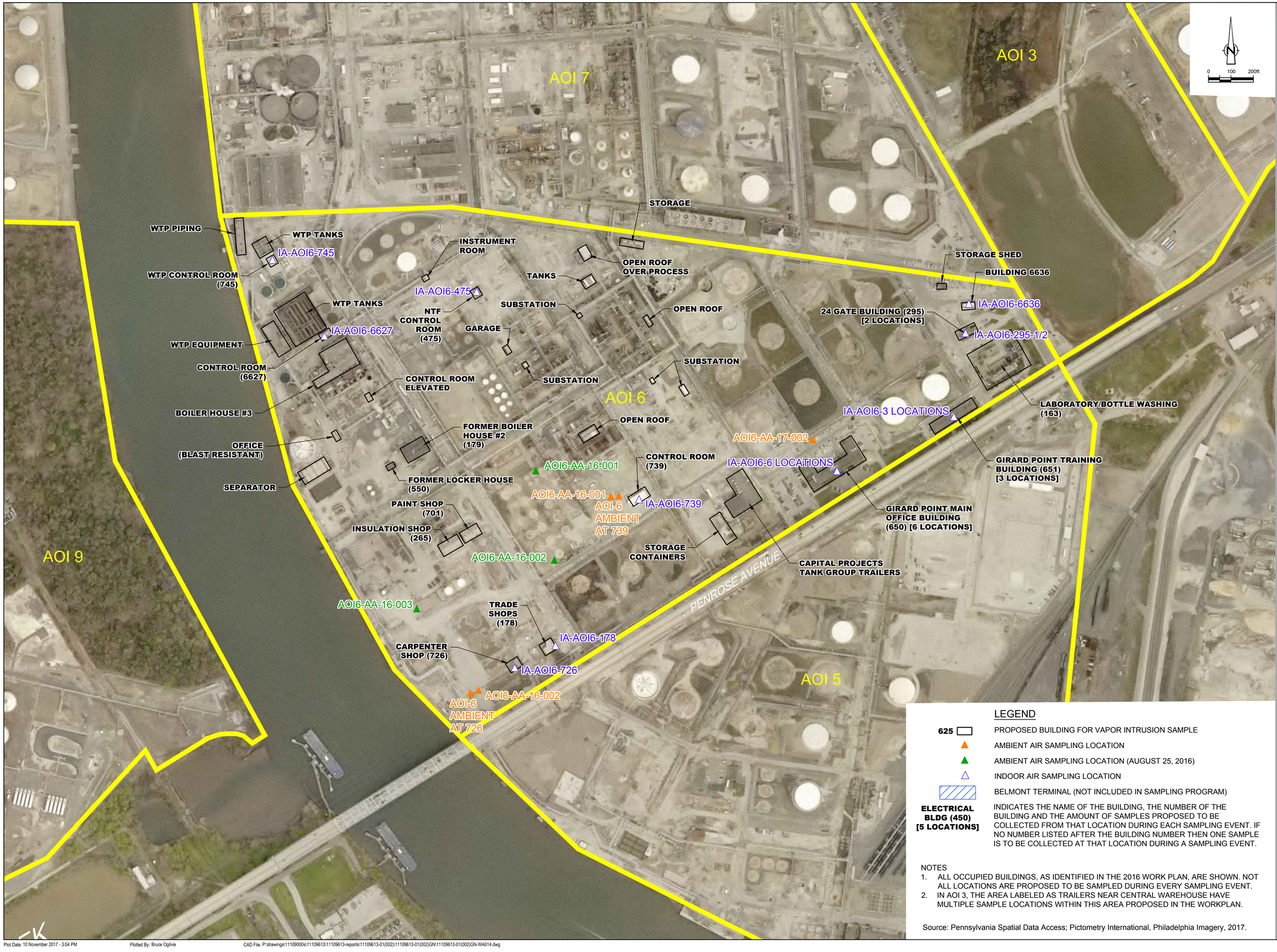
EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

LNAPL APPARENT THICKNESS
MAY 11, 2017

11109613-01
Nov 11, 2017

FIGURE 17

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA015.dwg




## LEGEND

- 625 — PROPOSED BUILDING FOR VAPOR INTRUSION SAMPLE
- AMBIENT AIR SAMPLING LOCATION
- AMBIENT AIR SAMPLING LOCATION (AUGUST 25, 2016)
- INDOOR AIR SAMPLING LOCATION
- BELMONT TERMINAL (NOT INCLUDED IN SAMPLING PROGRAM)
- ELECTRICAL BLDG (450) [5 LOCATIONS] — INDICATES THE NAME OF THE BUILDING, THE NUMBER OF THE BUILDING AND THE AMOUNT OF SAMPLES PROPOSED TO BE COLLECTED FROM THAT LOCATION DURING EACH SAMPLING EVENT. IF NO NUMBER LISTED AFTER THE BUILDING NUMBER THEN ONE SAMPLE IS TO BE COLLECTED AT THAT LOCATION DURING A SAMPLING EVENT.

NOTES
1. ALL OCCUPIED BUILDINGS, AS IDENTIFIED IN THE 2016 WORK PLAN, ARE SHOWN. NOT ALL LOCATIONS ARE PROPOSED TO BE SAMPLED DURING EVERY SAMPLING EVENT.
2. IN AOI 3, THE AREA LABELED AS TRAILERS NEAR CENTRAL WAREHOUSE HAVE MULTIPLE SAMPLE LOCATIONS WITHIN THIS AREA PROPOSED IN THE WORKPLAN.

Source: Pennsylvania Spatial Data Access; Pictometry International, Philadelphia Imagery, 2017.

GHD
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com



Client
**PHILADELPHIA ENERGY SOLUTIONS FACILITY**

Project

| No. | Issue | Drawn | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| Drawn **B. OGILVIE** | Designer **F. RAMACCIOTTI** |
| Drafting Check | Design Check |
| Project Manager **PM** | Date **Nov 10, 2017** |
| This document shall not be used for construction unless signed and sealed for construction. | Scale **AS SHOWN** |
| Original Size **ANSI D** | Bar is one inch on original size drawing 0 1" |

Project No. **11109613-01**

Title
# INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS AOI 6

Sheet No.
# FIGURE 18

Sheet **1** of **1**

Plot Date: 10 November 2017 - 3:04 PM Plotted By: Bruce Ogilvie CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\1109613-01(002)GN\1109613-01(002)GN-WA014.dwg


Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Acquisition Date June 2014, Accessed: 2017

0 100 300ft

N

LEGEND

B-173 SAMPLE LOCATION

14 BENZENE CONCENTRATION (µg/L)

0.0 BENZENE ISO-CONCENTRATION CONTOUR (µg/L)

NOTE: 5ppb IS THE NON-RESIDENTIAL GROUNDWATER MSC FOR BENZENE.

GHD

EVERGREEN RESOURCES MANAGEMENT OPERATIONS LLC
PHILADELPHIA REFINERY - 3144 PASSYUNK AVENUE, PHILADELPHIA, PA
REMEDIAL INVESTIGATION REPORT

# DISSOLVED BENZENE GROUNDWATER CONCENTRATIONS MAY 2016

11109613-01

Nov 10, 2017

FIGURE 19

CAD File: P:\drawings\11109000s\11109613\11109613-reports\11109613-01(002)\11109613-01(002)GN\11109613-01(002)GN-WA018.dwg


GHD Limited
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com

Source: Aerial: Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

0 150 300 450
Feet

Coordinate System:
NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

**Legend**

- 2016 Groundwater Sample (Did not Exceed MSC)
- 2016 Groundwater Sample (Exceeds MSC)
- 2016 RI Groundwater Sample
- Water Table Monitoring Well
- Recovery Well
- Deep Monitoring Well
- Damaged Monitoring Well
- Destroyed Monitoring Well
- Monitoring Well (Unable to Locate)
- Piezometer
- 2016 RI Soil Sample
- 2017 RI Soil Sample
- Historical Soil Sample
- 2016 RI (Not Sampled)
- 2016 RI (Attempted Sample Location)
- Air Sample
- Bulkhead
- Tank
- Solid Waste Management Unit
- Area Of Interest

Original Size
**ANSI D**

Bar is one inch on original size drawing
0 1"

Project : 11109613

Date: Nov 20, 2017

# EVERGREEN RESOURCES MANAGEMENT
# AOI-6 PHILADELPHIA REFINERY OPERATIONS
# DEEP GROUNDWATER RESULTS – MAY 2016

Figure No.

# FIGURE 20

GIS File: Q:\GIS\PROJECTS\11109000s\11109613\Layouts\002\11109613-00(002)GIS-OT020.mxd

**Table 1**

**Constituents of Concern**
**Evergreen Act 2/One Cleanup Program Petroleum Short List**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Volatile Organic Compounds** | **CAS No.** |
|---|---|
| Benzene | 71-43-2 |
| Cumene | 98-82-8 |
| Dichloroethane, 1,2- | 107-06-2 |
| Ethylbenzene | 100-41-4 |
| Ethylene Dibromide | 106-93-4 |
| Methyl tert butyl ether | 1634-04-4 |
| Toluene | 108-88-3 |
| Trimethylbenzene, 1,2,4- | 95-63-6 |
| Trimethylbenzene, 1,3,5- | 108-67-8 |
| Xylenes | 1330-20-7 |
| | |
| **Semi Volatile Organic Compounds** | **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 |
| | |
| **Metals** | **CAS No.** |
| Lead | 7439-92-1 |

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**

**Characterization Activities**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, A Series of Evergreen Resources Group, LLC**

| Location ID | Location Rationale | Media | Surface Soil Sample Collected (0-2 ft bgs) | Subsurface Soil Sample Collected (>2 ft bgs) | Groundwater Sample Collection | Analyte List |
|---|---|---|---|---|---|---|
| B-171 | Investigate groundwater quality to characterize groundwater; characterize soil | GW/Soil | X | X | X | Evergreen COCs, Table 1 |
| B-172 | Investigate groundwater quality to characterize groundwater; characterize soil | GW/Soil | X | X | X | Evergreen COCs, Table 1 |
| B-173 | Investigate groundwater quality to characterize groundwater; characterize soil | GW/Soil | X | X | X | Evergreen COCs, Table 1 |
| B-174 | Investigate groundwater quality to characterize groundwater; characterize soil | GW/Soil | X | X | X | Evergreen COCs, Table 1 |
| B-175 | Investigate groundwater quality in vicinity of LNAPL plume | GW/Soil | X | X | X | Evergreen COCs, Table 1 |
| B-115 | Characterize groundwater conditions in vicinity of B-129 and along NE boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-116 | Characterize groundwater conditions along NE boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-117 | Characterize conditions downgradient of #4 Boilerhouse and Tank Farm | GW | | | X | Evergreen COCs, Table 1 |
| B-125 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-126 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-131 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-132 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-132D | Monitor Deep (AOI-11) groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-133 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-133D | Monitor Deep (AOI-11) groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-134 | Characterize groundwater conditions under NAPL | GW | | | X | Evergreen COCs, Table 1 |
| B-134D | Monitor Deep (AOI-11) groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-144 | Characterize groundwater conditions under NAPL | GW | | | X | Evergreen COCs, Table 1 |
| B-145 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-150 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-152 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-153 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-154 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-155 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-156 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-158 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-162 | Characterize groundwater downgradient of historical release unit 1332 | GW | | | X | Evergreen COCs, Table 1 |
| B-163 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-164 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-165 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-168 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-169 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-170 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-39 | Characterize groundwater conditions under NAPL | GW | | | X | Evergreen COCs, Table 1 |
| B-43 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| B-45 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| B-48D | Monitor Deep (AOI-11) groundwater | GW | | | X | Evergreen COCs, Table 1 |
| U-4 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| URS-1 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| URS-3 | Characterize/delineate groundwater | GW | | | X | Evergreen COCs, Table 1 |
| URS-4 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| URS-5 | Characterize conditions along downgradient boundary | GW | | | X | Evergreen COCs, Table 1 |
| AOI6-BH-16-001 | Delineate/characterize by historic release at #3 Boiler House | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-002 | Delineate/characterize by historic release at #3 Boiler House | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-003 | Delineate/characterize by historic release at #3 Boiler House | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-004 | Delineate/characterize by historic release at #3 Boiler House | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-005 | Delineate/characterize by historic release at #3 Boiler House | Soil | X | X | | Evergreen COCs, Table 1 |

**Table 2**

**Characterization Activities**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, A Series of Evergreen Resources Group, LLC**

| Location ID | Location Rationale | Media | Surface Soil Sample Collected (0-2 ft bgs) | Subsurface Soil Sample Collected (>2 ft bgs) | Groundwater Sample Collection | Analyte List |
|---|---|---|---|---|---|---|
| AOI6-BH-16-006 | Delineate/characterize by historic tank incident | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-007 | Delineate/characterize by historic release 1733 Unit | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-008 | Delineate/characterize by historic release 1733 Unit | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-009 | Delineate/characterize by historic release 1733 Unit | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-010 | Investigate former Tank 238 | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-011 | Investigate former Tank 238 | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-012 | Investigate/characterize/delineate historic release behind former Boiler House 4 | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-013 | Investigate/characterize/delineate historic release behind former Boiler House 4 | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-014 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-015 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-016 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-017 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-018 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-019 | Delineate/characterize historic release by main office building | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-020 | Delineate/characterize historic release by main office building | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-021 | Delineate/characterize historic release by main office building | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-022 | Delineate/characterize historic release by main office building | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-023 | Delineate/characterize historic release unit 1332 line | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-024 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-025 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-026 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-027 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-028 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-029 | Delineate benzene around Tank GP-797 area | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-030 | Delineate/characterize on northwest side of Tank GP-797 (outside HA-1) | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-031 | Delineate/characterize on southeast side of Tank GP-797 (outside HA-3) | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-032 | Delineate/characterize on southwest side of Tank GP-797 (outside AOI6-BH-12-128) | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-033 | Delineate/characterize in southwest corner of GP-797 tank group dike | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-034 | Delineate/characterize on west side of GP-797 tank group dike | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-035 | Delineate/characterize in northwest corner of GP-797 tank group dike | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-036 | Delineate/characterize in northeast corner of GP-797 tank group dike | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-037 | Delineate/characterize on the east side of GP-797 tank group dike | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-038 | Characterize in central GP-797 tank group dike (between GP-792, 793, 794 and 795) | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-039 | Investigate former Tank 238 | Soil | X | X | | Evergreen COCs, Table 1 |
| AOI6-BH-16-040 | Investigate/characterize/delineate release of caustic material from Tank T-81 | Soil | X | X | | pH and Evergreen COCs, Table 1 |
| AOI6-BH-16-041 | Investigate/characterize/delineate release of caustic material from Tank T-81 | Soil | X | X | | pH and Evergreen COCs, Table 1 |
| AOI6-BH-16-043 | Investigate/characterize/delineate release of caustic material from Tank T-81 | Soil | X | X | | pH and Evergreen COCs, Table 1 |
| AOI 6 -BH-17-01 | Delienate lead exceedance in BH-16-19 | Soil | X | X | | lead |
| AOI 6 -BH-17-02 | Delienate lead exceedance in BH-16-19 | Soil | X | X | | lead |
| AOI 6 -BH-17-03 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-04 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-05 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-06 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-07 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-08 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI 6 -BH-17-09 | Delineate lead exceedance in BH-16-041 | Soil | X | | | lead |
| AOI6-AA16-001 | Investigate outdoor air quality in location over NAPL plume - gasoline plume | Outdoor Air | | | | TO-15 |

**Table 2**

**Characterization Activities**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, A Series of Evergreen Resources Group, LLC**

| Location ID | Location Rationale | Media | Surface Soil Sample Collected (0-2 ft bgs) | Subsurface Soil Sample Collected (>2 ft bgs) | Groundwater Sample Collection | Analyte List |
|---|---|---|---|---|---|---|
| AOI6-AA16-002 | Investigate outdoor air quality in location over NAPL plume - residual oil plume | Outdoor Air | | | | TO-15 |
| AOI6-AA16-003 | Investigate outdoor air quality in location over NAPL plume - other NAPL plume | Outdoor Air | | | | TO-15 |
| AOI6-AA16-004 | duplicate sample | Outdoor Air | | | | TO-15 |

Note:

Indoor Air Sampling Summary is in Table 12.

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | AOI6-BH-16-001 | AOI6-BH-16-002 | AOI6-BH-16-003 | AOI6-BH-16-004 | AOI6-BH-16-004 | AOI6-BH-16-005 | AOI6-BH-16-006 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-BH-16-001-0-2-SOIL | AOI6-BH-16-002-0-2-SOIL | AOI6-BH-16-003-0-2-SOIL | AOI6-BH-16-004-0-2-SOIL | AOI6-BH16-DUP-SOIL-002 | AOI6-BH-16-005-0-2-SOIL | AOI6-BH-16-006-0-2-SOIL |
| Sample Date: | | Used Aquifer | Used Aquifer | 04/12/2016 | 04/12/2016 | 04/12/2016 | 04/21/2016 | 04/21/2016 | 04/12/2016 | 04/22/2016 |
| Sample Depth: | | Direct Contact | | 1.0-1.5 ft | 1.0-1.5 ft | 0.0-0.5 ft | 0.8-1.8 ft | 0.8-1.8 ft | 0.0-0.5 ft | 1.0-1.5 ft |
| | | MSC | MSC | | | | | Duplicate | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | ND(0.006) | ND(0.005) | ND(0.005) | 0.0009 J | 0.002 J | ND(0.004) | ND(0.28) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | ND(0.006)[b] | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.004) | ND(0.28)[b] |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | ND(0.006) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.004) | ND(0.28) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.006) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.004) | ND(0.28) |
| Benzene | mg/kg | 290 | 0.5 | 0.002 J | 0.001 J | ND(0.005) | 0.001 J | 0.002 J | 0.0004 J | ND(0.28) |
| Ethylbenzene | mg/kg | 890 | 70 | ND(0.006) | ND(0.005) | ND(0.005) | ND(0.005) | 0.001 J | ND(0.004) | ND(0.28) |
| Isopropyl benzene | mg/kg | 10000 | 2500 | ND(0.006) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.004) | ND(0.28) |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | ND(0.006) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.004) | ND(0.28) |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | 0.003 J | 0.001 J | ND(0.005) | 0.003 J | 0.003 J | ND(0.004) | 0.088 J |
| Xylenes (total) | mg/kg | 8000 | 1000 | 0.001 J | ND(0.005) | ND(0.005) | 0.004 J | 0.005 J | ND(0.004) | 0.063 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.73 | 0.34 | 0.41 | 0.43 | 0.6 | 0.016 J | 0.7 |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 0.95 | 1.7 | 1.9 | 1.1 | 1.7 | 0.11 | 1.2 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 1.1 | 1.7 | 1.9 | 1.1 | 1.5 | 0.13 | 1.2 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 1.5 | 2.2 | 2.6 | 1.3 | 1.9 | 0.18 | 1.3 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 1.3 | 0.85 | 1.5 | 0.7 | 0.94 | 0.15 | 0.76 |
| Chrysene | mg/kg | 760 | 230 | 1.1 | 1.7 | 1.9 | 1.1 | 1.7 | 0.12 | 1.3 |
| Fluorene | mg/kg | 130000 | 3800 | 0.32 | 0.079 J | 0.11 | 0.16 | 0.19 | 0.005 J | 0.36 |
| Naphthalene | mg/kg | 760 | 25 | 6.9 | 0.63 | 0.51 | 1.2 | 1.3 | 0.025 | 1.6 |
| Phenanthrene | mg/kg | 190000 | 10000 | 2.0 | 0.87 | 1.7 | 1.1 | 1.7 | 0.053 | 1.5 |
| Pyrene | mg/kg | 96000 | 2200 | 1.6 | 2.0 | 2.8 | 1.3 | 2.3 | 0.15 | 2.0 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 288 | 180 | 549[b] | 399 | 529[b] | 68.7 | 142 |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 14.6 | 24.8 | 12.2 | 13.2 | 12.5 | 4.9 | 14.5 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-007** | **AOI6-BH-16-008** | **AOI6-BH-16-009** | **AOI6-BH-16-010** | **AOI6-BH-16-011** | **AOI6-BH-16-012** | **AOI6-BH-16-012** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-007-0-2-SOIL** | **AOI6-BH-16-008-0-2-SOIL** | **AOI6-BH-16-009-0-2-SOIL** | **AOI6-BH-16-010-0-2-SOIL** | **AOI6-BH-16-011-0-2-SOIL** | **AOI6-BH16-012-0-2-SOIL-B** | **AOI6-BH-16-012-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/08/2016** | **04/08/2016** | **04/08/2016** | **04/11/2016** | **04/11/2016** | **04/11/2016** | **04/11/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.0-2.0 ft** | **1.0-2.0 ft** | **1.5-1.8 ft** | **0.5-0.9 ft** | **0.5-0.8 ft** | **0.5-1.0 ft** | **1.0-1.1 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | ND(0.25) | ND(0.23) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | **ND(0.006)[b]** | ND(0.005) | **ND(0.006)[b]** | ND(0.005) | **ND(0.27)[b]** | **ND(0.25)[b]** | **ND(0.23)[b]** |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | ND(0.25) | ND(0.23) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | ND(0.25) | ND(0.23) |
| Benzene | mg/kg | 290 | 0.5 | 0.003 J | 0.001 J | 0.005 J | 0.011 | ND(0.27) | ND(0.25) | ND(0.23) |
| Ethylbenzene | mg/kg | 890 | 70 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | ND(0.25) | ND(0.23) |
| Isopropyl benzene | mg/kg | 10000 | 2500 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | 2.0 | 0.25 |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | ND(0.25) | ND(0.23) |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | 0.001 J | ND(0.005) | ND(0.006) | 0.004 J | ND(0.27) | ND(0.25) | ND(0.23) |
| Xylenes (total) | mg/kg | 8000 | 1000 | ND(0.006) | ND(0.005) | ND(0.006) | ND(0.005) | ND(0.27) | 0.061 J | 0.047 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.2 | 2.3 | 4.3 | 0.079 | 1.7 | 1.3 | 0.69 |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 0.72 | 5.5 | 5.2 | 0.21 | 0.99 | 0.94 | 1.9 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 0.67 | 4.8 | 3.3 | 0.26 | 0.99 | 0.89 | 1.8 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 0.95 | 6.3 | 4 | 0.41 | 1.3 | 1.6 | 2.3 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.51 | 3.3 | 1.9 | 0.23 | 0.69 | 0.74 | 1.4 |
| Chrysene | mg/kg | 760 | 230 | 0.85 | 5.6 | 5.1 | 0.28 | 1.0 | 2.7 | 1.8 |
| Fluorene | mg/kg | 130000 | 3800 | 0.07 | 1.7 | 1.4 | 0.012 J | 8.5 | 66 | 0.33 |
| Naphthalene | mg/kg | 760 | 25 | 0.63 | 2.9 | 1.9 | 0.22 | ND(0.22) | 1.3 | 0.44 |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.72 | 10 | 14 | 0.23 | 10 | 20 | 2.0 |
| Pyrene | mg/kg | 96000 | 2200 | 1.2 | 10 | 13 | 0.43 | 1.9 | 1.8 | 3.3 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 803[b] | 298 | 149 | 1460[b] | 734[b] | 141 | 194 |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 14.7 | 13.6 | 11.5 | 19.7 | 22.8 | 20.0 | 8.2 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | AOI6-BH-16-013 | AOI6-BH-16-014 | AOI6-BH-16-014 | AOI6-BH-16-015 | AOI6-BH-16-015 | AOI6-BH-16-016 | AOI6-BH-16-016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-BH-16-013-0-2-SOIL | AOI6-BH-16-014-0-2-SOIL | AOI6-BH-16-014-0-2-071116 | AOI6-BH-16-015-0-2-SOIL | AOI6-BH-16-015-0-2-071116 | AOI6-BH-16-016-0-2-SOIL | AOI6-BH-16-016-0-2-071116 |
| Sample Date: | | Used Aquifer | Used Aquifer | 04/11/2016 | 04/05/2016 | 07/11/2016 | 04/05/2016 | 07/11/2016 | 04/04/2016 | 07/11/2016 |
| Sample Depth: | | Direct Contact | | 0.5-1.0 ft | 1.0-1.5 ft | 1.3-1.8 ft | 1.5-2.0 ft | 1.0-1.4 ft | 1.0-1.5 ft | 1.5-2.0 ft |
| | | MSC | MSC | | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | ND(0.23) | 0.11 J | - | 0.11 J | - | ND(0.006) | - |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | ND(0.23)[b] | ND(0.33)[b] | - | ND(0.33)[b] | - | ND(0.006)[b] | - |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | ND(0.23) | ND(0.33) | - | ND(0.33) | - | ND(0.006) | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.23) | ND(0.33) | - | ND(0.33) | - | ND(0.006) | - |
| Benzene | mg/kg | 290 | 0.5 | ND(0.23) | 0.24 J | - | 0.053 J | - | 0.004 J | - |
| Ethylbenzene | mg/kg | 890 | 70 | ND(0.23) | 0.095 J | - | ND(0.33) | - | ND(0.006) | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | ND(0.23) | ND(0.33) | - | 0.77 | - | ND(0.006) | - |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | ND(0.23) | ND(0.33) | - | ND(0.33) | - | ND(0.006) | - |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | ND(0.23) | 0.260 J | - | 0.130 J | - | 0.003 J | - |
| Xylenes (total) | mg/kg | 8000 | 1000 | ND(0.23) | 0.280 J | - | 0.470 | - | ND(0.006) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.40 | - | 6.2 | - | 5.4 | - | 1.9 |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 0.46 | - | 7.8 | - | 2.0 J | - | 1.7 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 0.28 | - | 8.3 | - | 1.6 J | - | 1.7 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 0.34 | - | 8.2 | - | 2.9 | - | 2.3 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.21 | - | 6.3 | - | 2.2 | - | 1.6 |
| Chrysene | mg/kg | 760 | 230 | 1.6 | - | 8.9 | - | 5.8 | - | 2.0 |
| Fluorene | mg/kg | 130000 | 3800 | 2.5 | - | 9.3 | - | 7.4 | - | 5.1 |
| Naphthalene | mg/kg | 760 | 25 | ND(0.20) | - | 21 | - | 2.8 | - | 9.3 |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.96 | - | 24 | - | 16 | - | 9.6 |
| Pyrene | mg/kg | 96000 | 2200 | 0.81 | - | 12 | - | 8.4 | - | 2.4 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 32.0 | 344 | - | 671[b] | - | 313 | - |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 14.8 | 33.7 | 34.4 | 26.7 | 19.9 | 12.5 | 29.2 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

a PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016.

b PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential,

c Site Specific Standard for Lead (SSS) August 27, 2016.

ND Not detected at the associated reporting limit.

J Estimated concentration.

**ND(10)[b]** Indicates reporting limit was above the applicable standard.

**6.5[A]** Concentration exceeds the indicated standard.

ft Feet.

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-017** | **AOI6-BH-16-018** | **AOI6-BH-16-019** | **AOI6-BH-16-019** | **AOI6-BH-16-020** | **AOI6-BH-16-021** | **AOI6-BH-16-022** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-017-0-2-SOIL** | **AOI6-BH-16-018-0-2-SOIL** | **AOI6-BH-16-019-0-2-SOIL** | **AOI6-BH16-DUP-SOIL-001** | **AOI6-BH-16-020-0-2-SOIL** | **AOI6-BH-16-021-0-2-SOIL** | **AOI6-BH-16-022-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/11/2016** | **04/11/2016** | **04/21/2016** | **04/21/2016** | **04/21/2016** | **04/21/2016** | **04/06/2016** |
| **Sample Depth:** | | **Direct Contact** | | **0.5-1.0 ft** | **0.8-1.0 ft** | **0.8-1.8 ft** | **0.8-1.8 ft** | **0.0-1.1 ft** | **0.0-0.5 ft** | **0.5-1.0 ft** |
| | | **MSC** | **MSC** | | | | **Duplicate** | | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | ND(0.004) | 0.001 J | ND(0.006) | ND(0.005) | ND(0.30) | 0.11 J | ND(0.24) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | ND(0.004) | ND(0.004) | **ND(0.006)[b]** | ND(0.005) | **ND(0.30)[b]** | **ND(0.24)[b]** | **ND(0.24)[b]** |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | ND(0.004) | ND(0.004) | ND(0.006) | ND(0.005) | ND(0.30) | ND(0.24) | ND(0.24) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.004) | ND(0.004) | ND(0.006) | ND(0.005) | ND(0.30) | 0.082 J | ND(0.24) |
| Benzene | mg/kg | 290 | 0.5 | 0.001 J | 0.071 | ND(0.006) | ND(0.005) | 0.039 J | 0.062 J | 0.089 J |
| Ethylbenzene | mg/kg | 890 | 70 | ND(0.004) | 0.001 J | ND(0.006) | ND(0.005) | ND(0.30) | ND(0.24) | 0.052 J |
| Isopropyl benzene | mg/kg | 10000 | 2500 | ND(0.004) | 0.001 J | ND(0.006) | ND(0.005) | 0.420 | ND(0.24) | ND(0.24) |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | ND(0.004) | ND(0.004) | ND(0.006) | ND(0.005) | ND(0.30) | ND(0.24) | ND(0.24) |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | ND(0.004) | 0.005 | ND(0.006) | ND(0.005) | ND(0.30) | 0.10 J | 0.15 J |
| Xylenes (total) | mg/kg | 8000 | 1000 | ND(0.004) | 0.002 J | ND(0.006) | ND(0.005) | 0.072 J | 0.10 J | 0.18 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.35 | 0.67 | 1.4 | 1.4 | 3.7 | 1.0 | 2.1 |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 3.3 | 1.4 | 1.2 | 1.3 | 7.4 | 2.4 | 3.4 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 4.2 | 1.9 | 1.3 | 1.4 | 7.8 | 2.2 | 4.1 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 6.7 | 2.3 | 1.5 | 1.7 | 9.8 | 3.0 | 5.3 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 4.8 | 1.5 | 1.4 | 1.5 | 5.1 | 1.4 | 3.3 |
| Chrysene | mg/kg | 760 | 230 | 4.9 | 1.9 | 1.3 | 1.4 | 7.7 | 2.3 | 4.9 |
| Fluorene | mg/kg | 130000 | 3800 | 0.081 | 0.48 | 0.59 | 0.61 | 2.2 | 0.53 | 1.6 |
| Naphthalene | mg/kg | 760 | 25 | 0.12 | 2.1 | 7.7 | 8.3 | 3.3 | 1.1 | 3.5 |
| Phenanthrene | mg/kg | 190000 | 10000 | 2.4 | 1.6 | 3.3 | 3.2 | 13 | 3.2 | 5.4 |
| Pyrene | mg/kg | 96000 | 2200 | 8.1 | 2.4 | 1.6 | 1.6 | 13 | 3.9 | 7.9 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 180 | 138 | **2920[ab]** | **6690[ab]** | 199 | 223 | 236 |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 9.4 | 8.6 | 22.8 | 20.3 | 12.6 | 9.6 | 12.5 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-023** | **AOI6-BH-16-025** | **AOI6-BH-16-025** | **AOI6-BH-16-026** | **AOI6-BH-16-027** | **AOI6-BH-16-028** | **AOI6-BH-16-029** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-023-0-2-SOIL** | **AOI6-BH-16-025-0-2-SOIL** | **AOI6-BH16-DUP-04-22-16-003** | **AOI6-BH-16-026-0-2-SOIL** | **AOI6-BH-16-027-0-2-SOIL** | **AOI6-BH-16-028-0-2-SOIL** | **AOI6-BH-16-029-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/21/2016** | **04/22/2016** | **04/22/2016** | **04/22/2016** | **04/13/2016** | **04/13/2016** | **04/13/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.5-1.9 ft** | **1.5-1.9 ft** | **1.5-1.9 ft** | **0.4-1.3 ft** | **1.8-2.0 ft** | **0.3-0.5 ft** | **1.8-2.0 ft** |
| | | **MSC** | **MSC** | | | **Duplicate** | | | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | 0.12 J | 0.095 J | 0.096 J | ND(0.22) | ND(0.005) | 0.057 J | 0.25 J |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | ND(0.47)[b] | ND(0.22)[b] | ND(0.21)[b] | ND(0.22)[b] | ND(0.005) | ND(0.26)[b] | ND(0.25)[b] |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | ND(0.47) | ND(0.22) | ND(0.21) | ND(0.22) | ND(0.005) | ND(0.26) | ND(0.25) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.47) | 0.045 J | ND(0.21) | ND(0.22) | ND(0.005) | ND(0.26) | 0.095 J |
| Benzene | mg/kg | 290 | 0.5 | 0.13 J | **2.7**[b] | **2.6**[b] | **7.6**[b] | ND(0.005) | 0.46 | **0.990**[b] |
| Ethylbenzene | mg/kg | 890 | 70 | 0.10 J | 0.12 J | 0.110 J | 0.082 J | ND(0.005) | 0.10 J | 0.30 |
| Isopropyl benzene | mg/kg | 10000 | 2500 | 0.34 J | 2.9 | 2.6 | 1.8 | ND(0.005) | 0.22 J | 1.7 |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | ND(0.47) | ND(0.22) | ND(0.21) | ND(0.22) | ND(0.005) | ND(0.26) | ND(0.25) |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | 0.20 J | 0.9 | 0.75 | ND(0.22) | ND(0.005) | 0.45 | 0.37 |
| Xylenes (total) | mg/kg | 8000 | 1000 | 0.21 J | 0.53 | 0.48 | 0.092 J | ND(0.005) | 0.34 | 0.6 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 2.1 | 4.4 | 4.9 | 0.71 | 0.007 J | 0.39 | 2.9 |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 1.3 | 3.2 | 3.8 | 1.3 | 0.011 J | 0.91 | 6.1 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 1.7 | 2.3 | 2.7 | 1.3 | 0.010 J | 1.2 | 6.2 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 1.8 | 2.8 | 3.2 | 0.89 | 0.016 J | 1.6 | 8.7 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 1.8 | 0.93 | 1.0 | 0.72 | 0.009 J | 1.1 | 4.5 |
| Chrysene | mg/kg | 760 | 230 | 1.5 | 2.8 | 3.2 | 2.2 | 0.021 J | 1.0 | 6.1 |
| Fluorene | mg/kg | 130000 | 3800 | 1.9 | 4.2 | 4.4 | 0.51 | 0.009 J | 0.16 | 3.2 |
| Naphthalene | mg/kg | 760 | 25 | 12 | 0.46 | 0.48 | 1.1 | 0.010 J | 1.2 | 3.1 |
| Phenanthrene | mg/kg | 190000 | 10000 | 4.8 | 13 | 14 | 1.9 | 0.02 J | 1.1 | 11 |
| Pyrene | mg/kg | 96000 | 2200 | 2.4 | 5.6 | 6.6 | 2.1 | 0.032 | 1.2 | 11 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 393 | 10.3 | 10.2 | 61.8 | 20.0 | 159 | 138 |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 34.9 | 8.7 | 9.1 | 8.8 | 24.8 | 8.7 | 12.0 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| ND(10)[b] | Indicates reporting limit was above the applicable standard. |
| **6.5**[A] | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-030** | **AOI6-BH-16-031** | **AOI6-BH-16-032** | **AOI6-BH-16-033** | **AOI6-BH-16-034** | **AOI6-BH-16-035** | **AOI6-BH-16-036** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-030-0-2-SOIL** | **AOI6-BH-16-031-0-2-SOIL** | **AOI6-BH-16-032-0-2-SOIL** | **AOI6-BH-16-033-0-2-SOIL** | **AOI6-BH-16-034-0-2-SOIL** | **AOI6-BH-16-035-0-2-SOIL** | **AOI6-BH-16-036-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/14/2016** | **04/14/2016** | **04/13/2016** | **04/13/2016** | **04/13/2016** | **04/13/2016** | **04/14/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.5-2.0 ft** | **1.0-2.0 ft** | **1.0-2.0 ft** | **1.5-2.0 ft** | **1.5-1.8 ft** | **1.5-2.0 ft** | **1.3-1.8 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | ND(4.4) | ND(0.22) | ND(0.22) | ND(0.004) | ND(5.0) | ND(0.004) | ND(4.5) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | **ND(4.4)[b]** | **ND(0.22)[b]** | **ND(0.22)[b]** | ND(0.004) | **ND(5.0)[b]** | ND(0.004) | **ND(4.5)[b]** |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | **ND(4.4)[b]** | ND(0.22) | ND(0.22) | ND(0.004) | **ND(5.0)[b]** | ND(0.004) | **ND(4.5)[b]** |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(4.4) | ND(0.22) | ND(0.22) | ND(0.004) | ND(5.0) | ND(0.004) | ND(4.5) |
| Benzene | mg/kg | 290 | 0.5 | **9.4[b]** | **0.630[b]** | 0.12 J | 0.003 J | **44[b]** | 0.001 J | **0.55 J[b]** |
| Ethylbenzene | mg/kg | 890 | 70 | ND(4.4) | 0.053 J | 0.051 J | ND(0.004) | ND(5.0) | ND(0.004) | ND(4.5) |
| Isopropyl benzene | mg/kg | 10000 | 2500 | 18 | 4 | 1.7 | 0.019 | 230 | 0.021 | 59 |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | **ND(4.4)[b]** | ND(0.22) | ND(0.22) | ND(0.004) | **ND(5.0)[b]** | ND(0.004) | **ND(4.5)[b]** |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | ND(4.4) | ND(0.22) | 0.091 J | ND(0.004) | 38 | ND(0.004) | ND(4.5) |
| Xylenes (total) | mg/kg | 8000 | 1000 | ND(4.4) | 0.083 J | 0.13 J | ND(0.004) | 2.1 J | ND(0.004) | ND(4.5) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.037 J | ND(0.019) | 0.008 J | 0.030 J | 0.027 | ND(0.019) | 0.064 J |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 0.094 J | 0.004 J | 0.032 | 0.12 | 0.09 | 0.008 J | 0.35 |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 0.12 | 0.006 J | 0.036 | 0.13 | 0.092 | 0.009 J | 0.30 |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 0.18 | 0.007 J | 0.049 | 0.18 | 0.13 | 0.014 J | 0.57 |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.13 | 0.005 J | 0.032 | 0.13 | 0.083 | 0.010 J | 0.27 |
| Chrysene | mg/kg | 760 | 230 | 0.098 | 0.005 J | 0.038 | 0.14 | 0.11 | 0.010 J | 0.41 |
| Fluorene | mg/kg | 130000 | 3800 | ND(0.095) | ND(0.019) | ND(0.018) | ND(0.092) | 0.017 J | ND(0.019) | 0.035 J |
| Naphthalene | mg/kg | 760 | 25 | 0.024 J | ND(0.019) | ND(0.018) | ND(0.092) | 0.07 | ND(0.019) | 0.099 |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.054 J | 0.004 J | 0.025 | 0.058 J | 0.087 | 0.010 J | 0.26 |
| Pyrene | mg/kg | 96000 | 2200 | 0.13 | 0.007 J | 0.057 | 0.19 | 0.16 | 0.015 J | 0.51 |
| **Metals - Total** | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 66.0 | 5.63 | 10.3 | 12.8 | 14.0 | 10.0 | 60.8 |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 11.4 | 10.4 | 8.1 | 8.4 | 13.2 | 10.7 | 10.5 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-037** | **AOI6-BH-16-038** | **AOI6-BH-16-039** | **AOI6-BH-16-040** | **AOI6-BH-16-041** | **AOI6-BH-16-043** | **B-171** | **B-172** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-037-0-2-SOIL** | **AOI6-BH-16-038-0-2-SOIL** | **AOI6-BH-16-039-0-2-SOIL** | **AOI6-BH-16-040-0-2-SOIL** | **AOI6-BH-16-041-0-2-SOIL** | **AOI6-BH-16-43-0-2-SOIL** | **AOI6-B-171-0-2-SOIL** | **AOI6-B-172-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/14/2016** | **04/14/2016** | **04/11/2016** | **04/07/2016** | **04/07/2016** | **04/07/2016** | **04/06/2016** | **04/06/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.0-1.8 ft** | **1.5-1.8 ft** | **0.5-0.6 ft** | **0.5-0.8 ft** | **0.8-1.3 ft** | **0.5-1.0 ft** | **1.0-2.0 ft** | **0.5-1.0 ft** |
| | | **MSC** | **MSC** | | | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | **ND(94)[b]** | ND(4.8) | ND(0.005) | 0.33 J | - | 0.045 J | ND(0.004) | 0.110 J |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | **ND(94)[b]** | **ND(4.8)[b]** | ND(0.005) | **ND(1.1)[b]** | - | **ND(0.22)[b]** | ND(0.004) | **ND(0.38)[b]** |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | **ND(94)[b]** | **ND(4.8)[b]** | ND(0.005) | **ND(1.1)[b]** | - | ND(0.22) | ND(0.004) | ND(0.38) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(94) | ND(4.8) | ND(0.005) | 0.38 J | - | 0.046 J | ND(0.004) | ND(0.38) |
| Benzene | mg/kg | 290 | 0.5 | **710[ab]** | **8.8[b]** | ND(0.005) | **1.1 J[b]** | - | **0.810[b]** | 0.001 J | 0.21 J |
| Ethylbenzene | mg/kg | 890 | 70 | **ND(94)[b]** | ND(4.8) | ND(0.005) | 0.76 J | - | 0.064 J | ND(0.004) | 0.10 J |
| Isopropyl benzene | mg/kg | 10000 | 2500 | **6500[b]** | 14 | ND(0.005) | 1.2 | - | 0.055 J | ND(0.004) | ND(0.38) |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | **ND(94)[b]** | **ND(4.8)[b]** | ND(0.005) | ND(1.1) | - | ND(0.22) | ND(0.004) | ND(0.38) |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | **840[b]** | ND(4.8) | ND(0.005) | ND(1.1) | - | 0.190 J | ND(0.004) | 0.58 |
| Xylenes (total) | mg/kg | 8000 | 1000 | 26 J | ND(4.8) | ND(0.005) | 0.88 J | - | 0.33 | ND(0.004) | 0.51 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.068 J | 0.073 J | 0.005 J | 1.7 | 6.2 | 0.26 | 0.12 | - |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 0.11 | 0.19 | 0.019 J | 3.1 | 12 | 0.71 | 0.44 | - |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 0.16 | 0.22 | 0.019 J | 2.2 | 8.0 | 1.1 | 0.45 | - |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 0.24 | 0.33 | 0.033 | 3.2 | 14 | 1.5 | 0.54 | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.19 | 0.20 | 0.015 J | 1.2 | 5.1 | 1.3 | 0.29 | - |
| Chrysene | mg/kg | 760 | 230 | 0.14 | 0.22 | 0.025 | 2.9 | 12 | 0.78 | 0.42 | - |
| Fluorene | mg/kg | 130000 | 3800 | 0.049 J | 0.036 J | ND(0.023) | 1.6 | 6.8 | 0.050 J | 0.044 J | - |
| Naphthalene | mg/kg | 760 | 25 | 1.3 | 0.093 J | 0.006 J | 3.2 | 22 | 0.27 | 0.23 | - |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.18 | 0.18 | 0.016 J | 6.7 | 25 | 0.42 | 0.22 | - |
| Pyrene | mg/kg | 96000 | 2200 | 0.22 | 0.28 | 0.033 | 6.4 | 21 | 0.86 | 0.50 | - |
| **Metals - Total** | | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 100 | 33.1 | 7.22 | 249 | **3820[ab]** | 331 | 45.7 | 168 |
| **General Chemistry** | | | | | | | | | | | |
| Percent moisture | % | - | - | 15.1 | 10.1 | 24.7 | 10.6 | 16.5 | 8.0 | 6.2 | 14.6 |
| pH, lab | s.u. | - | - | - | - | - | 8.15 | 7.89 | 9.15 | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **B-172** | **B-173** | **B-173** | **B-174** | **B-174** | **B-175** | **B-175** | **AOI6-BH-17-001** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-B-172-0-2-071216** | **AOI6-B-173-0-2-SOIL** | **AOI6-B-173-0-2-071216** | **AOI6-B-174-0-2-SOIL** | **AOI6-B-174-0-2-071316** | **AOI6-B-175-0-2-SOIL** | **AOI6-B-175-0-2-071316** | **AOI6-BH-17-001-0-2-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **07/12/2016** | **04/05/2016** | **07/12/2016** | **04/04/2016** | **07/13/2016** | **04/05/2016** | **07/13/2016** | **01/06/2017** |
| **Sample Depth:** | | **Direct Contact** | | **0.5-1.0 ft** | **1.0-1.5 ft** | **1.0-1.5 ft** | **1.0-1.5 ft** | **1.0-1.5 ft** | **1.5-2.0 ft** | **1.5-2.0 ft** | **0.5-0.75 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | - | 0.31 | - | ND(0.004) | - | 0.29 J | - | - |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | - | **ND(0.31)[b]** | - | ND(0.004) | - | **ND(0.32)[b]** | - | - |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | - | ND(0.31) | - | ND(0.004) | - | ND(0.32) | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | - | 0.130 J | - | ND(0.004) | - | 0.26 J | - | - |
| Benzene | mg/kg | 290 | 0.5 | - | 0.300 J | - | ND(0.004) | - | **1.1[b]** | - | - |
| Ethylbenzene | mg/kg | 890 | 70 | - | ND(0.31) | - | ND(0.004) | - | 0.35 | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | - | 0.36 | - | ND(0.004) | - | 0.27 J | - | - |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | - | ND(0.31) | - | ND(0.004) | - | ND(0.32) | - | - |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | - | 0.13 J | - | ND(0.004) | - | 1.3 | - | - |
| Xylenes (total) | mg/kg | 8000 | 1000 | - | 0.66 | - | ND(0.004) | - | 1.6 | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | 0.80 | - | 0.089 J | - | 0.110 J | - | 2.4 | - |
| Benzo(a)anthracene | mg/kg | 130 | 130 | 2.4 | - | 0.30 | - | 0.60 | - | 1.9 | - |
| Benzo(a)pyrene | mg/kg | 12 | 12 | 1.4 | - | 0.33 | - | 0.54 | - | 1.4 | - |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | 2.6 | - | 0.44 | - | 0.71 | - | 1.9 | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.95 | - | 0.39 | - | 0.39 | - | 1.7 | - |
| Chrysene | mg/kg | 760 | 230 | 2.3 | - | 0.42 | - | 0.63 | - | 2.0 | - |
| Fluorene | mg/kg | 130000 | 3800 | 0.079 J | - | 0.049 J | - | ND(0.21) | - | 3.6 | - |
| Naphthalene | mg/kg | 760 | 25 | 1.2 | - | 0.27 | - | 0.18 J | - | 9.3 | - |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.93 | - | 0.34 | - | 0.40 | - | 10 | - |
| Pyrene | mg/kg | 96000 | 2200 | 3.0 | - | 0.49 | - | 0.89 | - | 2.8 | - |
| **Metals - Total** | | | | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | - | 170 | - | 6.22 | - | 207 | - | 211 |
| **General Chemistry** | | | | | | | | | | | |
| Percent moisture | % | - | - | 26.2 | 17.5 | 9.1 | 4.8 | 21.2 | 30.1 | 40.2 | - |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3a**

**Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:**<br>**Sample ID:**<br>**Sample Date:**<br>**Sample Depth:**<br>**Parameters** | **Units** | **Act 2 Non-Residential Used Aquifer Direct Contact MSC** a | **Act 2 Non-Residential Used Aquifer MSC** b | **AOI6-BH-17-002**<br>**AOI6-BH-17-002-0-2-SOIL**<br>**01/06/2017**<br>**0.8-1.1 ft** | **AOI6-BH-17-003**<br>**AOI6-BH-17-003-0-2-SOIL**<br>**01/06/2017**<br>**1.2-1.5 ft** | **AOI6-BH-17-004**<br>**AOI6-BH-17-004-0-2-SOIL**<br>**01/06/2017**<br>**1.2-1.6 ft** | **AOI6-BH-17-005**<br>**AOI6-BH-17-005-0-2-SOIL**<br>**01/06/2017**<br>**1.0-1.25 ft** | **AOI6-BH-17-009**<br>**AOI6-BH-17-009-0-2-SOIL**<br>**01/06/2017**<br>**1.0-1.3 ft** |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 560 | 35 | - | - | - | - | - |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 3.7 | 0.005 | - | - | - | - | - |
| 1,2-Dichloroethane | mg/kg | 86 | 0.5 | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | - | - | - | - | - |
| Benzene | mg/kg | 290 | 0.5 | - | - | - | - | - |
| Ethylbenzene | mg/kg | 890 | 70 | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | - | - | - | - | - |
| Methyl tert butyl ether (MTBE) | mg/kg | 8600 | 2.0 | - | - | - | - | - |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | - | - | - | - | - |
| Xylenes (total) | mg/kg | 8000 | 1000 | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | |
| Anthracene | mg/kg | 190000 | 350 | - | - | - | - | - |
| Benzo(a)anthracene | mg/kg | 130 | 130 | - | - | - | - | - |
| Benzo(a)pyrene | mg/kg | 12 | 12 | - | - | - | - | - |
| Benzo(b)fluoranthene | mg/kg | 76 | 76 | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | - | - | - | - | - |
| Chrysene | mg/kg | 760 | 230 | - | - | - | - | - |
| Fluorene | mg/kg | 130000 | 3800 | - | - | - | - | - |
| Naphthalene | mg/kg | 760 | 25 | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000 | 10000 | - | - | - | - | - |
| Pyrene | mg/kg | 96000 | 2200 | - | - | - | - | - |
| **Metals - Total** | | | | | | | | |
| Lead | mg/kg | 1000[a] | 450[b] , 2240[c] | 234 | 899[b] | **7490**[ab] | 770[b] | 34.3 |
| **General Chemistry** | | | | | | | | |
| Percent moisture | % | - | - | - | - | - | - | - |
| pH, lab | s.u. | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Surface Soil (0-2 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, |
| c | Site Specific Standard for Lead (SSS) August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| ft | Feet. |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-004** | **AOI6-BH-16-006** | **AOI6-BH-16-007** | **AOI6-BH-16-008** | **AOI6-BH-16-014** | **AOI6-BH-16-014** | **AOI6-BH-16-015** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-004-2-4-SOIL** | **AOI6-BH-16-006-2-4-SOIL** | **AOI6-BH-16-007-2-4-SOIL** | **AOI6-BH-16-008-2-4-SOIL** | **AOI6-BH-16-014-2-4-SOIL** | **AOI6-BH-16-014-2-4-071116** | **AOI6-BH-16-015-2-4-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/21/2016** | **04/22/2016** | **04/08/2016** | **04/08/2016** | **04/05/2016** | **07/11/2016** | **04/05/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.8-2.3 ft** | **1.5-2.3 ft** | **2.0-2.3 ft** | **2.0-2.5 ft** | **2.0-2.5 ft** | **2.0-2.3 ft** | **2.0-2.1 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 640 | 35 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | ND(0.27) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 4.3 | 0.005 | ND(0.005) | **ND(0.22)**[b] | ND(0.005) | ND(0.004) | **ND(0.44)**[b] | - | **ND(0.27)**[b] |
| 1,2-Dichloroethane | mg/kg | 98 | 0.5 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | ND(0.27) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | ND(0.27) |
| 2-Phenylbutane (sec-Butylbenzene) | mg/kg | 10000 | 2800 | - | - | - | - | - | - | - |
| Benzene | mg/kg | 330 | 0.5 | 0.001 J | 0.023 J | 0.004 J | 0.001 J | ND(0.44) | - | ND(0.27) |
| Cyclohexane | mg/kg | 10000 | 6900 | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 1000 | 70 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | ND(0.27) |
| Hexane | mg/kg | 10000 | 5600 | - | - | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | 0.23 J |
| Methyl tert butyl ether (MTBE) | mg/kg | 9900 | 2 | ND(0.005) | ND(0.22) | ND(0.005) | ND(0.004) | ND(0.44) | - | ND(0.27) |
| Naphthalene | mg/kg | 190000 | 25 | - | - | - | - | - | - | - |
| tert-Butylbenzene | mg/kg | 10000 | 2200 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | 0.002 J | 0.073 J | ND(0.005) | ND(0.004) | 0.29 J | - | ND(0.27) |
| Xylenes (total) | mg/kg | 9100 | 1000 | 0.001 J | 0.065 J | ND(0.005) | ND(0.004) | 0.10 J | - | 0.092 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| 2,4-Dimethylphenol | mg/kg | 10000 | 230 | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000 | 23 | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000 | 1900 | - | - | - | - | - | - | - |
| 2-Methylphenol | mg/kg | 190000 | 580 | - | - | - | - | - | - | - |
| 4-Methylphenol | mg/kg | 190000 | 58 | - | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000 | 6 | - | - | - | - | - | - | - |
| Acenaphthene | mg/kg | 190000 | 4700 | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000 | 350 | 0.55 | 0.43 | 0.84 | 1.8 | - | 12 | - |
| Benzo(a)anthracene | mg/kg | 190000 | 430 | 1.6 | 0.75 | 2.2 | 3.7 | - | 25 | - |
| Benzo(a)pyrene | mg/kg | 190000 | 46 | 1.5 | 0.74 | 1.8 | 2.9 | - | 26 | - |
| Benzo(b)fluoranthene | mg/kg | 190000 | 170 | 1.7 | 1.0 | 2.3 | 4.0 | - | 26 | - |
| Benzo(b)pyridine (Quinoline) | mg/kg | 10000 | 0.37 | - | - | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.84 | 0.52 | 1.2 | 2.0 | - | 15 | - |
| Benzo(k)fluoranthene | mg/kg | 190000 | 610 | - | - | - | - | - | - | - |
| Biphenyl (1,1-Biphenyl) | mg/kg | 190000 | 190 | - | - | - | - | - | - | - |
| bis(2-Ethylhexyl)phthalate (DEHP) | mg/kg | 10000 | 130 | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000 | 230 | 1.5 | 0.82 | 2.1 | 3.7 | - | 30 | - |
| Dibenz(a,h)anthracene | mg/kg | 190000 | 270 | - | - | - | - | - | - | - |
| Diethyl phthalate | mg/kg | 10000 | 9300 | - | - | - | - | - | - | - |
| Di-n-butylphthalate (DBP) | mg/kg | 10000 | 4900 | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000 | 3200 | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000 | 3800 | 0.20 | 0.27 | 0.31 | 1.7 | - | 12 | - |
| Indeno(1,2,3-cd)pyrene | mg/kg | 190000 | 22000 | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000 | 25 | 1.1 | 1.6 | 0.71 | 1.5 | - | 24 | - |
| Phenanthrene | mg/kg | 190000 | 10000 | 1.2 | 1.1 | 2.6 | 8.8 | - | 37 | - |
| Phenol | mg/kg | 18000 | 200 | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000 | 2200 | 1.9 | 1.2 | 3.4 | 7.3 | - | 39 | - |
| Pyridine | mg/kg | 10000 | 12 | - | - | - | - | - | - | - |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-004** | **AOI6-BH-16-006** | **AOI6-BH-16-007** | **AOI6-BH-16-008** | **AOI6-BH-16-014** | **AOI6-BH-16-014** | **AOI6-BH-16-015** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-004-2-4-SOIL** | **AOI6-BH-16-006-2-4-SOIL** | **AOI6-BH-16-007-2-4-SOIL** | **AOI6-BH-16-008-2-4-SOIL** | **AOI6-BH-16-014-2-4-SOIL** | **AOI6-BH-16-014-2-4-071116** | **AOI6-BH-16-015-2-4-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/21/2016** | **04/22/2016** | **04/08/2016** | **04/08/2016** | **04/05/2016** | **07/11/2016** | **04/05/2016** |
| **Sample Depth:** | | **Direct Contact** | | **1.8-2.3 ft** | **1.5-2.3 ft** | **2.0-2.3 ft** | **2.0-2.5 ft** | **2.0-2.5 ft** | **2.0-2.3 ft** | **2.0-2.1 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Metals - Total** | | | | | | | | | | |
| Cobalt | mg/kg | 190000 | 160 | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000 | 450 | 189 | 225 | 243 | 267 | 352 | - | 134 |
| Nickel | mg/kg | 190000 | 650 | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000 | 820 | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000 | 12000 | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 11 | 11.8 | 17.6 | 14.8 | 44.3 | 34.8 | 21.6 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

a PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Subsurface Soil (2-15 feet), August 27, 2016.

b PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, August 27, 2016.

ND Not detected at the associated reporting limit.

J Estimated concentration.

**ND(10)[b]** Indicates reporting limit was above the applicable standard.

**6.5[A]** Concentration exceeds the indicated standard.

SS Lead value is the site specific standard for lead accepted by the PADEP.

ft feet

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | AOI6-BH-16-015 | AOI6-BH-16-016 | AOI6-BH-16-016 | AOI6-BH-16-019 | AOI6-BH-16-022 | AOI6-BH-16-025 |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-BH-16-015-2-4-071116 | AOI6-BH-16-016-2-4-SOIL | AOI6-BH-16-016-2-4-071116 | AOI6-BH-16-019-2-4-SOIL | AOI6-BH-16-022-2-4-SOIL | AOI6-BH-16-025-2-4-SOIL |
| Sample Date: | | Used Aquifer | Used Aquifer | 07/11/2016 | 04/04/2016 | 07/11/2016 | 04/21/2016 | 04/06/2016 | 04/22/2016 |
| Sample Depth: | | Direct Contact | | 2.0-2.2 ft | 2.0-2.5 ft | 2.0-2.3 ft | 1.8-3.0 ft | 2.3-2.5 ft | 1.9-2.2 ft |
| | | MSC | MSC | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 640 | 35 | - | 0.14 J | - | ND(0.006) | ND(0.005) | **50 J**[b] |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 4.3 | 0.005 | - | **ND(0.34)**[b] | - | **ND(0.006)**[b] | ND(0.005) | **ND(24)**[b] |
| 1,2-Dichloroethane | mg/kg | 98 | 0.5 | - | ND(0.34) | - | ND(0.006) | ND(0.005) | **ND(24)**[b] |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | - | ND(0.34) | - | ND(0.006) | ND(0.005) | 18 J |
| 2-Phenylbutane (sec-Butylbenzene) | mg/kg | 10000 | 2800 | - | - | - | - | - | - |
| Benzene | mg/kg | 330 | 0.5 | - | ND(0.34) | - | 0.002 J | ND(0.005) | **1400 J**[ab] |
| Cyclohexane | mg/kg | 10000 | 6900 | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 1000 | 70 | - | ND(0.34) | - | ND(0.006) | ND(0.005) | 61 J |
| Hexane | mg/kg | 10000 | 5600 | - | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | - | 0.44 | - | 0.002 J | ND(0.005) | 2200 J |
| Methyl tert butyl ether (MTBE) | mg/kg | 9900 | 2 | - | ND(0.34) | - | ND(0.006) | ND(0.005) | **ND(24)**[b] |
| Naphthalene | mg/kg | 190000 | 25 | - | - | - | - | - | - |
| tert-Butylbenzene | mg/kg | 10000 | 2200 | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | - | 0.19 J | - | 0.002 J | ND(0.005) | **640 J**[b] |
| Xylenes (total) | mg/kg | 9100 | 1000 | - | 0.16 J | - | ND(0.006) | ND(0.005) | 340 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| 2,4-Dimethylphenol | mg/kg | 10000 | 230 | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000 | 23 | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000 | 1900 | - | - | - | - | - | - |
| 2-Methylphenol | mg/kg | 190000 | 580 | - | - | - | - | - | - |
| 4-Methylphenol | mg/kg | 190000 | 58 | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000 | 6 | - | - | - | - | - | - |
| Acenaphthene | mg/kg | 190000 | 4700 | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000 | 350 | 2.3 | - | 3.4 | 0.39 | 0.05 | 1.2 |
| Benzo(a)anthracene | mg/kg | 190000 | 430 | 1.2 | - | 3.3 | 1.4 | 0.13 | 1.1 |
| Benzo(a)pyrene | mg/kg | 190000 | 46 | 1.2 | - | 3.3 | 1.4 | 0.14 | 0.69 |
| Benzo(b)fluoranthene | mg/kg | 190000 | 170 | 1.2 | - | 3.6 | 1.7 | 0.2 | 1.0 |
| Benzo(b)pyridine (Quinoline) | mg/kg | 10000 | 0.37 | - | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 1.6 | - | 3.5 | 0.88 | 0.11 | 0.33 |
| Benzo(k)fluoranthene | mg/kg | 190000 | 610 | - | - | - | - | - | - |
| Biphenyl (1,1-Biphenyl) | mg/kg | 190000 | 190 | - | - | - | - | - | - |
| bis(2-Ethylhexyl)phthalate (DEHP) | mg/kg | 10000 | 130 | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000 | 230 | 2.4 | - | 3.7 | 1.4 | 0.14 | 0.97 |
| Dibenz(a,h)anthracene | mg/kg | 190000 | 270 | - | - | - | - | - | - |
| Diethyl phthalate | mg/kg | 10000 | 9300 | - | - | - | - | - | - |
| Di-n-butylphthalate (DBP) | mg/kg | 10000 | 4900 | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000 | 3200 | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000 | 3800 | 2.6 | - | 6.3 | 0.20 | 0.019 J | 0.85 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 190000 | 22000 | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000 | 25 | 6.3 | - | 18 | 1.5 | 0.045 | 2.0 |
| Phenanthrene | mg/kg | 190000 | 10000 | 7.2 | - | 17 | 1.1 | 0.16 | 4.1 |
| Phenol | mg/kg | 18000 | 200 | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000 | 2200 | 3.2 | - | 4.2 | 1.4 | 0.21 | 2.1 |
| Pyridine | mg/kg | 10000 | 12 | - | - | - | - | - | - |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-015** | **AOI6-BH-16-016** | **AOI6-BH-16-016** | **AOI6-BH-16-019** | **AOI6-BH-16-022** | **AOI6-BH-16-025** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-015-2-4-071116** | **AOI6-BH-16-016-2-4-SOIL** | **AOI6-BH-16-016-2-4-071116** | **AOI6-BH-16-019-2-4-SOIL** | **AOI6-BH-16-022-2-4-SOIL** | **AOI6-BH-16-025-2-4-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **07/11/2016** | **04/04/2016** | **07/11/2016** | **04/21/2016** | **04/06/2016** | **04/22/2016** |
| **Sample Depth:** | | **Direct Contact** | | **2.0-2.2 ft** | **2.0-2.5 ft** | **2.0-2.3 ft** | **1.8-3.0 ft** | **2.3-2.5 ft** | **1.9-2.2 ft** |
| | | **MSC** | **MSC** | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | |
| **Metals - Total** | | | | | | | | | |
| Cobalt | mg/kg | 190000 | 160 | - | - | - | - | - | - |
| Lead | mg/kg | 190000 | 450 | - | 256 | - | **1370**[b] | 101 | 64.3 |
| Nickel | mg/kg | 190000 | 650 | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000 | 820 | - | - | - | - | - | - |
| Zinc | mg/kg | 190000 | 12000 | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | |
| Percent moisture | % | - | - | 30.5 | 32.5 | 32.3 | 24.9 | 10.9 | 9.1 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| a | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Subsurface Soil (2-15 feet), August 27, 2016. |
| b | PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, August 27, 2016. |
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)[b]** | Indicates reporting limit was above the applicable standard. |
| **6.5[A]** | Concentration exceeds the indicated standard. |
| SS | Lead value is the site specific standard for lead accepted by the PADEP. |
| ft | feet |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-027** | **AOI6-BH-16-029** | **AOI6-BH-16-030** | **AOI6-BH-16-031** | **AOI6-BH-16-032** | **AOI6-BH-16-033** | **AOI6-BH-16-034** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-027-2-4-SOIL** | **AOI6-BH-16-029-2-4-SOIL** | **AOI6-BH-16-030-2-4-SOIL** | **AOI6-BH-16-031-2-4-SOIL** | **AOI6-BH-16-032-2-4-SOIL** | **AOI6-BH-16-033-2-4-SOIL** | **AOI6-BH-16-034-2-4-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/13/2016** | **04/13/2016** | **04/14/2016** | **04/14/2016** | **04/13/2016** | **04/13/2016** | **04/13/2016** |
| **Sample Depth:** | | **Direct Contact** | | **2.5-2.8 ft** | **2.3-2.5 ft** | **2.5-2.8 ft** | **2.0-2.5 ft** | **2.0-2.5 ft** | **2.0-2.3 ft** | **2.0-2.3 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 640 | 35 | 10 | 1.0 | ND(4.3) | 0.960 J | 0.70J | ND(0.21) | ND(4.7) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 4.3 | 0.005 | **ND(5.3)[b]** | **ND(0.28)[b]** | **ND(4.3)[b]** | **ND(2)[b]** | **ND(0.77)[b]** | **ND(0.21)[b]** | **ND(4.7)[b]** |
| 1,2-Dichloroethane | mg/kg | 98 | 0.5 | **ND(5.3)[b]** | ND(0.28) | **ND(4.3)[b]** | **ND(2)[b]** | **ND(0.77)[b]** | ND(0.21) | **ND(4.7)[b]** |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | 9.3 | 0.48 | ND(4.3) | 0.440 J | 0.37 J | ND(0.21) | ND(4.7) |
| 2-Phenylbutane (sec-Butylbenzene) | mg/kg | 10000 | 2800 | - | - | - | - | - | - | - |
| Benzene | mg/kg | 330 | 0.5 | **2.500 J[b]** | **4.5[b]** | **130[b]** | **27[b]** | **3.7[b]** | ND(0.21) | **96[b]** |
| Cyclohexane | mg/kg | 10000 | 6900 | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 1000 | 70 | ND(5.3) | 0.81 | ND(4.3) | 2.9 | 3.6 | ND(0.21) | 1.2 J |
| Hexane | mg/kg | 10000 | 5600 | - | - | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | 360 | 10 | 710 | 180 | 110 | 0.130 J | 360 |
| Methyl tert butyl ether (MTBE) | mg/kg | 9900 | 2 | **ND(5.3)[b]** | ND(0.28) | **ND(4.3)[b]** | ND(2) | ND(0.77) | ND(0.21) | **ND(4.7)[b]** |
| Naphthalene | mg/kg | 190000 | 25 | - | - | - | - | - | - | - |
| tert-Butylbenzene | mg/kg | 10000 | 2200 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | 3.9 J | 1.2 | 20 | 22 | 45 | ND(0.21) | 81 |
| Xylenes (total) | mg/kg | 9100 | 1000 | 3.3 J | 1.5 | 2.900 J | 12 | 17 | ND(0.21) | 3.8 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| 2,4-Dimethylphenol | mg/kg | 10000 | 230 | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000 | 23 | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000 | 1900 | - | - | - | - | - | - | - |
| 2-Methylphenol | mg/kg | 190000 | 580 | - | - | - | - | - | - | - |
| 4-Methylphenol | mg/kg | 190000 | 58 | - | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000 | 6 | - | - | - | - | - | - | - |
| Acenaphthene | mg/kg | 190000 | 4700 | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000 | 350 | 3.4 | 2.2 | 0.16 | 0.014 J | 0.004 J | 0.006 J | ND(0.092) |
| Benzo(a)anthracene | mg/kg | 190000 | 430 | 2.3 | 2.8 | 0.079 | 0.014 J | 0.014 J | 0.026 | 0.050 J |
| Benzo(a)pyrene | mg/kg | 190000 | 46 | 1.7 | 2.6 | 0.079 | 0.012 J | 0.013 J | 0.028 | 0.039 J |
| Benzo(b)fluoranthene | mg/kg | 190000 | 170 | 1.7 | 3.5 | 0.18 | 0.019 | 0.021 | 0.032 | 0.084 J |
| Benzo(b)pyridine (Quinoline) | mg/kg | 10000 | 0.37 | - | - | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 1.0 | 1.7 | 0.073 | 0.008 J | 0.016 J | 0.029 | 0.042 J |
| Benzo(k)fluoranthene | mg/kg | 190000 | 610 | - | - | - | - | - | - | - |
| Biphenyl (1,1-Biphenyl) | mg/kg | 190000 | 190 | - | - | - | - | - | - | - |
| bis(2-Ethylhexyl)phthalate (DEHP) | mg/kg | 10000 | 130 | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000 | 230 | 4.0 | 3.3 | 0.094 | 0.02 | 0.018 J | 0.032 | 0.095 |
| Dibenz(a,h)anthracene | mg/kg | 190000 | 270 | - | - | - | - | - | - | - |
| Diethyl phthalate | mg/kg | 10000 | 9300 | - | - | - | - | - | - | - |
| Di-n-butylphthalate (DBP) | mg/kg | 10000 | 4900 | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000 | 3200 | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000 | 3800 | 6.3 | 8.4 | 0.034 | 0.047 | 0.008 J | ND(0.018) | 0.033 J |
| Indeno(1,2,3-cd)pyrene | mg/kg | 190000 | 22000 | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000 | 25 | 7.8 | 4.8 | 2.4 | 0.062 | 0.029 | 0.014 J | 0.16 |
| Phenanthrene | mg/kg | 190000 | 10000 | 13 | 10 | 3.3 | 0.059 | 0.013 J | 0.011 J | 0.12 |
| Phenol | mg/kg | 18000 | 200 | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000 | 2200 | 6.2 | 5.8 | 0.14 | 0.033 | 0.025 | 0.042 | 0.12 |
| Pyridine | mg/kg | 10000 | 12 | - | - | - | - | - | - | - |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | AOI6-BH-16-027 | AOI6-BH-16-029 | AOI6-BH-16-030 | AOI6-BH-16-031 | AOI6-BH-16-032 | AOI6-BH-16-033 | AOI6-BH-16-034 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-BH-16-027-2-4-SOIL | AOI6-BH-16-029-2-4-SOIL | AOI6-BH-16-030-2-4-SOIL | AOI6-BH-16-031-2-4-SOIL | AOI6-BH-16-032-2-4-SOIL | AOI6-BH-16-033-2-4-SOIL | AOI6-BH-16-034-2-4-SOIL |
| Sample Date: | | Used Aquifer | Used Aquifer | 04/13/2016 | 04/13/2016 | 04/14/2016 | 04/14/2016 | 04/13/2016 | 04/13/2016 | 04/13/2016 |
| Sample Depth: | | Direct Contact MSC | MSC | 2.5-2.8 ft | 2.3-2.5 ft | 2.5-2.8 ft | 2.0-2.5 ft | 2.0-2.5 ft | 2.0-2.3 ft | 2.0-2.3 ft |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Metals - Total** | | | | | | | | | | |
| Cobalt | mg/kg | 190000 | 160 | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000 | 450 | 90.6 | 137 | 34.3 | 6.19 | 10.6 | 9.85 | 15.3 |
| Nickel | mg/kg | 190000 | 650 | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000 | 820 | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000 | 12000 | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 15 | 10.5 | 11.6 | 8.6 | 9.0 | 5.7 | 8.9 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

a PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Subsurface Soil (2-15 feet), August 27, 2016.

b PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, August 27, 2016.

ND Not detected at the associated reporting limit.

J Estimated concentration.

**ND(10)[b]** Indicates reporting limit was above the applicable standard.

**6.5[A]** Concentration exceeds the indicated standard.

SS Lead value is the site specific standard for lead accepted by the PADEP.

ft feet

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **AOI6-BH-16-035** | **AOI6-BH-16-036** | **AOI6-BH-16-037** | **AOI6-BH-16-040** | **AOI6-BH-16-041** | **AOI6-BH-16-043** | **B-172** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-BH-16-035-2-4-SOIL** | **AOI6-BH-16-036-2-4-SOIL** | **AOI6-BH-16-037-2-4-SOIL** | **AOI6-BH-16-040-2-4-SOIL** | **AOI6-BH-16-041-2-4-SOIL** | **AOI6-BH-16-043-2-4-SOIL** | **AOI6-B-172-2-4-SOIL** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **04/13/2016** | **04/14/2016** | **04/14/2016** | **04/07/2016** | **04/07/2016** | **04/07/2016** | **04/06/2016** |
| **Sample Depth:** | | **Direct Contact** | | **2.0-2.3 ft** | **2.0-2.3 ft** | **1.8-2.3 ft** | **1.8-2.0 ft** | **1.8-2.3 ft** | **2.0-2.5 ft** | **2.5-3.0 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 640 | 35 | ND(0.004) | ND(4.2) | **ND(97)[b]** | 8.1 | **47[b]** | 0.088 J | ND(0.41) |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 4.3 | 0.005 | ND(0.004) | **ND(4.2)[b]** | **ND(97)[b]** | **ND(4.9)[b]** | **ND(3.2)[b]** | **ND(0.24)[b]** | **ND(0.41)[b]** |
| 1,2-Dichloroethane | mg/kg | 98 | 0.5 | ND(0.004) | **ND(4.2)[b]** | **ND(97)[b]** | **ND(4.9)[b]** | **ND(3.2)[b]** | ND(0.24) | ND(0.41) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | ND(0.004) | ND(4.2) | ND(97) | 5.8 | 22 | 0.081 J | ND(0.41) |
| 2-Phenylbutane (sec-Butylbenzene) | mg/kg | 10000 | 2800 | - | - | - | - | - | - | - |
| Benzene | mg/kg | 330 | 0.5 | 0.002 J | **0.700 J[b]** | **850[ab]** | **1.4 J[b]** | **4.3[b]** | **1.3[b]** | ND(0.41) |
| Cyclohexane | mg/kg | 10000 | 6900 | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 1000 | 70 | ND(0.004) | ND(4.2) | **ND(97)[b]** | 13 | 17 | 0.13 J | ND(0.41) |
| Hexane | mg/kg | 10000 | 5600 | - | - | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | 0.083 | 180 | **8500[b]** | 6.4 | 6.4 | 0.23 J | ND(0.41) |
| Methyl tert butyl ether (MTBE) | mg/kg | 9900 | 2 | ND(0.004) | **ND(4.2)[b]** | **ND(97)[b]** | **ND(4.9)[b]** | **ND(3.2)[b]** | ND(0.24) | ND(0.41) |
| Naphthalene | mg/kg | 190000 | 25 | - | - | - | - | - | - | - |
| tert-Butylbenzene | mg/kg | 10000 | 2200 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | ND(0.004) | ND(4.2) | **1200[b]** | ND(4.9) | 2.5 J | 0.32 | 0.41 |
| Xylenes (total) | mg/kg | 9100 | 1000 | ND(0.004) | ND(4.2) | 27 J | 2.7 J | 39 | 0.56 | 0.091 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| 2,4-Dimethylphenol | mg/kg | 10000 | 230 | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000 | 23 | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000 | 1900 | - | - | - | - | - | - | - |
| 2-Methylphenol | mg/kg | 190000 | 580 | - | - | - | - | - | - | - |
| 4-Methylphenol | mg/kg | 190000 | 58 | - | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000 | 6 | - | - | - | - | - | - | - |
| Acenaphthene | mg/kg | 190000 | 4700 | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000 | 350 | 0.004 J | 0.036 | 0.11 | 5.9 | 2.7 | 0.29 | - |
| Benzo(a)anthracene | mg/kg | 190000 | 430 | 0.015 J | 0.086 | 0.05 | 5.0 | 5.8 | 0.9 | - |
| Benzo(a)pyrene | mg/kg | 190000 | 46 | 0.02 | 0.088 | 0.074 | 4.9 | 5.3 | 1.5 | - |
| Benzo(b)fluoranthene | mg/kg | 190000 | 170 | 0.022 | 0.12 | 0.11 | 6.3 | 7.8 | 1.9 | - |
| Benzo(b)pyridine (Quinoline) | mg/kg | 10000 | 0.37 | - | - | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.024 | 0.083 | 0.07 | 3.1 | 3.9 | 1.4 | - |
| Benzo(k)fluoranthene | mg/kg | 190000 | 610 | - | - | - | - | - | - | - |
| Biphenyl (1,1-Biphenyl) | mg/kg | 190000 | 190 | - | - | - | - | - | - | - |
| bis(2-Ethylhexyl)phthalate (DEHP) | mg/kg | 10000 | 130 | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000 | 230 | 0.02 | 0.10 | 0.053 | 5.1 | 5.6 | 1.1 | - |
| Dibenz(a,h)anthracene | mg/kg | 190000 | 270 | - | - | - | - | - | - | - |
| Diethyl phthalate | mg/kg | 10000 | 9300 | - | - | - | - | - | - | - |
| Di-n-butylphthalate (DBP) | mg/kg | 10000 | 4900 | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000 | 3200 | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000 | 3800 | ND(0.019) | 0.010 J | 0.033 | 6.4 | 2.8 | 0.090 J | - |
| Indeno(1,2,3-cd)pyrene | mg/kg | 190000 | 22000 | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000 | 25 | ND(0.019) | 0.018 J | 1.4 | **36[b]** | 12 | 0.42 | - |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.014 J | 0.077 | 3.2 | 21 | 13 | 0.58 | - |
| Phenol | mg/kg | 18000 | 200 | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000 | 2200 | 0.026 | 0.16 | 0.084 | 9.7 | 11 | 0.9 | - |
| Pyridine | mg/kg | 10000 | 12 | - | - | - | - | - | - | - |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | AOI6-BH-16-035 | AOI6-BH-16-036 | AOI6-BH-16-037 | AOI6-BH-16-040 | AOI6-BH-16-041 | AOI6-BH-16-043 | B-172 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-BH-16-035-2-4-SOIL | AOI6-BH-16-036-2-4-SOIL | AOI6-BH-16-037-2-4-SOIL | AOI6-BH-16-040-2-4-SOIL | AOI6-BH-16-041-2-4-SOIL | AOI6-BH-16-043-2-4-SOIL | AOI6-B-172-2-4-SOIL |
| Sample Date: | | Used Aquifer | Used Aquifer | 04/13/2016 | 04/14/2016 | 04/14/2016 | 04/07/2016 | 04/07/2016 | 04/07/2016 | 04/06/2016 |
| Sample Depth: | | Direct Contact | | 2.0-2.3 ft | 2.0-2.3 ft | 1.8-2.3 ft | 1.8-2.0 ft | 1.8-2.3 ft | 2.0-2.5 ft | 2.5-3.0 ft |
| | | MSC | MSC | | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Metals - Total** | | | | | | | | | | |
| Cobalt | mg/kg | 190000 | 160 | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000 | 450 | 10.9 | 18.9 | 105 | 142 | 196 | **1720**[b] | 208 |
| Nickel | mg/kg | 190000 | 650 | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000 | 820 | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000 | 12000 | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 9.4 | 8 | 14.4 | 8.4 | 17.9 | 9.3 | 42.4 |
| pH, lab | s.u. | - | - | - | - | - | 8.09 | 7.86 | 8.84 | - |

Notes:

a PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Subsurface Soil (2-15 feet), August 27, 2016.

b PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, August 27, 2016.

ND Not detected at the associated reporting limit.

J Estimated concentration.

**ND(10)**[b] Indicates reporting limit was above the applicable standard.

**6.5**[A] Concentration exceeds the indicated standard.

SS Lead value is the site specific standard for lead accepted by the PADEP.

ft feet

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | Act 2 | Act 2 | B-172 | B-173 | B-173 | B-174 | B-174 | B-175 | B-175 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | Non-Residential | Non-Residential | AOI6-B-172-2-4-071216 | AOI6-B-173-2-4-SOIL | AOI6-B-173-2-4-071316 | AOI6-B-174-2-4-SOIL | AOI6-B-174-2-4-071316 | AOI6-B-175-2-4-SOIL | AOI6-B-175-2-4-071316 |
| Sample Date: | | Used Aquifer | Used Aquifer | 07/12/2016 | 04/05/2016 | 07/13/2016 | 04/04/2016 | 07/13/2016 | 04/05/2016 | 07/13/2016 |
| Sample Depth: | | Direct Contact | | 2.5-3.0 ft | 3.5-4.0 ft | 3.5-4.0 ft | 3.5-4.0 ft | 3.5-4.0 ft | 2.7-3.0 ft | 2.7-3.0 ft |
| | | MSC | MSC | | | | | | | |
| **Parameters** | **Units** | a | b | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | mg/kg | 640 | 35 | - | ND(0.33) | - | ND(0.005) | - | 0.88 | - |
| 1,2-Dibromoethane (Ethylene dibromide) | mg/kg | 4.3 | 0.005 | - | ND(0.33)[b] | - | ND(0.005) | - | ND(0.34)[b] | - |
| 1,2-Dichloroethane | mg/kg | 98 | 0.5 | - | ND(0.33) | - | ND(0.005) | - | ND(0.34) | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000 | 210 | - | ND(0.33) | - | ND(0.005) | - | 1.5 | - |
| 2-Phenylbutane (sec-Butylbenzene) | mg/kg | 10000 | 2800 | - | - | - | - | - | - | - |
| Benzene | mg/kg | 330 | 0.5 | - | 0.054 J | - | 0.005 | - | 0.21 J | - |
| Cyclohexane | mg/kg | 10000 | 6900 | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 1000 | 70 | - | ND(0.33) | - | ND(0.005) | - | 0.23 J | - |
| Hexane | mg/kg | 10000 | 5600 | - | - | - | - | - | - | - |
| Isopropyl benzene | mg/kg | 10000 | 2500 | - | ND(0.33) | - | ND(0.005) | - | 0.58 | - |
| Methyl tert butyl ether (MTBE) | mg/kg | 9900 | 2 | - | ND(0.33) | - | ND(0.005) | - | ND(0.34) | - |
| Naphthalene | mg/kg | 190000 | 25 | - | - | - | - | - | - | - |
| tert-Butylbenzene | mg/kg | 10000 | 2200 | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000 | 100 | - | 0.38 | - | 0.001 J | - | 0.5 | - |
| Xylenes (total) | mg/kg | 9100 | 1000 | - | 0.074 J | - | ND(0.005) | - | 2.2 | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| 2,4-Dimethylphenol | mg/kg | 10000 | 230 | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000 | 23 | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000 | 1900 | - | - | - | - | - | - | - |
| 2-Methylphenol | mg/kg | 190000 | 580 | - | - | - | - | - | - | - |
| 4-Methylphenol | mg/kg | 190000 | 58 | - | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000 | 6 | - | - | - | - | - | - | - |
| Acenaphthene | mg/kg | 190000 | 4700 | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000 | 350 | 0.27 | - | 0.19 J | - | 0.14 J | - | 4.3 |
| Benzo(a)anthracene | mg/kg | 190000 | 430 | 0.48 | - | 0.45 | - | 0.63 | - | 5.6 |
| Benzo(a)pyrene | mg/kg | 190000 | 46 | 0.36 | - | 0.45 | - | 0.52 | - | 4.4 |
| Benzo(b)fluoranthene | mg/kg | 190000 | 170 | 0.50 | - | 0.63 | - | 0.65 | - | 7.7 |
| Benzo(b)pyridine (Quinoline) | mg/kg | 10000 | 0.37 | - | - | - | - | - | - | - |
| Benzo(g,h,i)perylene | mg/kg | 190000 | 180 | 0.23 | - | 0.47 | - | 0.40 | - | 3.3 |
| Benzo(k)fluoranthene | mg/kg | 190000 | 610 | - | - | - | - | - | - | - |
| Biphenyl (1,1-Biphenyl) | mg/kg | 190000 | 190 | - | - | - | - | - | - | - |
| bis(2-Ethylhexyl)phthalate (DEHP) | mg/kg | 10000 | 130 | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000 | 230 | 0.51 | - | 0.65 | - | 0.67 | - | 5.6 |
| Dibenz(a,h)anthracene | mg/kg | 190000 | 270 | - | - | - | - | - | - | - |
| Diethyl phthalate | mg/kg | 10000 | 9300 | - | - | - | - | - | - | - |
| Di-n-butylphthalate (DBP) | mg/kg | 10000 | 4900 | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000 | 3200 | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000 | 3800 | 0.11 | - | 0.16 J | - | 0.041 J | - | 8.4 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 190000 | 22000 | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000 | 25 | 0.12 | - | 1.2 | - | 0.14 J | - | 3.9 |
| Phenanthrene | mg/kg | 190000 | 10000 | 0.79 | - | 0.88 | - | 0.53 | - | 22 |
| Phenol | mg/kg | 18000 | 200 | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000 | 2200 | 0.78 | - | 0.81 | - | 1.0 | - | 6.3 |
| Pyridine | mg/kg | 10000 | 12 | - | - | - | - | - | - | - |

**Table 3b**

**Sub-Surface Soil Analytical Results Summary**
**Statewide Health Standards**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | **Act 2** | **Act 2** | **B-172** | **B-173** | **B-173** | **B-174** | **B-174** | **B-175** | **B-175** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **Non-Residential** | **Non-Residential** | **AOI6-B-172-2-4-071216** | **AOI6-B-173-2-4-SOIL** | **AOI6-B-173-2-4-071316** | **AOI6-B-174-2-4-SOIL** | **AOI6-B-174-2-4-071316** | **AOI6-B-175-2-4-SOIL** | **AOI6-B-175-2-4-071316** |
| **Sample Date:** | | **Used Aquifer** | **Used Aquifer** | **07/12/2016** | **04/05/2016** | **07/13/2016** | **04/04/2016** | **07/13/2016** | **04/05/2016** | **07/13/2016** |
| **Sample Depth:** | | **Direct Contact** | | **2.5-3.0 ft** | **3.5-4.0 ft** | **3.5-4.0 ft** | **3.5-4.0 ft** | **3.5-4.0 ft** | **2.7-3.0 ft** | **2.7-3.0 ft** |
| **Parameters** | **Units** | **MSC** a | **MSC** b | | | | | | | |
| **Metals - Total** | | | | | | | | | | |
| Cobalt | mg/kg | 190000 | 160 | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000 | 450 | - | 315 | - | **1360**[b] | - | 255 | - |
| Nickel | mg/kg | 190000 | 650 | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000 | 820 | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000 | 12000 | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | |
| Percent moisture | % | - | - | 16.7 | 34.3 | 14.4 | 24.2 | 15.1 | 37.5 | 29.6 |
| pH, lab | s.u. | - | - | - | - | - | - | - | - | - |

Notes:

a PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Direct Contact, Non-Residential, Subsurface Soil (2-15 feet), August 27, 2016.

b PADEP Act 2 Medium-Specific Concentration (MSCs) for Organic/Inorganic Regulated Substances in Soil, Minimum of Direct Contact and Soil to Groundwater Max(Generic vs x100), Used Aquifers TDS <= 2500,Non-residential, August 27, 2016.

ND Not detected at the associated reporting limit.

J Estimated concentration.

**ND(10)**[b] Indicates reporting limit was above the applicable standard.

**6.5**[A] Concentration exceeds the indicated standard.

SS Lead value is the site specific standard for lead accepted by the PADEP.

ft feet

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6 BH-12-104 | AOI6 BH-12-106 | AOI6 BH-12-107 | AOI6 BH-12-108 | AOI6 BH-12-111 | | AOI6 BH-12-112 | AOI6 BH-12-114 | AOI6 BH-12-115 | AOI6 BH-12-119 | AOI6 BH-12-120 | AOI6 BH-12-122 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 4-Dec-12 | 4-Dec-12 | 3-Dec-12 |
| Sample ID | | | | BH-12-104_0.5-1' | BH-12-106_1-1.5' | BH-12-107_1-1.5' | BH-12-108_1' | BH-12-111_0.5-1' | BH-12-111_1-1.5' | BH-12-112_0.5-1' | BH-12-114_1-1.5' | BH-12-115_1-2' | BH-12-119_0.5-1' | BH-12-120_0-1' | BH-12-122_1-1.5' |
| Sample Depth | | | | 0.5 - 1 ft | 1 - 1.5 ft | 1 - 1.5 ft | 0.5 - 1 ft | 0.5 - 1 ft | 1 - 1.5 ft | 0.5 - 1 ft | 1 - 1.5 ft | 1 - 2 ft | 0.5 - 1 ft | 0 - 1 ft | 1 - 1.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | A | B | JB22962 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22962 | JB22962 | JB22822 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | JB22962-14 | JB22822-8 | JB22822-2 | JB22822-6 | JB22822-10 | JB22822-11 | JB22822-1 | JB22822-15 | JB22822-12 | JB22962-11 | JB22962-13 | JB22822-18 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.063) (0.0075) | ***88.2*** [B] (0.076) | 0.0124 (0.00011) | ***23.6*** [B] (0.030) | 0.207 J (0.030) | 0.404 (0.027) | 0.0016 (0.00011) | ND (0.00094) (0.00011) | 0.0013 (0.00011) | 0.00056 J (0.00012) | ND (0.0013) (0.00015) | 0.0034 (0.00011) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.063)* (0.0080) | *ND (0.064)* (0.0081) | ND (0.00092) (0.00012) | *ND (0.25)* (0.032) | *ND (0.25)* (0.032) | *ND (0.23)* (0.029) | ND (0.00095) (0.00012) | ND (0.00094) (0.00012) | ND (0.00094) (0.00012) | ND (0.0010) (0.00013) | ND (0.0013) (0.00016) | ND (0.00088) (0.00011) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.063) (0.0085) | ND (0.064) (0.0086) | ND (0.00092) (0.00012) | ND (0.25) (0.034) | ND (0.25) (0.033) | ND (0.23) (0.031) | ND (0.00095) (0.00013) | ND (0.00094) (0.00013) | ND (0.00094) (0.00013) | ND (0.0010) (0.00014) | ND (0.0013) (0.00017) | ND (0.00088) (0.00012) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.063) (0.017) | 0.452 (0.017) | 0.00039 J (0.00024) | 57.1 (1.3) | 0.0992 J (0.065) | 0.116 J (0.061) | 0.00044 J (0.00025) | ND (0.00094) (0.00025) | ND (0.00094) (0.00025) | ND (0.0010) (0.00027) | ND (0.0013) (0.00033) | 0.0021 (0.00023) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.0351 J (0.0047) | 31.2 (0.048) | 0.00026 J (0.000069) | 25.2 (0.019) | 0.295 J (0.018) | 0.200 J (0.017) | ND (0.0048) (0.000071) | ND (0.0047) (0.000070) | ND (0.0047) (0.000070) | 0.00026 J (0.000076) | ND (0.0063) (0.000093) | 0.0082 (0.000066) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.063) (0.015) | ND (0.064) (0.015) | ND (0.00092) (0.00022) | ND (0.25) (0.059) | ND (0.25) (0.058) | ND (0.23) (0.054) | ND (0.00095) (0.00022) | ND (0.00094) (0.00022) | ND (0.00094) (0.00022) | ND (0.0010) (0.00024) | ND (0.0013) (0.00029) | ND (0.00088) (0.00021) |
| Naphthalene | mg/kg | 760[A] | 25[B] | ND (0.32) (0.0077) | 0.994 (0.0078) | ND (0.0046) (0.00011) | ***25.9*** [B] (0.031) | 0.282 J (0.030) | 0.285 J (0.028) | ND (0.0048) (0.00012) | ND (0.0047) (0.00011) | ND (0.0047) (0.00011) | ND (0.0051) (0.00012) | ND (0.0063) (0.00015) | 0.0051 (0.00011) |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.0154 J (0.0066) | 5.34 (0.0067) | 0.0017 (0.000097) | 10.3 (0.026) | 0.172 J (0.026) | 0.217 J (0.024) | 0.0022 (0.00010) | ND (0.00094) (0.00009 | 0.00045 J (0.000099) | ND (0.0010) (0.00011) | ND (0.0013) (0.00013) | 0.0033 (0.000093) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.32) (0.013) | 0.717 (0.013) | ND (0.0046) (0.00019) | ***306*** [B] (1.0) | 0.301 J (0.052) | 0.277 J (0.048) | ND (0.0048) (0.00020) | 0.00055 J (0.00020) | ND (0.0047) (0.00020) | ND (0.0051) (0.00021) | ND (0.0063) (0.00026) | 0.0079 (0.00018) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.32) (0.010) | 0.272 J (0.010) | ND (0.0046) (0.00015) | 119 (0.80) | 0.624 J (0.040) | 0.0943 J (0.037) | ND (0.0048) (0.00015) | ND (0.0047) (0.00015) | ND (0.0047) (0.00015) | ND (0.0051) (0.00016) | ND (0.0063) (0.00020) | 0.0049 (0.00014) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.063) (0.0088) | 1.14 (0.0089) | 0.00094 (0.00013) | 314 (0.70) | 0.638 (0.034) | 0.652 (0.032) | 0.00062 J (0.00013) | 0.00044 J (0.00013) | 0.00052 J (0.00013) | 0.00037 J (0.00014) | ND (0.0013) (0.00017) | 0.0080 (0.00012) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | ND (0.038) (0.013) | 1.24 (0.060) | 0.715 (0.024) | 1.70 (0.011) | 0.472 (0.061) | 0.0920 J (0.057) | 0.151 (0.012) | 0.0343 J (0.012) | 0.224 (0.013) | 0.219 (0.026) | 0.185 (0.015) | 0.210 (0.011) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.0863 (0.012) | 3.68 (0.056) | 2.32 (0.022) | 4.55 (0.21) | 1.10 (0.057) | 0.171 (0.053) | 0.411 (0.011) | 0.0569 (0.011) | 0.499 (0.012) | 0.266 (0.024) | 0.127 (0.014) | 0.589 (0.010) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.0630 (0.012) | 4.06 (0.052) | 2.61 (0.021) | 4.83 (0.20) | 1.43 (0.053) | 0.142 J (0.050) | 0.484 (0.010) | 0.0748 (0.011) | 0.783 (0.011) | 0.320 (0.023) | 0.118 (0.013) | 0.816 (0.0097) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.103 (0.013) | 4.41 (0.057) | 2.32 (0.023) | 2.89 (0.011) | 0.924 (0.058) | 0.119 J (0.055) | 0.626 (0.011) | 0.0956 (0.012) | 0.333 (0.012) | 0.395 (0.025) | 0.198 (0.014) | 0.874 (0.011) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.0866 (0.014) | 2.17 (0.064) | 1.81 (0.026) | 3.54 (0.24) | 1.44 (0.065) | 0.127 J (0.061) | 0.335 (0.013) | 0.100 (0.013) | 0.766 (0.013) | 0.587 (0.027) | 0.555 (0.016) | 0.915 (0.012) |
| Chrysene | mg/kg | 760[A] | 230[B] | 0.0989 (0.013) | 3.49 (0.058) | 2.37 (0.023) | 5.36 (0.22) | 2.93 (0.059) | 0.258 (0.055) | 0.557 (0.012) | 0.0876 (0.012) | 1.03 (0.012) | 0.295 (0.025) | 0.236 (0.015) | 0.730 (0.011) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.038) (0.013) | 1.02 (0.056) | 0.439 (0.022) | 15.2 (0.21) | 1.23 (0.057) | 0.641 (0.054) | 0.206 (0.011) | 0.0227 J (0.012) | 0.0803 (0.012) | 0.0540 J (0.024) | 0.0220 J (0.014) | 0.0605 (0.010) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.0288 J (0.017) | 5.80 (0.078) | 3.02 (0.031) | 14.9 (0.29) | 1.74 (0.079) | 0.680 (0.074) | 0.510 (0.016) | 0.0550 (0.016) | 0.200 (0.016) | 0.170 (0.034) | 0.243 (0.020) | 0.456 (0.015) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 0.0825 (0.015) | 6.80 (0.066) | 5.05 (0.026) | 7.95 (0.25) | 3.64 (0.067) | 0.588 (0.063) | 0.718 (0.013) | 0.103 (0.013) | 1.57 (0.014) | 0.301 (0.028) | 0.300 (0.017) | 0.937 (0.012) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 161 (0.14) | ***897*** [B] (0.13) | 221 (0.12) | 380 (0.13) | 163 (0.13) | 34.6 (0.11) | 427 (0.26) | 49.1 (0.24) | 126 (0.28) | 237 (0.14) | 309 (0.15) | 75.2 (0.12) |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | 82.3 () | 83.0 () | 87.3 () | 87.2 () | 89.4 () | 93.9 () | 83.5 () | 88.5 () | 81.9 () | 81.9 () | 73.8 () | 91.2 () |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential |
| | Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6 BH-12-123 | AOI6 BH-12-129 | AOI6 BH-12-130 | AOI6 BH-12-131 | AOI6 BH-12-135 | AOI6 BH-12-136 | AOI6 BH-12-137 | AOI6 BH-12-138 | AOI6 BH-12-139 | AOI6 BH-12-140 | AOI6 BH-12-144 | AOI6 BH-12-146 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 | 5-Dec-12 |
| Sample ID | | | | BH-12-123_1-1.5' | BH-12-129_1.5-2' | BH-12-130_1-2' | BH-12-131_1-2' | BH-12-135_1-1.5' | BH-12-136_1-1.5' | BH-12-137_0-1' | BH-12-138_0-1' | BH-12-139_1-1.5' | BH-12-140_0-0.5' | BH-12-144_0-0.5' | BH-12-146_0-1' |
| Sample Depth | | | | 1 - 1.5 ft | 1.5 - 2 ft | 1 - 2 ft | 1 - 2 ft | 1 - 1.5 ft | 1 - 1.5 ft | 0 - 1 ft | 0 - 1 ft | 1 - 1.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 1 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | | JB22962 | JB22962 | JB22962 | JB22962 | JB23100 | JB23100 | JB23100 | JB23100 | JB23100 | JB23100 | JB23100 | JB23100 |
| Laboratory Sample ID | Units | A MSC-PA | B SHS-PA | JB22962-1 | JB22962-6 | JB22962-15 | JB22962-16 | JB23100-11 | JB23100-9 | JB23100-10 | JB23100-6 | JB23100-8 | JB23100-3 | JB23100-5 | JB23100-4 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.0010) (0.00012) | ***91.6*** [B] (0.57) | 0.337 J (0.060) | 0.110 (0.0068) | ND (0.00091) (0.00011) | ND (0.00084) (0.00009) | ND (0.00091) (0.00011) | ND (0.0015) (0.00018) | ND (0.00097) (0.00012) | ND (0.0012) (0.00014) | ND (0.00083) (0.00009) | ND (0.00098) (0.00012) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | ND (0.0010) (0.00013) | *ND (0.048)* (0.0061) | *ND (0.50)* (0.064) | *ND (0.057)* (0.0072) | ND (0.00091) (0.00012) | ND (0.00084) (0.00011) | ND (0.00091) (0.00012) | ND (0.0015) (0.00019) | ND (0.00097) (0.00012) | ND (0.0012) (0.00015) | ND (0.00083) (0.00010) | ND (0.00098) (0.00012) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.0010) (0.00014) | ND (0.048) (0.0064) | ND (0.50) (0.068) | ND (0.057) (0.0077) | ND (0.00091) (0.00012) | ND (0.00084) (0.00011) | ND (0.00091) (0.00012) | ND (0.0015) (0.00020) | ND (0.00097) (0.00013) | ND (0.0012) (0.00016) | ND (0.00083) (0.00011) | ND (0.00098) (0.00013) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.0010) (0.00027) | 0.837 (0.013) | ND (0.50) (0.13) | 0.136 (0.015) | ND (0.00091) (0.00024) | ND (0.00084) (0.00022) | ND (0.00091) (0.00024) | ND (0.0015) (0.00039) | ND (0.00097) (0.00025) | ND (0.0012) (0.00031) | ND (0.00083) (0.00022) | ND (0.00098) (0.00026) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.00034 J (0.000077) | 311 (0.35) | 32.9 (0.037) | 0.245 J (0.0042) | ND (0.0045) (0.000068) | ND (0.0042) (0.000062) | ND (0.0046) (0.000068) | ND (0.0074) (0.00011) | ND (0.0048) (0.000072) | ND (0.0059) (0.000087) | ND (0.0041) (0.000061) | ND (0.0049) (0.000073) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.0010) (0.00024) | ND (0.048) (0.011) | ND (0.50) (0.12) | ND (0.057) (0.013) | ND (0.00091) (0.00021) | ND (0.00084) (0.00020) | ND (0.00091) (0.00021) | ND (0.0015) (0.00035) | ND (0.00097) (0.00023) | ND (0.0012) (0.00028) | ND (0.00083) (0.00019) | ND (0.00098) (0.00023) |
| Naphthalene | mg/kg | 760[A] | 25[B] | ND (0.0052) (0.00013) | 0.0543 J (0.0058) | ND (2.5) (0.061) | 0.360 (0.0069) | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.0010) (0.00011) | ***116*** [B] (0.50) | 0.175 J (0.053) | 0.211 (0.0060) | ND (0.00091) (0.000095) | ND (0.00084) (0.000088) | ND (0.00091) (0.000096) | ND (0.0015) (0.00016) | ND (0.00097) (0.00010) | ND (0.0012) (0.00012) | ND (0.00083) (0.000087) | ND (0.00098) (0.00010) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.0052) (0.00022) | 0.705 (0.010) | ND (2.5) (0.11) | 0.0814 J (0.012) | ND (0.0045) (0.00019) | ND (0.0042) (0.00017) | ND (0.0046) (0.00019) | ND (0.0074) (0.00031) | ND (0.0048) (0.00020) | ND (0.0059) (0.00025) | ND (0.0041) (0.00017) | ND (0.0049) (0.00020) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.0052) (0.00017) | 0.257 (0.0076) | ND (2.5) (0.081) | 0.0211 J (0.0091) | ND (0.0045) (0.00015) | ND (0.0042) (0.00013) | ND (0.0046) (0.00015) | ND (0.0074) (0.00024) | ND (0.0048) (0.00015) | ND (0.0059) (0.00019) | ND (0.0041) (0.00013) | ND (0.0049) (0.00016) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.0010) (0.00014) | 3.69 (0.0066) | ND (0.50) (0.070) | 0.216 (0.0079) | ND (0.00091) (0.00013) | ND (0.00084) (0.00012) | ND (0.00091) (0.00013) | ND (0.0015) (0.00021) | ND (0.00097) (0.00013) | ND (0.0012) (0.00016) | ND (0.00083) (0.00011) | ND (0.00098) (0.00014) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.597 (0.014) | ND (0.033) (0.012) | 3.58 (0.25) | 0.0602 (0.012) | ND (0.037) (0.013) | 0.0941 (0.012) | 0.142 (0.013) | 0.118 (0.014) | 0.0718 (0.013) | 0.290 (0.012) | ND (0.033) (0.012) | 0.0787 (0.013) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 1.79 (0.013) | 0.0699 (0.011) | 3.52 (0.012) | 0.0983 (0.012) | 0.0614 (0.012) | 0.267 (0.011) | 0.374 (0.012) | 0.145 (0.013) | 0.214 (0.012) | 0.0701 (0.012) | 0.0373 (0.011) | 0.603 (0.012) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 2.11 (0.012) | 0.0627 (0.010) | 6.52 (0.22) | 0.116 (0.011) | 0.0757 (0.011) | 0.234 (0.011) | 0.296 (0.011) | 0.168 (0.013) | 0.221 (0.011) | 0.0915 (0.011) | 0.0397 (0.010) | 1.02 (0.012) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 2.15 (0.013) | 0.0687 (0.011) | 11.3 (0.24) | 0.0976 (0.012) | 0.0894 (0.012) | 0.265 (0.012) | 0.307 (0.012) | 0.215 (0.014) | 0.240 (0.012) | 0.103 (0.012) | 0.0560 (0.011) | 1.36 (0.013) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 1.59 (0.014) | 0.0498 (0.012) | 4.33 (0.27) | 0.178 (0.013) | 0.0597 (0.014) | 0.122 (0.013) | 0.141 (0.013) | 0.169 (0.015) | 0.144 (0.013) | 0.0844 (0.013) | 0.0289 J (0.012) | 0.982 (0.014) |
| Chrysene | mg/kg | 760[A] | 230[B] | 1.87 (0.013) | 0.0711 (0.011) | 9.88 (0.25) | 0.136 (0.012) | 0.0655 (0.012) | 0.237 (0.012) | 0.332 (0.012) | 0.148 (0.014) | 0.219 (0.012) | 0.0825 (0.012) | 0.0422 (0.011) | 0.818 (0.013) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 0.307 (0.013) | ND (0.033) (0.011) | 34.6 (0.24) | 0.122 (0.012) | ND (0.037) (0.012) | 0.0334 J (0.012) | 0.0342 J (0.012) | ND (0.041) (0.014) | ND (0.036) (0.012) | ND (0.036) (0.012) | ND (0.033) (0.011) | 0.0195 J (0.012) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | ND (0.037) (0.010) | ND (0.035) (0.0096) | ND (0.036) (0.0098) | 0.0191 J (0.011) | 0.0204 J (0.0098) | ND (0.036) (0.0097) | ND (0.033) (0.0090) | 0.0158 J (0.010) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 1.49 (0.018) | 0.0395 (0.015) | 10.0 (0.33) | 0.174 (0.016) | 0.0353 J (0.017) | 0.373 (0.016) | 0.556 (0.016) | 0.138 (0.019) | 0.260 (0.016) | 0.0474 (0.016) | 0.0219 J (0.015) | 0.329 (0.017) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 2.51 (0.015) | 0.121 (0.013) | 12.1 (0.28) | 0.140 (0.014) | 0.0708 (0.014) | 0.415 (0.014) | 0.594 (0.014) | 0.202 (0.016) | 0.340 (0.014) | 0.108 (0.014) | 0.0613 (0.013) | 1.36 (0.015) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 224 (0.14) | 48.0 (0.12) | 84.4 (0.13) | 111 (0.13) | 106 (0.12) | ***853*** [B] (0.25) | 137 (0.28) | ***483*** [B] (0.13) | ***1120*** [B] (0.13) | ***766*** [B] (0.44) | 17.1 (0.12) | 184 (0.13) |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | 84.4 () | 90.0 () | 87.0 () | 85.1 () | 87.3 () | 88.0 () | 85.5 () | 80.0 () | 84.8 () | 78.7 () | 91.8 () | 86.5 () |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6 BH-12-147 | AOI6 BH-12-148 | AOI6 BH-12-149 | AOI6-BH-16-001 | AOI6-BH-16-002 | AOI6-BH-16-003 | AOI6-BH-16-004 | | | AOI6-BH-16-005 | AOI6-BH-16-006 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 5-Dec-12 | 5-Dec-12 | 4-Dec-12 | 12-Apr-16 | 12-Apr-16 | 12-Apr-16 | 21-Apr-16 | 21-Apr-16 | 21-Apr-16 | 12-Apr-16 | 22-Apr-16 | 22-Apr-16 |
| Sample ID | | | | BH-12-147_1-1.5' | BH-12-148_0-1' | BH-12-149_1-1.5' | AOI6-BH-16-001-0-2-SOIL | AOI6-BH-16-002-0-2-SOIL | AOI6-BH-16-003-0-2-SOIL | AOI6-BH16-DUP-SOIL-002 | AOI6-BH-16-004-0-2-SOIL | AOI6-BH-16-004-2-4-SOIL | AOI6-BH-16-005-0-2-SOIL | AOI6-BH-16-006-0-2-SOIL | AOI6-BH-16-006-2-4-SOIL |
| Sample Depth | | | | 1 - 1.5 ft | 0 - 1 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 0 - 0.5 ft | | 0.75 - 1.75 ft | 1.75 - 2.3 ft | 0 - 0.5 ft | 1 - 1.5 ft | 1.5 - 2.25 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | JB23100 | JB23100 | JB22962 | 1651423 | 1651423 | 1651423 | 1653975 | 1653975 | 1653975 | 1651423 | 1653975 | 1653975 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | JB23100-2 | JB23100-1 | JB22962-4 | 8336826 | 8336823 | 8336825 | 8349806 | 8349805 | 8349807 | 8336824 | 8349808 | 8349809 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.00089) (0.00011) | ND (0.0011) (0.00013) | 0.0506 J (0.0083) | 0.002 J (0.0005) | 0.001 J (0.0005) | ND (0.005) (0.0005) | 0.002 J (0.0005) | 0.001 J (0.0005) | 0.001 J (0.0005) | 0.0004 J (0.0005) | ND (0.280) (0.028) | 0.023 J (0.022) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | ND (0.00089) (0.00011) | ND (0.0011) (0.00014) | *ND (0.070)* (0.0088) | *ND (0.006)* (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | *ND (0.280)* (0.055) | *ND (0.220)* (0.044) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.00089) (0.00012) | ND (0.0011) (0.00014) | ND (0.070) (0.0094) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | ND (0.280) (0.055) | ND (0.220) (0.044) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.00089) (0.00023) | ND (0.0011) (0.00028) | ND (0.070) (0.018) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | 0.001 J (0.001) | ND (0.005) (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | ND (0.280) (0.055) | ND (0.220) (0.044) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.0044) (0.000066) | ND (0.0053) (0.000079) | 0.147 J (0.0052) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | ND (0.280) (0.055) | ND (0.220) (0.044) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.00089) (0.00021) | ND (0.0011) (0.00025) | ND (0.070) (0.016) | ND (0.006) (0.0005) | ND (0.005) (0.0005) | ND (0.005) (0.0005) | ND (0.005) (0.0005) | ND (0.005) (0.0005) | ND (0.005) (0.0005) | ND (0.004) (0.0005) | ND (0.280) (0.028) | ND (0.220) (0.022) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | ND (0.35) (0.0085) | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.00089) (0.000093 | ND (0.0011) (0.00011) | 0.0223 J (0.0073) | 0.003 J (0.001) | 0.001 J (0.001) | ND (0.005) (0.001) | 0.003 J (0.001) | 0.003 J (0.0009) | 0.002 J (0.0009) | ND (0.004) (0.001) | 0.088 J (0.055) | 0.073 J (0.044) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.0044) (0.00019) | ND (0.0053) (0.00022) | ND (0.35) (0.015) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | 0.002 J (0.001) | 0.0009 J (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | ND (0.280) (0.055) | ND (0.220) (0.044) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.0044) (0.00014) | ND (0.0053) (0.00017) | ND (0.35) (0.011) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | ND (0.005) (0.0009) | ND (0.005) (0.0009) | ND (0.004) (0.001) | ND (0.280) (0.055) | ND (0.220) (0.044) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.00089) (0.00012) | ND (0.0011) (0.00015) | ND (0.070) (0.0097) | 0.001 J (0.001) | ND (0.005) (0.001) | ND (0.005) (0.001) | 0.005 J (0.001) | 0.004 J (0.0009) | 0.001 J (0.0009) | ND (0.004) (0.001) | 0.063 J (0.055) | 0.065 J (0.044) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.0166 J (0.012) | 0.155 (0.014) | ND (0.037) (0.013) | 0.730 (0.003) | 0.340 (0.003) | 0.410 (0.003) | 0.600 (0.008) | 0.430 (0.008) | 0.550 (0.007) | 0.016 J (0.003) | 0.700 (0.008) | 0.430 (0.007) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.0519 (0.011) | 0.328 (0.013) | 0.0518 (0.012) | 0.950 (0.003) | 1.700 (0.003) | 1.900 (0.003) | 1.700 (0.008) | 1.100 (0.008) | 1.600 (0.007) | 0.110 (0.003) | 1.200 (0.008) | 0.750 (0.007) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.0650 (0.010) | 0.327 (0.013) | 0.0576 (0.011) | 1.100 (0.003) | 1.700 (0.003) | 1.900 (0.003) | 1.500 (0.008) | 1.100 (0.008) | 1.500 (0.007) | 0.130 (0.003) | 1.200 (0.008) | 0.740 (0.007) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.0787 (0.011) | 0.334 (0.014) | 0.0670 (0.012) | 1.500 (0.003) | 2.200 (0.003) | 2.600 (0.003) | 1.900 (0.008) | 1.300 (0.008) | 1.700 (0.007) | 0.180 (0.003) | 1.300 (0.008) | 1.000 (0.007) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.0542 (0.013) | 0.205 (0.015) | 0.0459 (0.014) | 1.300 (0.003) | 0.850 (0.003) | 1.500 (0.003) | 0.940 (0.008) | 0.700 (0.008) | 0.840 (0.007) | 0.150 (0.003) | 0.760 (0.008) | 0.520 (0.007) |
| Chrysene | mg/kg | 760[A] | 230[B] | 0.0608 (0.012) | 0.307 (0.014) | 0.0640 (0.013) | 1.100 (0.003) | 1.700 (0.003) | 1.900 (0.003) | 1.700 (0.008) | 1.100 (0.008) | 1.500 (0.007) | 0.120 (0.003) | 1.300 (0.008) | 0.820 (0.007) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.034) (0.011) | 0.0308 J (0.014) | ND (0.037) (0.012) | 0.320 (0.003) | 0.079 J (0.003) | 0.110 (0.003) | 0.190 (0.008) | 0.160 (0.008) | 0.200 (0.007) | 0.005 J (0.003) | 0.360 (0.008) | 0.270 (0.007) |
| Naphthalene | mg/kg | 760[A] | 25[B] | ND (0.034) (0.0093) | ND (0.041) (0.011) | - | 6.900 (0.003) | 0.630 (0.003) | 0.510 (0.003) | 1.300 (0.008) | 1.200 (0.008) | 1.100 (0.007) | 0.025 (0.003) | 1.600 (0.008) | 1.600 (0.007) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.0321 J (0.016) | 0.425 (0.019) | 0.0283 J (0.017) | 2.000 (0.003) | 0.870 (0.003) | 1.700 (0.003) | 1.700 (0.008) | 1.100 (0.008) | 1.200 (0.007) | 0.053 (0.003) | 1.500 (0.008) | 1.100 (0.007) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 0.0774 (0.013) | 0.469 (0.016) | 0.0804 (0.014) | 1.600 (0.003) | 2.000 (0.003) | 2.800 (0.003) | 2.300 (0.008) | 1.300 (0.008) | 1.900 (0.007) | 0.150 (0.003) | 2.000 (0.008) | 1.200 (0.007) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 286 (0.13) | ***745*** [B] (0.13) | 27.9 (0.14) | 288 (0.510) | 180 (0.510) | ***549*** [B] (0.510) | ***529*** [B] (0.452) | 399 (0.411) | 189 (0.398) | 68.7 (0.510) | 142 (0.510) | 225 (0.435) |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | 14.6 (0.50) | 24.8 (0.50) | 12.2 (0.50) | 12.5 (0.50) | 13.2 (0.50) | 11.0 (0.50) | 4.9 (0.50) | 14.5 (0.50) | 11.8 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | 90.9 () | 80.7 () | 81.3 () | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6-BH-16-007 | AOI6-BH-16-008 | AOI6-BH-16-009 | AOI6-BH-16-010 | AOI6-BH-16-011 | AOI6-BH-16-012 | | AOI6-BH-16-013 | AOI6-BH-16-014 | | AOI6-BH-16-015 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 8-Apr-16 | 8-Apr-16 | 8-Apr-16 | 11-Apr-16 | 11-Apr-16 | 11-Apr-16 | 11-Apr-16 | 11-Apr-16 | 5-Apr-16 | 11-Jul-16 | 5-Apr-16 | 11-Jul-16 |
| Sample ID | | | | AOI6-BH-16-007-0-2-SOIL | AOI6-BH-16-008-0-2-SOIL | AOI6-BH-16-009-0-2-SOIL | AOI6-BH-16-010-0-2-SOIL | AOI6-BH-16-011-0-2-SOIL | AOI6-BH16-012-0-2-SOIL-B | AOI6-BH-16-012-0-2-SOIL | AOI6-BH-16-013-0-2-SOIL | AOI6-BH-16-014-0-2-SOIL | AOI6-BH-16-014-0-2-071116 | AOI6-BH-16-015-0-2-SOIL | AOI6-BH-16-015-0-2-071116 |
| Sample Depth | | | | 1 - 2 ft | 1 - 2 ft | 1.5 - 1.75 ft | 0.5 - 0.9 ft | 0.5 - 0.83 ft | 0.5 - 1 ft | 1 - 1.1 ft | 0.5 - 1 ft | 1 - 1.5 ft | 1.25 - 1.83 ft | 1.5 - 2 ft | 1 - 1.41 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1649742 | 1649742 | 1649742 | 1649742 | 1649742 | 1649742 | 1649742 | 1649742 | 1647893 | 1682991 | 1647893 | 1682991 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8329537 | 8329540 | 8329542 | 8329545 | 8329546 | 8329549 | 8329548 | 8329550 | 8321192 | 8475490 | 8321190 | 8475488 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.003 J (0.0005) | 0.001 J (0.0005) | 0.005 J (0.0005) | 0.011 (0.0005) | ND (0.270) (0.0005) | ND (0.250) (0.0005) | ND (0.230) (0.0005) | ND (0.230) (0.0005) | 0.240 J (0.0005) | - | 0.053 J (0.0005) | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.006)* (0.001) | ND (0.005) (0.001) | *ND (0.006)* (0.001) | ND (0.005) (0.001) | *ND (0.270)* (0.001) | *ND (0.250)* (0.001) | *ND (0.230)* (0.001) | *ND (0.230)* (0.001) | *ND (0.330)* (0.001) | - | *ND (0.330)* (0.001) | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | ND (0.250) (0.001) | ND (0.230) (0.001) | ND (0.230) (0.001) | ND (0.330) (0.001) | - | ND (0.330) (0.001) | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | ND (0.250) (0.001) | ND (0.230) (0.001) | ND (0.230) (0.001) | 0.095 J (0.001) | - | ND (0.330) (0.001) | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | 2.000 (0.001) | 0.250 (0.001) | ND (0.230) (0.001) | ND (0.330) (0.001) | - | 0.770 (0.001) | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.006) (0.0005) | ND (0.005) (0.0005) | ND (0.006) (0.0005) | ND (0.005) (0.0005) | ND (0.270) (0.0005) | ND (0.250) (0.0005) | ND (0.230) (0.0005) | ND (0.230) (0.0005) | ND (0.330) (0.0005) | - | ND (0.330) (0.0005) | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.001 J (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | 0.004 J (0.001) | ND (0.270) (0.001) | ND (0.250) (0.001) | ND (0.230) (0.001) | ND (0.230) (0.001) | 0.260 J (0.001) | - | 0.130 J (0.001) | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | ND (0.250) (0.001) | ND (0.230) (0.001) | ND (0.230) (0.001) | 0.110 J (0.001) | - | 0.110 J (0.001) | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | ND (0.250) (0.001) | ND (0.230) (0.001) | ND (0.230) (0.001) | ND (0.330) (0.001) | - | ND (0.330) (0.001) | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.005) (0.001) | ND (0.270) (0.001) | 0.061 J (0.001) | 0.047 J (0.001) | ND (0.230) (0.001) | 0.280 J (0.001) | - | 0.470 (0.001) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.200 (0.003) | 2.300 (0.003) | 4.300 (0.003) | 0.079 (0.003) | 1.700 (0.003) | 1.300 (0.003) | 0.690 (0.003) | 0.400 (0.003) | - | 6.200 (0.003) | - | 5.400 (0.003) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.720 (0.003) | 5.500 (0.003) | 5.200 (0.003) | 0.210 (0.003) | 0.990 (0.003) | 0.940 (0.003) | 1.900 (0.003) | 0.460 (0.003) | - | 7.800 (0.003) | - | 2.000 J (0.003) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.670 (0.003) | 4.800 (0.003) | 3.300 (0.003) | 0.260 (0.003) | 0.990 (0.003) | 0.890 (0.003) | 1.800 (0.003) | 0.280 (0.003) | - | 8.300 (0.003) | - | 1.600 J (0.003) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.950 (0.003) | 6.300 (0.003) | 4.000 (0.003) | 0.410 (0.003) | 1.300 (0.003) | 1.600 (0.003) | 2.300 (0.003) | 0.340 (0.003) | - | 8.200 (0.003) | - | 2.900 (0.003) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.510 (0.003) | 3.300 (0.003) | 1.900 (0.003) | 0.230 (0.003) | 0.690 (0.003) | 0.740 (0.003) | 1.400 (0.003) | 0.210 (0.003) | - | 6.300 (0.003) | - | 2.200 (0.003) |
| Chrysene | mg/kg | 760[A] | 230[B] | 0.850 (0.003) | 5.600 (0.003) | 5.100 (0.003) | 0.280 (0.003) | 1.000 (0.003) | 2.700 (0.003) | 1.800 (0.003) | 1.600 (0.003) | - | 8.900 (0.003) | - | 5.800 (0.003) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 0.070 (0.003) | 1.700 (0.003) | 1.400 (0.003) | 0.012 J (0.003) | 8.500 (0.003) | 66.000 (0.003) | 0.330 (0.003) | 2.500 (0.003) | - | 9.300 (0.003) | - | 7.400 (0.003) |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.630 (0.003) | 2.900 (0.003) | 1.900 (0.003) | 0.220 (0.003) | ND (0.220) (0.003) | 1.300 (0.003) | 0.440 (0.003) | ND (0.200) (0.003) | - | 21.000 (0.003) | - | 2.800 (0.003) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.720 (0.003) | 10.000 (0.003) | 14.000 (0.003) | 0.230 (0.003) | 10.000 (0.003) | 20.000 (0.003) | 2.000 (0.003) | 0.960 (0.003) | - | 24.000 (0.003) | - | 16.000 (0.003) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 1.200 (0.003) | 10.000 (0.003) | 13.000 (0.003) | 0.430 (0.003) | 1.900 (0.003) | 1.800 (0.003) | 3.300 (0.003) | 0.810 (0.003) | - | 12.000 (0.003) | - | 8.400 (0.003) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | ***803*** [B] (0.510) | 298 (0.510) | 149 (0.510) | ***1460*** [B] (0.510) | ***734*** [B] (0.510) | 141 (0.510) | 194 (0.510) | 32.0 (0.510) | 344 (0.510) | - | ***671*** [B] (0.510) | - |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 14.7 (0.50) | 13.6 (0.50) | 11.5 (0.50) | 19.7 (0.50) | 22.8 (0.50) | 20.0 (0.50) | 8.2 (0.50) | 14.8 (0.50) | 33.7 (0.50) | 34.4 (0.50) | 26.7 (0.50) | 19.9 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6-BH-16-016 | | AOI6-BH-16-017 | AOI6-BH-16-018 | AOI6-BH-16-019 | | | AOI6-BH-16-020 | AOI6-BH-16-021 | AOI6-BH-16-022 | AOI6-BH-16-023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Apr-16 | 11-Jul-16 | 11-Apr-16 | 11-Apr-16 | 21-Apr-16 | 21-Apr-16 | 21-Apr-16 | 21-Apr-16 | 21-Apr-16 | 6-Apr-16 | 21-Apr-16 |
| Sample ID | | | | AOI6-BH-16-016-0-2-SOIL | AOI6-BH-16-016-0-2-071116 | AOI6-BH-16-017-0-2-SOIL | AOI6-BH-16-018-0-2-SOIL | AOI6-BH16-DUP-SOIL-001 | AOI6-BH-16-019-0-2-SOIL | AOI6-BH-16-019-2-4-SOIL | AOI6-BH-16-020-0-2-SOIL | AOI6-BH-16-021-0-2-SOIL | AOI6-BH-16-022-0-2-SOIL | AOI6-BH-16-023-0-2-SOIL |
| Sample Depth | | | | 1 - 1.5 ft | 1.5 - 2 ft | 0.5 - 1 ft | 0.75 - 1 ft | | 0.8 - 1.8 ft | 1.8 - 3 ft | 0 - 1.1 ft | 0 - 0.5 ft | 0.5 - 1 ft | 1.5 - 1.9 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1647893 | 1682991 | 1649742 | 1649742 | 1653975 | 1653975 | 1653975 | 1653975 | 1653975 | 1648963 | 1653975 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8321184 | 8475486 | 8329544 | 8329543 | 8349803 | 8349802 | 8349804 | 8349801 | 8349800 | 8325910 | 8349798 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.004 J (0.0005) | - | 0.001 J (0.0005) | 0.071 (0.0005) | ND (0.005) (0.0005) | ND (0.006) (0.0006) | 0.002 J (0.0006) | 0.039 J (0.030) | 0.062 J (0.024) | 0.089 J (0.0005) | 0.130 J (0.047) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.006)* (0.001) | - | ND (0.004) (0.001) | ND (0.004) (0.001) | ND (0.005) (0.001) | *ND (0.006)* (0.001) | *ND (0.006)* (0.001) | *ND (0.300)* (0.061) | *ND (0.240)* (0.048) | *ND (0.240)* (0.001) | *ND (0.470)* (0.094) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | ND (0.004) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.006) (0.001) | ND (0.300) (0.061) | ND (0.240) (0.048) | ND (0.240) (0.001) | ND (0.470) (0.094) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | 0.001 J (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.006) (0.001) | ND (0.300) (0.061) | ND (0.240) (0.048) | 0.052 J (0.001) | 0.100 J (0.094) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | 0.001 J (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | 0.002 J (0.001) | 0.420 (0.061) | ND (0.240) (0.048) | ND (0.240) (0.001) | 0.340 J (0.094) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.006) (0.0005) | - | ND (0.004) (0.0005) | ND (0.004) (0.0005) | ND (0.005) (0.0005) | ND (0.006) (0.0006) | ND (0.006) (0.0006) | ND (0.300) (0.030) | ND (0.240) (0.024) | ND (0.240) (0.0005) | ND (0.470) (0.047) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.003 J (0.001) | - | ND (0.004) (0.001) | 0.005 (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | 0.002 J (0.001) | ND (0.300) (0.061) | 0.100 J (0.048) | 0.150 J (0.001) | 0.200 J (0.094) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | 0.001 J (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.006) (0.001) | ND (0.300) (0.061) | 0.110 J (0.048) | ND (0.240) (0.001) | 0.120 J (0.094) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | ND (0.004) (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.006) (0.001) | ND (0.300) (0.061) | 0.082 J (0.048) | ND (0.240) (0.001) | ND (0.470) (0.094) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.006) (0.001) | - | ND (0.004) (0.001) | 0.002 J (0.001) | ND (0.005) (0.001) | ND (0.006) (0.001) | ND (0.006) (0.001) | 0.072 J (0.061) | 0.100 J (0.048) | 0.180 J (0.001) | 0.210 J (0.094) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | 1.900 (0.003) | 0.350 (0.003) | 0.670 (0.003) | 1.400 (0.008) | 1.400 (0.009) | 0.390 (0.009) | 3.700 (0.019) | 1.000 (0.007) | 2.100 (0.003) | 2.100 (0.010) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | 1.700 (0.003) | 3.300 (0.003) | 1.400 (0.003) | 1.300 (0.008) | 1.200 (0.009) | 1.400 (0.009) | 7.400 (0.019) | 2.400 (0.007) | 3.400 (0.003) | 1.300 (0.010) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | 1.700 (0.003) | 4.200 (0.003) | 1.900 (0.003) | 1.400 (0.008) | 1.300 (0.009) | 1.400 (0.009) | 7.800 (0.019) | 2.200 (0.007) | 4.100 (0.003) | 1.700 (0.010) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | 2.300 (0.003) | 6.700 (0.003) | 2.300 (0.003) | 1.700 (0.008) | 1.500 (0.009) | 1.700 (0.009) | 9.800 (0.019) | 3.000 (0.007) | 5.300 (0.003) | 1.800 (0.010) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | 1.600 (0.003) | 4.800 (0.003) | 1.500 (0.003) | 1.500 (0.008) | 1.400 (0.009) | 0.880 (0.009) | 5.100 (0.019) | 1.400 (0.007) | 3.300 (0.003) | 1.800 (0.010) |
| Chrysene | mg/kg | 760[A] | 230[B] | - | 2.000 (0.003) | 4.900 (0.003) | 1.900 (0.003) | 1.400 (0.008) | 1.300 (0.009) | 1.400 (0.009) | 7.700 (0.019) | 2.300 (0.007) | 4.900 (0.003) | 1.500 (0.010) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | - | 5.100 (0.003) | 0.081 (0.003) | 0.480 (0.003) | 0.610 (0.008) | 0.590 (0.009) | 0.200 (0.009) | 2.200 (0.019) | 0.530 (0.007) | 1.600 (0.003) | 1.900 (0.010) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | 9.300 (0.003) | 0.120 (0.003) | 2.100 (0.003) | 8.300 (0.008) | 7.700 (0.009) | 1.500 (0.009) | 3.300 (0.019) | 1.100 (0.007) | 3.500 (0.003) | 12.000 (0.010) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | 9.600 (0.003) | 2.400 (0.003) | 1.600 (0.003) | 3.200 (0.008) | 3.300 (0.009) | 1.100 (0.009) | 13.000 (0.019) | 3.200 (0.007) | 5.400 (0.003) | 4.800 (0.010) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | 2.400 (0.003) | 8.100 (0.003) | 2.400 (0.003) | 1.600 (0.008) | 1.600 (0.009) | 1.400 (0.009) | 13.000 (0.019) | 3.900 (0.007) | 7.900 (0.003) | 2.400 (0.010) |
| **Metals** | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 313 (0.510) | - | 180 (0.510) | 138 (0.510) | ***6690*** [AB] (2.34) | ***2920*** [AB] (2.34) | ***1370*** [B] (2.81) | 199 (0.503) | 223 (2.43) | 236 (0.510) | 393 (0.593) |
| **General Chemistry** | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 12.5 (0.50) | 29.2 (0.50) | 9.4 (0.50) | 8.6 (0.50) | 20.3 (0.50) | 22.8 (0.50) | 24.9 (0.50) | 12.6 (0.50) | 9.6 (0.50) | 12.5 (0.50) | 34.9 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6-BH-16-025 | | | AOI6-BH-16-026 | AOI6-BH-16-027 | AOI6-BH-16-028 | AOI6-BH-16-029 | AOI6-BH-16-030 | AOI6-BH-16-031 | AOI6-BH-16-032 | AOI6-BH-16-033 | AOI6-BH-16-034 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 22-Apr-16 | 22-Apr-16 | 22-Apr-16 | 22-Apr-16 | 13-Apr-16 | 13-Apr-16 | 13-Apr-16 | 14-Apr-16 | 14-Apr-16 | 13-Apr-16 | 13-Apr-16 | 13-Apr-16 |
| Sample ID | | | | AOI6-BH16-DUP-04-22-16-003 | AOI6-BH-16-025-0-2-SOIL | AOI6-BH-16-025-2-4-SOIL | AOI6-BH-16-026-0-2-SOIL | AOI6-BH-16-027-0-2-SOIL | AOI6-BH-16-028-0-2-SOIL | AOI6-BH-16-029-0-2-SOIL | AOI6-BH-16-030-0-2-SOIL | AOI6-BH-16-031-0-2-SOIL | AOI6-BH-16-032-0-2-SOIL | AOI6-BH-16-033-0-2-SOIL | AOI6-BH-16-034-0-2-SOIL |
| Sample Depth | | | | | 1.5 - 1.9 ft | 1.9 - 2.2 ft | 0.4 - 1.3 ft | 1.75 - 2 ft | 0.25 - 0.5 ft | 1.75 - 2 ft | 1.5 - 2 ft | 1 - 2 ft | 1 - 2 ft | 1.5 - 2 ft | 1.5 - 1.75 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1653975 | 1653975 | 1653975 | 1653975 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8349812 | 8349810 | 8349811 | 8349813 | 8336830 | 8336829 | 8336827 | 8336847 | 8336849 | 8336838 | 8336836 | 8336834 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ***2.600*** [B] (0.021) | ***2.700*** [B] (0.022) | ***1400.000 J*** [AB] (2.400) | ***7.600*** [B] (0.022) | ND (0.005) (0.0005) | 0.460 (0.0005) | ***0.990*** [B] (0.0005) | ***9.400*** [B] (0.0005) | ***0.630*** [B] (0.0005) | 0.120 J (0.0005) | 0.003 J (0.0005) | ***44.000*** [B] (0.0005) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.210)* (0.043) | *ND (0.220)* (0.045) | *ND (24.000)* (4.800) | *ND (0.220)* (0.044) | ND (0.005) (0.001) | *ND (0.260)* (0.001) | *ND (0.250)* (0.001) | *ND (4.400)* (0.001) | *ND (0.220)* (0.001) | *ND (0.220)* (0.001) | ND (0.004) (0.001) | *ND (5.000)* (0.001) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.210) (0.043) | ND (0.220) (0.045) | *ND (24.000)* (4.800) | ND (0.220) (0.044) | ND (0.005) (0.001) | ND (0.260) (0.001) | ND (0.250) (0.001) | *ND (4.400)* (0.001) | ND (0.220) (0.001) | ND (0.220) (0.001) | ND (0.004) (0.001) | *ND (5.000)* (0.001) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | 0.110 J (0.043) | 0.120 J (0.045) | 61.000 J (4.800) | 0.082 J (0.044) | ND (0.005) (0.001) | 0.100 J (0.001) | 0.300 (0.001) | ND (4.400) (0.001) | 0.053 J (0.001) | 0.051 J (0.001) | ND (0.004) (0.001) | ND (5.000) (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 2.600 (0.043) | 2.900 (0.045) | 2200.000 J (48.000) | 1.800 (0.044) | ND (0.005) (0.001) | 0.220 J (0.001) | 1.700 (0.001) | 18.000 (0.001) | 4.000 (0.001) | 1.700 (0.001) | 0.019 (0.001) | 230.000 (0.001) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.210) (0.021) | ND (0.220) (0.022) | *ND (24.000)* (2.400) | ND (0.220) (0.022) | ND (0.005) (0.0005) | ND (0.260) (0.0005) | ND (0.250) (0.0005) | *ND (4.400)* (0.0005) | ND (0.220) (0.0005) | ND (0.220) (0.0005) | ND (0.004) (0.0005) | *ND (5.000)* (0.0005) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.750 (0.043) | 0.900 (0.045) | ***640.000 J*** [B] (4.800) | ND (0.220) (0.044) | ND (0.005) (0.001) | 0.450 (0.001) | 0.370 (0.001) | ND (4.400) (0.001) | ND (0.220) (0.001) | 0.091 J (0.001) | ND (0.004) (0.001) | 38.000 (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | 0.096 J (0.043) | 0.095 J (0.045) | ***50.000 J*** [B] (4.800) | ND (0.220) (0.044) | ND (0.005) (0.001) | 0.057 J (0.001) | 0.250 J (0.001) | ND (4.400) (0.001) | ND (0.220) (0.001) | ND (0.220) (0.001) | ND (0.004) (0.001) | ND (5.000) (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.210) (0.043) | 0.045 J (0.045) | 18.000 J (4.800) | ND (0.220) (0.044) | ND (0.005) (0.001) | ND (0.260) (0.001) | 0.095 J (0.001) | ND (4.400) (0.001) | ND (0.220) (0.001) | ND (0.220) (0.001) | ND (0.004) (0.001) | ND (5.000) (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | 0.480 (0.043) | 0.530 (0.045) | 340.000 J (4.800) | 0.092 J (0.044) | ND (0.005) (0.001) | 0.340 (0.001) | 0.600 (0.001) | ND (4.400) (0.001) | 0.083 J (0.001) | 0.130 J (0.001) | ND (0.004) (0.001) | 2.100 J (0.001) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 4.900 (0.018) | 4.400 (0.018) | 1.200 (0.004) | 0.710 (0.015) | 0.007 J (0.003) | 0.390 (0.003) | 2.900 (0.003) | 0.037 J (0.003) | ND (0.019) (0.003) | 0.008 J (0.003) | 0.030 J (0.003) | 0.027 (0.003) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 3.800 (0.018) | 3.200 (0.018) | 1.100 (0.004) | 1.300 (0.015) | 0.011 J (0.003) | 0.910 (0.003) | 6.100 (0.003) | 0.094 J (0.003) | 0.004 J (0.003) | 0.032 (0.003) | 0.120 (0.003) | 0.090 (0.003) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 2.700 (0.018) | 2.300 (0.018) | 0.690 (0.004) | 1.300 (0.015) | 0.010 J (0.003) | 1.200 (0.003) | 6.200 (0.003) | 0.120 (0.003) | 0.006 J (0.003) | 0.036 (0.003) | 0.130 (0.003) | 0.092 (0.003) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 3.200 (0.018) | 2.800 (0.018) | 1.000 (0.004) | 0.890 (0.015) | 0.016 J (0.003) | 1.600 (0.003) | 8.700 (0.003) | 0.180 (0.003) | 0.007 J (0.003) | 0.049 (0.003) | 0.180 (0.003) | 0.130 (0.003) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 1.000 (0.018) | 0.930 (0.018) | 0.330 (0.004) | 0.720 (0.015) | 0.009 J (0.003) | 1.100 (0.003) | 4.500 (0.003) | 0.130 (0.003) | 0.005 J (0.003) | 0.032 (0.003) | 0.130 (0.003) | 0.083 (0.003) |
| Chrysene | mg/kg | 760[A] | 230[B] | 3.200 (0.018) | 2.800 (0.018) | 0.970 (0.004) | 2.200 (0.015) | 0.021 J (0.003) | 1.000 (0.003) | 6.100 (0.003) | 0.098 (0.003) | 0.005 J (0.003) | 0.038 (0.003) | 0.140 (0.003) | 0.110 (0.003) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 4.400 (0.018) | 4.200 (0.018) | 0.850 (0.004) | 0.510 (0.015) | 0.009 J (0.003) | 0.160 (0.003) | 3.200 (0.003) | ND (0.095) (0.003) | ND (0.019) (0.003) | ND (0.018) (0.003) | ND (0.092) (0.003) | 0.017 J (0.003) |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.480 (0.018) | 0.460 (0.018) | 2.000 (0.004) | 1.100 (0.015) | 0.010 J (0.003) | 1.200 (0.003) | 3.100 (0.003) | 0.024 J (0.003) | ND (0.019) (0.003) | ND (0.018) (0.003) | ND (0.092) (0.003) | 0.070 (0.003) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 14.000 (0.018) | 13.000 (0.018) | 4.100 (0.004) | 1.900 (0.015) | 0.02 J (0.003) | 1.100 (0.003) | 11.000 (0.003) | 0.054 J (0.003) | 0.004 J (0.003) | 0.025 (0.003) | 0.058 J (0.003) | 0.087 (0.003) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 6.600 (0.018) | 5.600 (0.018) | 2.100 (0.004) | 2.100 (0.015) | 0.032 (0.003) | 1.200 (0.003) | 11.000 (0.003) | 0.130 (0.003) | 0.007 J (0.003) | 0.057 (0.003) | 0.190 (0.003) | 0.160 (0.003) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 10.2 (0.480) | 10.3 (0.465) | 64.3 (0.382) | 61.8 (0.405) | 20.0 (0.510) | 159 (0.510) | 138 (0.510) | 66.0 (0.510) | 5.63 (0.510) | 10.3 (0.510) | 12.8 (0.510) | 14.0 (0.510) |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 9.1 (0.50) | 8.7 (0.50) | 9.1 (0.50) | 8.8 (0.50) | 24.8 (0.50) | 8.7 (0.50) | 12.0 (0.50) | 11.4 (0.50) | 10.4 (0.50) | 8.1 (0.50) | 8.4 (0.50) | 13.2 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6-BH-16-035 | AOI6-BH-16-036 | AOI6-BH-16-037 | | AOI6-BH-16-038 | AOI6-BH-16-039 | AOI6-BH-16-040 | | AOI6-BH-16-041 | | AOI6-BH-16-043 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 13-Apr-16 | 14-Apr-16 | 14-Apr-16 | 14-Apr-16 | 14-Apr-16 | 11-Apr-16 | 7-Apr-16 | 7-Apr-16 | 7-Apr-16 | 7-Apr-16 | 7-Apr-16 |
| Sample ID | | | | AOI6-BH-16-035-0-2-SOIL | AOI6-BH-16-036-0-2-SOIL | AOI6-BH-16-037-0-2-SOIL | AOI6-BH-16-037-2-4-SOIL | AOI6-BH-16-038-0-2-SOIL | AOI6-BH-16-039-0-2-SOIL | AOI6-BH-16-040-0-2-SOIL | AOI6-BH-16-040-2-4-SOIL | AOI6-BH-16-041-0-2-SOIL | AOI6-BH-16-041-2-4-SOIL | AOI6-BH-16-43-0-2-SOIL |
| Sample Depth | | | | 1.5 - 2 ft | 1.25 - 1.75 ft | 1 - 1.75 ft | 1.75 - 2.25 ft | 1.5 - 1.75 ft | 0.5 - 0.6 ft | 0.5 - 0.75 ft | 1.75 - 2 ft | 0.75 - 1.25 ft | 1.75 - 2.25 ft | 0.5 - 1 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1649742 | 1648963 | 1648963 | 1648963 | 1648963 | 1648963 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8336832 | 8336841 | 8336843 | 8336844 | 8336845 | 8329547 | 8325909 | 8325914 | 8325916 | 8325912 | 8325911 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.001 J (0.0005) | ***0.550 J*** [B] (0.0005) | ***710.000*** [AB] (0.0005) | ***850.000*** [AB] (0.0005) | ***8.800*** [B] (0.0005) | ND (0.005) (0.0005) | ***1.100 J*** [B] (0.0005) | ***1.400 J*** [B] (0.0005) | - | ***4.300*** [B] (0.0005) | ***0.810*** [B] (0.0005) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | ND (0.004) (0.001) | *ND (4.500)* (0.001) | *ND (94.000)* (0.001) | *ND (97.000)* (0.001) | *ND (4.800)* (0.001) | ND (0.005) (0.001) | *ND (1.100)* (0.001) | *ND (4.900)* (0.001) | - | *ND (3.200)* (0.001) | *ND (0.220)* (0.001) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.004) (0.001) | *ND (4.500)* (0.001) | *ND (94.000)* (0.001) | *ND (97.000)* (0.001) | *ND (4.800)* (0.001) | ND (0.005) (0.001) | *ND (1.100)* (0.001) | *ND (4.900)* (0.001) | - | *ND (3.200)* (0.001) | ND (0.220) (0.001) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.004) (0.001) | ND (4.500) (0.001) | *ND (94.000)* (0.001) | *ND (97.000)* (0.001) | ND (4.800) (0.001) | ND (0.005) (0.001) | 0.760 J (0.001) | 13.000 (0.001) | - | 17.000 (0.001) | 0.064 J (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.021 (0.001) | 59.000 (0.001) | ***6500.000*** [B] (0.001) | ***8500.000*** [B] (0.001) | 14.000 (0.001) | ND (0.005) (0.001) | 1.200 (0.001) | 6.400 (0.001) | - | 6.400 (0.001) | 0.055 J (0.001) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.004) (0.0005) | *ND (4.500)* (0.0005) | *ND (94.000)* (0.0005) | *ND (97.000)* (0.0005) | *ND (4.800)* (0.0005) | ND (0.005) (0.0005) | ND (1.100) (0.0005) | *ND (4.900)* (0.0005) | - | *ND (3.200)* (0.0005) | ND (0.220) (0.0005) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.004) (0.001) | ND (4.500) (0.001) | ***840.000*** [B] (0.001) | ***1200.000*** [B] (0.001) | ND (4.800) (0.001) | ND (0.005) (0.001) | ND (1.100) (0.001) | ND (4.900) (0.001) | - | 2.500 J (0.001) | 0.190 J (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | ND (0.004) (0.001) | ND (4.500) (0.001) | *ND (94.000)* (0.001) | *ND (97.000)* (0.001) | ND (4.800) (0.001) | ND (0.005) (0.001) | 0.330 J (0.001) | 8.100 (0.001) | - | ***47.000*** [B] (0.001) | 0.045 J (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.004) (0.001) | ND (4.500) (0.001) | ND (94.000) (0.001) | ND (97.000) (0.001) | ND (4.800) (0.001) | ND (0.005) (0.001) | 0.380 J (0.001) | 5.800 (0.001) | - | 22.000 (0.001) | 0.046 J (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.004) (0.001) | ND (4.500) (0.001) | 26.000 J (0.001) | 27.000 J (0.001) | ND (4.800) (0.001) | ND (0.005) (0.001) | 0.880 J (0.001) | 2.700 J (0.001) | - | 39.000 (0.001) | 0.330 (0.001) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | ND (0.019) (0.003) | 0.064 J (0.003) | 0.068 J (0.003) | 0.110 (0.003) | 0.073 J (0.003) | 0.005 J (0.003) | 1.700 (0.003) | 5.900 (0.003) | 6.200 (0.003) | 2.700 (0.003) | 0.260 (0.003) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.008 J (0.003) | 0.350 (0.003) | 0.110 (0.003) | 0.050 (0.003) | 0.190 (0.003) | 0.019 J (0.003) | 3.100 (0.003) | 5.000 (0.003) | 12.000 (0.003) | 5.800 (0.003) | 0.710 (0.003) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.009 J (0.003) | 0.300 (0.003) | 0.160 (0.003) | 0.074 (0.003) | 0.220 (0.003) | 0.019 J (0.003) | 2.200 (0.003) | 4.900 (0.003) | 8.000 (0.003) | 5.300 (0.003) | 1.100 (0.003) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.014 J (0.003) | 0.570 (0.003) | 0.240 (0.003) | 0.110 (0.003) | 0.330 (0.003) | 0.033 (0.003) | 3.200 (0.003) | 6.300 (0.003) | 14.000 (0.003) | 7.800 (0.003) | 1.500 (0.003) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.010 J (0.003) | 0.270 (0.003) | 0.190 (0.003) | 0.070 (0.003) | 0.200 (0.003) | 0.015 J (0.003) | 1.200 (0.003) | 3.100 (0.003) | 5.100 (0.003) | 3.900 (0.003) | 1.300 (0.003) |
| Chrysene | mg/kg | 760[A] | 230[B] | 0.010 J (0.003) | 0.410 (0.003) | 0.140 (0.003) | 0.053 (0.003) | 0.220 (0.003) | 0.025 (0.003) | 2.900 (0.003) | 5.100 (0.003) | 12.000 (0.003) | 5.600 (0.003) | 0.780 (0.003) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.019) (0.003) | 0.035 J (0.003) | 0.049 J (0.003) | 0.033 (0.003) | 0.036 J (0.003) | ND (0.023) (0.003) | 1.600 (0.003) | 6.400 (0.003) | 6.800 (0.003) | 2.800 (0.003) | 0.050 J (0.003) |
| Naphthalene | mg/kg | 760[A] | 25[B] | ND (0.019) (0.003) | 0.099 (0.003) | 1.300 (0.003) | 1.400 (0.003) | 0.093 J (0.003) | 0.006 J (0.003) | 3.200 (0.003) | ***36.000*** [B] (0.003) | 22.000 (0.003) | 12.000 (0.003) | 0.270 (0.003) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.010 J (0.003) | 0.260 (0.003) | 0.180 (0.003) | 3.200 (0.003) | 0.180 (0.003) | 0.016 J (0.003) | 6.700 (0.003) | 21.000 (0.003) | 25.000 (0.003) | 13.000 (0.003) | 0.420 (0.003) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 0.015 J (0.003) | 0.510 (0.003) | 0.220 (0.003) | 0.084 (0.003) | 0.280 (0.003) | 0.033 (0.003) | 6.400 (0.003) | 9.700 (0.003) | 21.000 (0.003) | 11.000 (0.003) | 0.860 (0.003) |
| **Metals** | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 10.0 (0.510) | 60.8 (0.510) | 100 (0.510) | 105 (0.510) | 33.1 (0.510) | 7.22 (0.510) | 249 (0.510) | 142 (0.510) | ***3820*** [AB] (0.510) | 196 (0.510) | 331 (0.510) |
| **General Chemistry** | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 10.7 (0.50) | 10.5 (0.50) | 15.1 (0.50) | 14.4 (0.50) | 10.1 (0.50) | 24.7 (0.50) | 10.6 (0.50) | 8.4 (0.50) | 16.5 (0.50) | 17.9 (0.50) | 8.0 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | 8.15 (0.0100) | 8.09 (0.0100) | 7.89 (0.0100) | 7.86 (0.0100) | 9.15 (0.0100) |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| [A] | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| [B] | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AST-250-SS-1 | | AST-250-SS-2 | | AST-250-SS-3 | | AST-250-SS-4 | | AST-250-SS-5 | | AST-250-SS-6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 |
| Sample ID | | | | AST-250-SS-1 | AST-250-SS-1 | AST-250-SS-2 | AST-250-SS-2 | AST-250-SS-3 | AST-250-SS-3 | AST-250-SS-4 | AST-250-SS-4 | AST-250-SS-5 | AST-250-SS-5 | AST-250-SS-6 | AST-250-SS-6 |
| Sample Depth | | | | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | PIP | PIP | PIP | PIP | PIP | PIP | PIP | PIP | PIP | PIP | PIP | PIP |
| Laboratory Work Order | | A | B | 073770 | 075326 | 073770 | 075326 | 073770 | 075326 | 073770 | 075326 | 073770 | 075326 | 073770 | 075326 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 0705-2798 | 0707-0961 | 0705-2799 | 0707-0962 | 0705-2800 | 0707-0963 | 0705-2802 | 0707-0964 | 0705-2801 | 0707-0965 | 0705-2803 | 0707-0966 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.081) D () | - | ND (0.097) D () | - | ND (0.088) D () | - | ND (0.100) D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.081) D* () | - | *ND (0.097) D* () | - | *ND (0.088) D* () | - | *ND (0.100) D* () | - | *ND (0.110) D* () | - | *ND (0.069) D* () | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.081) D () | - | ND (0.097) D () | - | ND (0.088) D () | - | ND (0.100) D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.081) D () | - | ND (0.097) D () | - | ND (0.088) D () | - | ND (0.100) D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.081) D () | - | ND (0.097) D () | - | ND (0.088) D () | - | 0.120 D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.052 J D () | - | 0.067 J D () | - | 0.310 D () | - | 4.2 D () | - | 0.081 J D () | - | 0.065 J D () | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.081) D () | - | ND (0.097) D () | - | ND (0.088) D () | - | ND (0.100) D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.081) D () | - | ND (0.097) D () | - | 0.098 D () | - | 0.870 D () | - | ND (0.110) D () | - | ND (0.069) D () | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 760[A] | 230[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.350) () | ND (0.350) () | ND (0.350) () | ND (0.350) () | ND (0.370) () | ND (0.350) () | ND (0.350) () | 0.620 () | ND (0.360) () | ND (0.370) () | ND (0.350) () | ND (0.380) () |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | - | ***940*** [B] () | - | 30 () | - | 100 () | - | 2.8 () | - | 190 () | - | ***1500*** [B] () |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AST-250-SS-7 | | AST-250-SS-8 | | B-148 | B-149 | B-150 | B-151 | B-152 | B-153 | B-154 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 15-May-07 | 15-May-07 | 15-May-07 | 15-May-07 | 17-Sep-02 | 17-Sep-02 | 16-Sep-02 | 1-Mar-06 | 1-Mar-06 | 1-Mar-06 | 1-Mar-06 |
| Sample ID | | | | AST-250-SS-7 | AST-250-SS-7 | AST-250-SS-8 | AST-250-SS-8 | MW-1(1-1.5) | MW-2(1-1.5) | MW-3(1-1.5) | BH-B151-030106-0.5-1 | BH-B152-030106-1.5-2 | BH-B153-030106-1.5-2 | BH-B154-030106-1-1.5 |
| Sample Depth | | | | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 0.5 - 1 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1 - 1.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | PIP | PIP | PIP | PIP | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 073770 | 075326 | 073770 | 075326 | 823334 | 823334 | 823334 | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 0705-2804 | 0707-0967 | 0705-2805 | 0707-0968 | 3901264 | 3901265 | 3901266 | 4720664 | 4720663 | 4720662 | 4720665 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.078) D () | - | ND (0.092) D () | - | ***2.6***[B] (0.001) | ***6.5***[B] (0.001) | ***610***[AB] (0.001) | ND (0.200) (0.018) | 0.460 (0.017) | ND (0.420) (0.025) | ***3.6***[B] (0.013) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.078) D* () | - | *ND (0.092) D* () | - | - | - | - | *ND (0.200)* (0.036) | *ND (0.200)* (0.033) | *ND (0.420)* (0.05) | *ND (0.160)* (0.027) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.078) D () | - | ND (0.092) D () | - | - | - | - | ND (0.200) (0.036) | ND (0.200) (0.033) | ND (0.420) (0.05) | ND (0.160) (0.027) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.078) D () | - | ND (0.092) D () | - | 3.7 (0.001) | 0.520 (0.001) | 14 (0.001) | ND (0.200) (0.036) | 0.240 (0.033) | ND (0.420) (0.05) | 1.8 (0.027) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.078) D () | - | ND (0.092) D () | - | 60 (0.001) | 190 (0.001) | 270 (0.001) | ND (0.200) (0.036) | 20 (0.33) | ND (0.420) (0.05) | 1.8 (0.027) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | - | - | - | - | ND (0.310) (0.001) | ND (0.330) (0.001) | ND (1.1) (0.001) | ND (0.200) (0.018) | ND (0.200) (0.017) | ND (0.420) (0.025) | ND (0.160) (0.013) |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.055 J D () | - | 0.075 J D () | - | 1.8 (0.001) | 1.9 (0.001) | 4.8 (0.001) | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.078) D () | - | ND (0.092) D () | - | 1.6 (0.001) | ND (0.330) (0.001) | ***300***[B] (0.001) | ND (0.200) (0.036) | ND (0.200) (0.033) | ND (0.420) (0.05) | 0.240 (0.027) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.078) D () | - | ND (0.092) D () | - | 3.5 (0.001) | 0.860 (0.001) | 67 (0.001) | ND (0.200) (0.036) | ND (0.200) (0.033) | ND (0.420) (0.05) | 1.2 (0.027) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | - | - | - | - | - | - | ND (0.920) (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 6.2 (1) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | - | - | - | - | - | - | 2.0 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 5.9 (1) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | - | - | - | - | - | - | 1.7 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | ND (5.8) (1) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | - | - | - | - | - | - | 1.6 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | ND (5.8) (1) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | - | - | - | - | - | - | ND (0.920) (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | ND (5.8) (1) |
| Chrysene | mg/kg | 760[A] | 230[B] | - | - | - | - | - | - | - | 2.4 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 7.8 (1) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.350) () | ND (0.390) () | ND (0.360) () | ND (0.350) () | - | - | - | 1.1 (0.17) | ND (3.0) (0.5) | 4.2 (0.033) | 7.8 (1) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | 8.6 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 6.8 (1) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | - | - | - | - | - | - | 2.9 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 31 (1) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | - | - | - | - | - | - | 5.3 (0.17) | ND (3.0) (0.5) | ND (0.280) (0.033) | 15 (1) |
| **Metals** | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | - | 140 () | - | 13 () | - | - | - | 198 (3.75) | 27 (0.765) | 66.3 (0.78) | 410 (0.772) |
| **General Chemistry** | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | 22.7 (0.50) | 27.4 (0.50) | 14.2 (0.50) | 9.4 (0.5) | 15.6 (0.5) | 40.8 (0.5) | 13.5 (0.5) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5***[A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | B-155 | B-156 | B-157 | B-160 | B-161 | B-162 | B-164 | B-166 | B-167 | B-170 | B-171 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 20-Mar-06 | 20-Mar-06 | 1-Mar-06 | 1-Mar-06 | 1-Mar-06 | 1-Mar-06 | 1-Mar-06 | 13-Dec-12 | 13-Dec-12 | 13-Dec-12 | 6-Apr-16 |
| Sample ID | | | | BH-B155-032006-1.5-2 | BH-B156-032006-1-1.5 | BH-B157-030106-1-1.5 | BH-B160-030106-1-1.5 | BH-B161-030106-1.5-2 | BH-B162-030106-1-1.5 | BH-B164-030106-1.5-2 | B-166_2' | B-167_2' | B-170_2' | AOI6-B-171-0-2-SOIL |
| Sample Depth | | | | 1.5 - 2 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1.5 - 2 ft | 1 - 1.5 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1 - 2 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | GHD |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | ACCUTEST | ACCUTEST | ACCUTEST | LL |
| Laboratory Work Order | | A | B | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | JB23816 | JB23816 | JB23816 | 1648963 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 4734388 | 4734387 | 4720661 | 4720658 | 4720659 | 4720657 | 4720660 | JB23816-3 | JB23816-1 | JB23816-5 | 8325908 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ND (0.220) (0.016) | 0.009 (0.0004) | ND (0.240) (0.019) | ND (0.005) (0.0004) | ND (0.440) (0.034) | ND (0.005) (0.0005) | ND (0.370) (0.03) | ND (0.0015) (0.00018) | 0.0638 (0.0058) | ND (0.0010) (0.00012) | 0.001 J (0.0005) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.220)* (0.032) | ND (0.005) (0.0007) | *ND (0.240)* (0.038) | ND (0.005) (0.0007) | *ND (0.440)* (0.069) | ND (0.005) (0.001) | *ND (0.370)* (0.06) | ND (0.0015) (0.00019) | *ND (0.048)* (0.0061) | ND (0.0010) (0.00013) | ND (0.004) (0.001) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.220) (0.032) | ND (0.005) (0.0007) | ND (0.240) (0.038) | ND (0.005) (0.0007) | ND (0.440) (0.069) | ND (0.005) (0.001) | ND (0.370) (0.06) | ND (0.0015) (0.00020) | ND (0.048) (0.0065) | ND (0.0010) (0.00014) | ND (0.004) (0.001) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.220) (0.032) | ND (0.005) (0.0007) | ND (0.240) (0.038) | ND (0.005) (0.0007) | ND (0.440) (0.069) | ND (0.005) (0.001) | ND (0.370) (0.06) | ND (0.0015) (0.00039) | 0.395 (0.013) | ND (0.0010) (0.00027) | ND (0.004) (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.220) (0.032) | 0.007 (0.0007) | ND (0.240) (0.038) | ND (0.005) (0.0007) | 2.2 (0.069) | ND (0.005) (0.001) | 2.2 (0.06) | ND (0.0074) (0.00011) | 3.15 (0.0036) | 0.0030 J (0.000077) | ND (0.004) (0.001) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.220) (0.016) | ND (0.005) (0.0004) | ND (0.240) (0.019) | ND (0.005) (0.0004) | ND (0.440) (0.034) | ND (0.005) (0.0005) | ND (0.370) (0.03) | ND (0.0015) (0.00035) | ND (0.048) (0.011) | 0.00054 J (0.00024) | ND (0.004) (0.0005) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | ND (0.220) (0.032) | 0.006 (0.0007) | ND (0.240) (0.038) | ND (0.005) (0.0007) | ND (0.440) (0.069) | ND (0.005) (0.001) | ND (0.370) (0.06) | ND (0.0015) (0.00016) | 0.0932 (0.0051) | 0.00040 J (0.00011) | ND (0.004) (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | ND (0.0074) (0.00031) | 0.229 J (0.010) | ND (0.0052) (0.00022) | ND (0.004) (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | ND (0.0074) (0.00024) | 0.101 J (0.0077) | ND (0.0052) (0.00017) | ND (0.004) (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.220) (0.032) | 0.007 (0.0007) | 0.270 (0.038) | ND (0.005) (0.0007) | 5.1 (0.069) | ND (0.005) (0.001) | ND (0.370) (0.06) | ND (0.0015) (0.00021) | 0.806 (0.0067) | ND (0.0010) (0.00014) | ND (0.004) (0.001) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.750 (0.033) | 0.860 (0.033) | ND (1.1) (0.17) | ND (0.220) (0.033) | 0.360 (0.033) | ND (0.180) (0.033) | ND (0.200) (0.033) | 0.0812 (0.015) | 0.0325 J (0.012) | 0.257 (0.013) | 0.120 (0.003) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.840 (0.033) | 0.830 (0.033) | 1.4 (0.17) | ND (0.220) (0.033) | 1.8 (0.033) | 0.200 (0.033) | 0.350 (0.033) | 0.318 (0.014) | 0.113 (0.011) | 0.578 (0.012) | 0.440 (0.003) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.780 (0.033) | 0.820 (0.033) | 1.5 (0.17) | ND (0.220) (0.033) | 2.2 (0.033) | 0.220 (0.033) | 0.410 (0.033) | 0.330 (0.013) | 0.130 (0.010) | 0.659 (0.011) | 0.450 (0.003) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 1.1 (0.033) | 1.1 (0.033) | 2.1 (0.17) | ND (0.220) (0.033) | 2.7 (0.033) | 0.290 (0.033) | 0.680 (0.033) | 0.293 (0.014) | 0.150 (0.011) | 0.617 (0.012) | 0.540 (0.003) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.310 (0.033) | 0.420 (0.033) | ND (1.1) (0.17) | ND (0.220) (0.033) | 1.3 (0.033) | ND (0.180) (0.033) | 0.270 (0.033) | 0.228 (0.016) | 0.121 (0.013) | 0.466 (0.014) | 0.290 (0.003) |
| Chrysene | mg/kg | 760[A] | 230[B] | 0.820 (0.033) | 0.920 (0.033) | 1.4 (0.17) | ND (0.220) (0.033) | 2.1 (0.033) | 0.250 (0.033) | 0.360 (0.033) | 0.334 (0.014) | 0.137 (0.011) | 0.589 (0.012) | 0.420 (0.003) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 1.1 (0.033) | 1.9 (0.033) | ND (1.1) (0.17) | ND (0.220) (0.033) | ND (0.210) (0.033) | ND (0.180) (0.033) | ND (0.200) (0.033) | 0.0259 J (0.014) | 0.0176 J (0.011) | 0.229 (0.012) | 0.044 J (0.003) |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.700 (0.033) | 0.370 (0.033) | ND (1.1) (0.17) | ND (0.220) (0.033) | 0.340 (0.033) | ND (0.180) (0.033) | ND (0.200) (0.033) | 0.0370 J (0.011) | 0.0352 (0.0092) | 0.114 (0.010) | 0.230 (0.003) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 3.0 (0.033) | 4.3 (0.033) | ND (1.1) (0.17) | ND (0.220) (0.033) | 0.410 (0.033) | ND (0.180) (0.033) | 0.400 (0.033) | 0.285 (0.019) | 0.108 (0.015) | 0.379 (0.017) | 0.220 (0.003) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 2.3 (0.033) | 2.5 (0.033) | 1.4 (0.17) | ND (0.220) (0.033) | 2.1 (0.033) | 0.320 (0.033) | 0.500 (0.033) | 0.536 (0.016) | 0.275 (0.013) | 1.16 (0.014) | 0.500 (0.003) |
| **Metals** | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | ***618*** [B] (0.765) | ***1070*** [B] (0.78) | 178 (0.78) | 30.8 (0.765) | 70.1 (0.757) | ***584*** [B] (0.757) | 18.5 (0.772) | ***744*** [B] (0.15) | 253 (0.12) | 66.9 (0.13) | 45.7 (0.510) |
| **General Chemistry** | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 27.3 (0.5) | 22 (0.5) | 21.7 (0.5) | 22.9 (0.5) | 21.6 (0.5) | 6.9 (0.5) | 17.9 (0.5) | - | - | - | 6.2 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | 75.0 () | 88.8 () | 83.1 () | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | B-172 | | B-173 | | B-174 | | B-175 | | BH-02-06 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 6-Apr-16 | 12-Jul-16 | 5-Apr-16 | 12-Jul-16 | 4-Apr-16 | 13-Jul-16 | 5-Apr-16 | 13-Jul-16 | 22-Mar-06 | 22-Mar-06 |
| Sample ID | | | | AOI6-B-172-0-2-SOIL | AOI6-B-172-0-2-071216 | AOI6-B-173-0-2-SOIL | AOI6-B-173-0-2-071216 | AOI6-B-174-0-2-SOIL | AOI6-B-174-0-2-071316 | AOI6-B-175-0-2-SOIL | AOI6-B-175-0-2-071316 | BH-02-06-032206-1.5-2 | BH-02-06-032206-1.5-2 |
| Sample Depth | | | | 0.5 - 1 ft | 0.5 - 1 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1.5 - 2 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1647893 | 1682991 | 1647893 | 1682991 | 1647893 | 1682991 | 1647893 | 1682991 | UNKNOWN | UNKNOWN |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8321194 | 8475492 | 8321186 | 8475494 | 8321182 | 8475496 | 8321188 | 8475498 | 4736395 | 4739181 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.210 J (0.0005) | - | 0.300 J (0.0005) | - | ND (0.004) (0.0005) | - | ***1.100*** [B] (0.0005) | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.380)* (0.001) | - | *ND (0.310)* (0.001) | - | ND (0.004) (0.001) | - | *ND (0.320)* (0.001) | - | - | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.380) (0.001) | - | ND (0.310) (0.001) | - | ND (0.004) (0.001) | - | ND (0.320) (0.001) | - | - | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | 0.100 J (0.001) | - | ND (0.310) (0.001) | - | ND (0.004) (0.001) | - | 0.350 (0.001) | - | - | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.380) (0.001) | - | 0.360 (0.001) | - | ND (0.004) (0.001) | - | 0.270 J (0.001) | - | - | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.380) (0.0005) | - | ND (0.310) (0.0005) | - | ND (0.004) (0.0005) | - | ND (0.320) (0.0005) | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.580 (0.001) | - | 0.130 J (0.001) | - | ND (0.004) (0.001) | - | 1.300 (0.001) | - | - | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | 0.110 J (0.001) | - | 0.310 (0.001) | - | ND (0.004) (0.001) | - | 0.290 J (0.001) | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.380) (0.001) | - | 0.130 J (0.001) | - | ND (0.004) (0.001) | - | 0.260 J (0.001) | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | 0.510 (0.001) | - | 0.660 (0.001) | - | ND (0.004) (0.001) | - | 1.600 (0.001) | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | 0.800 (0.003) | - | 0.089 J (0.003) | - | 0.110 J (0.003) | - | 2.400 (0.003) | - | - |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | 2.400 (0.003) | - | 0.300 (0.003) | - | 0.600 (0.003) | - | 1.900 (0.003) | - | - |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | 1.400 (0.003) | - | 0.330 (0.003) | - | 0.540 (0.003) | - | 1.400 (0.003) | - | - |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | 2.600 (0.003) | - | 0.440 (0.003) | - | 0.710 (0.003) | - | 1.900 (0.003) | - | - |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | 0.950 (0.003) | - | 0.390 (0.003) | - | 0.390 (0.003) | - | 1.700 (0.003) | - | - |
| Chrysene | mg/kg | 760[A] | 230[B] | - | 2.300 (0.003) | - | 0.420 (0.003) | - | 0.630 (0.003) | - | 2.000 (0.003) | - | - |
| Fluorene | mg/kg | 130000[A] | 3800[B] | - | 0.079 J (0.003) | - | 0.049 J (0.003) | - | ND (0.210) (0.003) | - | 3.600 (0.003) | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | 1.200 (0.003) | - | 0.270 (0.003) | - | 0.180 J (0.003) | - | 9.300 (0.003) | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | 0.930 (0.003) | - | 0.340 (0.003) | - | 0.400 (0.003) | - | 10.000 (0.003) | - | - |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | 3.000 (0.003) | - | 0.490 (0.003) | - | 0.890 (0.003) | - | 2.800 (0.003) | - | - |
| **Metals** | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | 240 (8.4) |
| Lead | mg/kg | 2240[A] | 450[B] | 168 (0.510) | - | 170 (0.510) | - | 6.22 (0.510) | - | 207 (0.510) | - | ***1260*** [B] (0.75) | - |
| **General Chemistry** | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 14.6 (0.50) | 26.2 (0.50) | 17.5 (0.50) | 9.1 (0.50) | 4.8 (0.50) | 21.2 (0.50) | 30.1 (0.50) | 40.2 (0.50) | 43.5 (0.5) | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| [A] | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| [B] | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | BH-03-06 | | BH-13-06 | BH-14-06 | | BH-20-06 | BH-21-06 | BH-22-06 | BH-23-06 | BH-24-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 22-Mar-06 | 22-Mar-06 | 22-Mar-06 | 23-Mar-06 | 23-Mar-06 | 20-Mar-06 | 20-Mar-06 | 21-Mar-06 | 21-Mar-06 | 21-Mar-06 |
| Sample ID | | | | BH-03-06-032206-1.5-2 | BH-03-06-032206-1.5-2 | BH-13-06-032206-1-1.5 | BH-14-06-032306-0.5-1 | BH-14-06-032306-0.5-1 | BH-20-06-032006-1-1.5 | BH-21-06-032006-1.5-2 | BH-22-06-032106-1.5-2 | BH-23-06-032106-1-1.5 | BH-24-06-032106-1-1.5 |
| Sample Depth | | | | 1.5 - 2 ft | 1.5 - 2 ft | 1 - 1.5 ft | 0.5 - 1 ft | 0.5 - 1 ft | 1 - 1.5 ft | 1.5 - 2 ft | 1.5 - 2 ft | 1 - 1.5 ft | 1 - 1.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 4736394 | 4739180 | 4736396 | 4736397 | 4739182 | 4734389 | 4734390 | 4734394 | 4734391 | 4734392 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | - | - | - | - | - | 0.290 (0.016) | 0.340 (0.017) | ND (0.004) (0.0003) | ND (0.210) (0.017) | ND (0.170) (0.015) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | - | - | - | - | - | *ND (0.200)* (0.031) | *ND (0.190)* (0.035) | ND (0.004) (0.0006) | *ND (0.210)* (0.033) | *ND (0.170)* (0.03) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | - | - | - | - | - | ND (0.200) (0.031) | ND (0.190) (0.035) | ND (0.004) (0.0006) | ND (0.210) (0.033) | ND (0.170) (0.03) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | - | - | - | - | - | 0.460 (0.031) | 0.810 (0.035) | ND (0.004) (0.0006) | ND (0.210) (0.033) | ND (0.170) (0.03) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | - | - | - | - | - | 9.7 (0.31) | 32 (0.35) | ND (0.004) (0.0006) | 0.810 (0.033) | 9.9 (0.03) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | - | - | - | - | - | ND (0.200) (0.016) | ND (0.190) (0.017) | ND (0.004) (0.0003) | ND (0.210) (0.017) | ND (0.170) (0.015) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | - | - | - | - | - | 0.410 (0.031) | ND (0.190) (0.035) | ND (0.004) (0.0006) | ND (0.210) (0.033) | 0.200 (0.03) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | - | - | - | - | - | 1.0 (0.031) | 0.830 (0.035) | ND (0.004) (0.0006) | 0.370 (0.033) | 0.560 (0.03) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | - | - | - | - | 2.5 (0.33) | ND (1.8) (0.33) | ND (0.190) (0.033) | 1.3 (0.1) | 3.9 (0.33) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | - | - | - | - | 3.8 (0.33) | ND (1.8) (0.33) | ND (0.190) (0.033) | 0.790 (0.1) | ND (1.9) (0.33) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | - | - | - | - | 4.9 (0.33) | ND (1.8) (0.33) | 0.350 (0.033) | 1.1 (0.1) | ND (1.9) (0.33) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | - | - | - | - | 6.3 (0.33) | ND (1.8) (0.33) | 0.400 (0.033) | 1.2 (0.1) | ND (1.9) (0.33) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | - | - | - | - | 2.9 (0.33) | ND (1.8) (0.33) | 0.290 (0.033) | 0.890 (0.1) | ND (1.9) (0.33) |
| Chrysene | mg/kg | 760[A] | 230[B] | - | - | - | - | - | 4.2 (0.33) | ND (1.8) (0.33) | ND (0.190) (0.033) | 1.3 (0.1) | 2.0 (0.33) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | - | - | - | - | - | 71 (0.67) | ND (1.8) (0.33) | ND (0.190) (0.033) | 3.5 (0.1) | 63 (0.67) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | ND (2.1) (0.33) | ND (1.8) (0.33) | ND (0.190) (0.033) | 0.980 (0.1) | ND (1.9) (0.33) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | - | - | - | - | 37 (0.33) | ND (1.8) (0.33) | ND (0.190) (0.033) | 7.4 (0.1) | 46 (0.33) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | - | - | - | - | 6.9 (0.33) | ND (1.8) (0.33) | 0.220 (0.033) | 1.6 (0.1) | 5.8 (0.33) |
| **Metals** | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | 90.1 (8.4) | - | - | 1120 (8.4) | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | ***1650*** [B] (0.757) | - | 283 (0.757) | ***1040*** [B] (0.75) | - | 145 (0.757) | 286 (0.757) | 165 (0.757) | 417 (0.772) | 233 (0.772) |
| **General Chemistry** | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 33.5 (0.5) | - | 38.3 (0.5) | 33.1 (0.5) | - | 20.4 (0.5) | 9.7 (0.5) | 10 (0.5) | 20.2 (0.5) | 14.4 (0.5) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | BH-25-06 | BH-26-06 | BH-27-06 | BH-27-09 | BH-28-06 | BH-28-09 | BH-29-06 | BH-29-09 | BH-30-09 | BH-31-09 | BH-32-09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 21-Mar-06 | 24-Mar-06 | 23-Mar-06 | 8-Apr-09 | 23-Mar-06 | 8-Apr-09 | 21-Mar-06 | 8-Apr-09 | 8-Apr-09 | 13-Jul-09 | 13-Jul-09 |
| Sample ID | | | | BH-25-06-032106-1-1.5 | BH-26-06-032406-0.5-1 | BH-27-06-032306-1-1.5 | BH-27-09 | BH-28-06-032306-1-1.5 | BH-28-09 | BH-29-06-032106-1.5-2 | BH-29-09 | BH-30-09 | BH-31-09 | BH-32-09 |
| Sample Depth | | | | 1 - 1.5 ft | 0.5 - 1 ft | 1 - 1.5 ft | 0 - 2 ft | 1 - 1.5 ft | 0 - 2 ft | 1.5 - 2 ft | 0 - 2 ft | 0 - 2 ft | 0 - 2 ft | 0 - 2 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory Sample ID | Units | A MSC-PA | B SHS-PA | 4734393 | 4738884 | 4736392 | 5643349 | 4736393 | 5643346 | 4734395 | 5643347 | 5643348 | 5722433 | 5722432 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | ***2.3*** [B] (0.018) | ***180*** [B] (1.6) | ***2.2*** [B] (0.016) | - | ***1.3*** [B] (0.033) | - | 0.410 (0.018) | - | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | *ND (0.220)* (0.035) | *ND (0.180)* (0.033) | *ND (0.180)* (0.031) | - | *ND (0.380)* (0.066) | - | *ND (0.230)* (0.037) | - | - | - | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.220) (0.035) | ND (0.180) (0.033) | ND (0.180) (0.031) | - | ND (0.380) (0.066) | - | ND (0.230) (0.037) | - | - | - | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | 0.300 (0.035) | 2.7 (0.033) | 1.6 (0.031) | - | 0.670 (0.066) | - | ND (0.230) (0.037) | - | - | - | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 2.7 (0.035) | 800 (3.3) | 9.1 (0.031) | - | 6.4 (0.066) | - | 0.990 (0.037) | - | - | - | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.220) (0.018) | ND (0.180) (0.016) | ND (0.180) (0.016) | - | ND (0.380) (0.033) | - | ND (0.230) (0.018) | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 1.7 (0.035) | ***260*** [B] (3.3) | ND (0.180) (0.031) | - | 0.590 (0.066) | - | ND (0.230) (0.037) | - | - | - | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | 1.1 (0.035) | 9.3 (0.033) | 0.770 (0.031) | - | 0.580 (0.066) | - | 0.560 (0.037) | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 10 (0.33) | ND (0.180) (0.033) | 3.3 (0.33) | - | 2.5 (0.033) | - | 27 (0.33) | - | - | - | - |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 5.3 (0.33) | ND (0.180) (0.033) | ND (1.9) (0.33) | - | 4.0 (0.033) | - | 70 (1.7) | - | - | - | - |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 6.0 (0.33) | ND (0.180) (0.033) | ND (1.9) (0.33) | - | 4.2 (0.17) | - | ***59*** [AB] (1.7) | - | - | - | - |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 8.1 (0.33) | ND (0.180) (0.033) | ND (1.9) (0.33) | - | 6.0 (0.17) | - | 75 (1.7) | - | - | - | - |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 3.6 (0.33) | ND (0.180) (0.033) | ND (1.9) (0.33) | - | 1.9 (0.033) | - | 29 (0.33) | - | - | - | - |
| Chrysene | mg/kg | 760[A] | 230[B] | 4.8 (0.33) | ND (0.180) (0.033) | ND (1.9) (0.33) | - | 4.3 (0.033) | - | 73 (1.7) | - | - | - | - |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 120 (1.7) | ND (0.180) (0.033) | 16 (0.33) | - | 12 (0.17) | - | 14 (0.33) | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | 2.4 (0.33) | ND (0.180) (0.033) | 12 (0.33) | - | 1.0 (0.033) | - | 2.4 (0.33) | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 120 (1.7) | 0.210 (0.033) | 36 (0.33) | - | 16 (0.17) | - | 91 (1.7) | - | - | - | - |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 11 (0.33) | 0.300 (0.033) | 2.0 (0.33) | - | 8.9 (0.17) | - | 110 (1.7) | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | 231 (0.772) | 32.6 (0.765) | 167 (0.772) | ***463*** [B] (0.015) | 200 (0.757) | ***993*** [B] (0.015) | ***2520*** [AB] (0.772) | 409 (0.015) | ***2310*** [AB] (0.015) | ***501*** [B] (0.02) | 186 (0.02) |
| **General Chemistry** | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 19.4 (0.5) | 9 (0.5) | 12.4 (0.5) | 14.6 (0.5) | 12.8 (0.5) | 23 (0.5) | 20.2 (0.5) | 10.1 (0.5) | 15.1 (0.5) | 7.5 (0.5) | 9.7 (0.5) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential<br>Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | GP U 677-1 | GP U 677-2 | GP U 677-3 | GP U 677-4 | GP U 677-5 | GP 797-HA-1 | GP 797-HA-2 | GP 797-HA-3 | | GP 797-HA-4 | GP-1088-SS-1 | GP-1088-SS-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 8-Jun-11 | 8-Jun-11 | 8-Jun-11 | 8-Jun-11 | 8-Jun-11 | 29-Aug-02 | 24-May-02 | 24-May-02 | 24-May-02 | 24-May-02 | 26-Mar-08 | 26-Mar-08 |
| Sample ID | | | | GP U 677-1(1.5-2.0) | GP U 677-2(0.8-1.3) | GP U 677-3(1.5-2.0) | GP U 677-4(0.3-0.8) | GP U 677-5(0.8-1.3) | HA-1 (1-1.5) | HA-2 (1-1.5) | HA-3 (1-1.5) | HA-3 (2) | HA-4 (1-1.5) | GP-1088-SS-1 | GP-1088-SS-2 |
| Sample Depth | | | | 1.5 - 2 ft | 0.8 - 1.3 ft | 1.5 - 2 ft | 0.3 - 0.8 ft | 0.8 - 1.3 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1 - 1.5 ft | 1.5 - 2 ft | 1 - 1.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | WGI | WGI | WGI | WGI | WGI | LL | LL |
| Laboratory Work Order | | | | 1250778 | 1250778 | 1250778 | 1250778 | 1250778 | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | 1083612 | 1083612 |
| Laboratory Sample ID | Units | A MSC-PA | B SHS-PA | 6311687 | 6311688 | 6311689 | 6311690 | 6311691 | HA-1 (1-1.5) | HA-2 (1-1.5) | HA-3 (1-1.5) | HA-3 (2) | HA-4 (1-1.5) | 5315612 | 5315613 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.060 J (0.0005) | ND (0.0006) (0.0005) | ND (0.0005) (0.0005) | ND (0.0005) (0.0005) | ND (0.0005) (0.0005) | ***920 D*** [AB] () | ***28 D*** [B] () | ***310 D*** [AB] () | ***170 D*** [B] () | ***190 D*** [B] () | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | ***0.130 J*** [B] (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | - | - | - | - | - | - | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.070) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | 0.110 J (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ***80 J D*** [B] () | 0.85 () | 37 J D () | 8.5 () | 55 D () | - | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.700 (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 1600 D () | 17 D () | 1000 D () | 230 D () | 950 D () | - | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | 310 D () | 4.5 () | 140 D () | 29 D () | 210 D () | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.035) (0.0005) | ND (0.0006) (0.0005) | ND (0.0005) (0.0005) | ND (0.0005) (0.0005) | ND (0.0005) (0.0005) | ND (0.24) () | ND (0.26) () | ND (0.27) () | ND (0.25) () | ND (0.25) () | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | 0.290 J (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.160 (0.001) | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | 71 D () | 1.4 () | 29 J D () | 7.7 () | 50 J D () | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.120 J (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.001 J (0.001) | ***1800 D*** [B] () | 11 D () | ***920 D*** [B] () | ***300 D*** [B] () | ***660 D*** [B] () | - | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | 0.097 J (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.056 (0.001) | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.070) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.046 (0.001) | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | 0.420 (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.005 (0.001) | - | - | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.780 (0.00067) | 0.037 J (0.00067) | 0.500 (0.00067) | ND (0.028) (0.00067) | 0.990 (0.00067) | - | - | - | - | - | - | - |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 1.0 (0.00033) | 0.110 (0.00033) | 1.2 (0.00033) | 0.031 (0.00033) | ND (0.590) (0.00033) | - | - | - | - | - | - | - |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 1.2 (0.00033) | 0.120 (0.00033) | 1.2 (0.00033) | 0.050 (0.00033) | 0.620 (0.00033) | - | - | - | - | - | - | - |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.800 (0.00027) | 0.091 (0.00027) | 0.850 (0.00027) | 0.053 (0.00027) | 0.810 (0.00027) | - | - | - | - | - | - | - |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 1.7 (0.0020) | 0.190 J (0.0020) | 1.5 (0.0020) | 0.130 J (0.0020) | 1.4 (0.0020) | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 760[A] | 230[B] | 2.0 (0.0030) | 0.160 (0.0030) | 1.6 (0.0030) | 0.250 (0.0030) | 4.3 (0.0030) | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 130000[A] | 3800[B] | 1.3 (0.0033) | ND (0.085) (0.0033) | 0.390 (0.0033) | ND (0.071) (0.0033) | 2.5 (0.0033) | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | 0.65 () | ND (0.26) () | 0.41 () | 0.3 () | 0.29 () | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 2.2 (0.0020) | 0.090 J (0.0020) | 1.6 (0.0020) | 0.095 J (0.0020) | 5.2 (0.0020) | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 1.5 (0.0033) | 0.240 J (0.0033) | 2.3 (0.0033) | ND (0.370) (0.0033) | ND (17) (0.0033) | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | ***453*** [B] (0.220) | 67.0 (0.220) | ***451*** [B] (0.220) | 47.8 (0.220) | 18.5 (0.220) | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 21.1 (0.50) | 21.2 (0.50) | 22.2 (0.50) | 6.1 (0.50) | 6.9 (0.50) | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | 11.2 (0.0100) | 10.4 (0.0100) |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | GP-1088-SS-3 | GP-1088-SS-4 | GP-1088-SS-5 | GP-1088-SS-6 | GP-1088-SS-7 | GP-1088-SS-8 | GP-201-SS-1 | GP-201-SS-2 | GP-201-SS-3 | GP-201-SS-4 | GP-201-SS-5 | GP-201-SS-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 | 26-Mar-08 |
| Sample ID | | | | GP-1088-SS-3 | GP-1088-SS-4 | GP-1088-SS-5 | GP-1088-SS-6 | GP-1088-SS-7 | GP-1088-SS-8 | GP-201-SS-1 | GP-201-SS-2 | GP-201-SS-3 | GP-201-SS-4 | GP-201-SS-5 | GP-201-SS-6 |
| Sample Depth | | | | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1083612 | 1083612 | 1083612 | 1083612 | 1083612 | 1083612 | 1083613 | 1083613 | 1083613 | 1083613 | 1083613 | 1083613 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 5315614 | 5315615 | 5315616 | 5315617 | 5315618 | 5315619 | 5315620 | 5315621 | 5315622 | 5315623 | 5315624 | 5315625 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 760[A] | 230[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 130000[A] | 3800[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | 10.1 (0.0100) | 10.3 (0.0100) | 10.7 (0.0100) | 11.6 (0.0100) | 10.1 (0.0100) | 10.5 (0.0100) | 8.88 (0.01) | 9.00 (0.01) | 8.53 (0.01) | 8.55 (0.01) | 8.88 (0.01) | 7.89 (0.01) |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| **6.5** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| **Sample Location** | | | | **GP-201-SS-7** | **GP676-1** | **GP676-2** | **GP676-3** | **GP676-4** | **GP676-5** | **GP676-6** | **GP676-7** | **GP676-8** | **GP676-9** | **SR-31-1** | **SR-31-2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample Date** | | | | **26-Mar-08** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **28-Apr-16** | **7-Jun-11** | **7-Jun-11** |
| **Sample ID** | | | | **GP-201-SS-7** | **GP676-1-(1.5')-20160428** | **GP676-2-(1.5')-20160428** | **GP676-3-(1.5')-20160428** | **GP676-4-(1.5')-20160428** | **GP676-5-(1.5')-20160428** | **GP676-6-(1.5')-20160428** | **GP676-7-(1.5')-20160428** | **GP676-8-(1.5')-20160428** | **GP676-9-(1.5')-20160428** | **SR-31-1(1.3-1.8)** | **SR-31-2(0.9-1.4)** |
| **Sample Depth** | | | | **0 - 0.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.5 ft** | **1.3 - 1.8 ft** | **0.9 - 1.4 ft** |
| **Sampling Company** | | | | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **STANTEC** | **UNKNOWN** | **UNKNOWN** |
| **Laboratory** | | | | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** | **LL** |
| **Laboratory Work Order** | | | | **1083613** | **1655906** | **1655906** | **1655906** | **1655906** | **1655906** | **1655906** | **1655906** | **1655906** | **1655906** | **1250778** | **1250778** |
| **Laboratory Sample ID** | **Units** | **A MSC-PA** | **B SHS-PA** | **5315626** | **8358306** | **8358307** | **8358308** | **8358309** | **8358310** | **8358311** | **8358312** | **8358313** | **8358314** | **6311678** | **6311679** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | - | 0.051 J (0.0005) | ND (0.064) (0.0005) | ND (0.13) (0.0005) | ND (0.0007) (0.0005) | ND (0.031) (0.0005) | ND (0.033) (0.0005) | ND (0.035) (0.0005) | ND (0.033) (0.0005) | ND (0.038) (0.0005) | 0.044 (0.0005) | 0.002 J (0.0005) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | - | - | - | - | - | - | - | - | - | - | ND (0.003) (0.001) | ND (0.002) (0.001) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | - | - | - | - | - | - | - | - | - | - | ND (0.003) (0.001) | ND (0.002) (0.001) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | - | - | - | - | - | - | - | - | - | - | 0.015 (0.001) | ND (0.002) (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | - | - | - | - | - | - | - | - | - | - | 0.006 J (0.001) | ND (0.002) (0.001) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | - | - | - | - | - | - | - | - | - | - | ND (0.001) (0.0005) | ND (0.0009) (0.0005) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | 0.37 J (0.001) | ND (0.13) (0.001) | ND (0.25) (0.001) | ND (0.001) (0.001) | 0.094 J (0.001) | 0.14 J (0.001) | ND (0.070) (0.001) | ND (0.067) (0.001) | ND (0.077) (0.001) | 0.008 J (0.001) | 0.006 J (0.001) |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | - | - | - | - | - | - | - | - | - | - | 0.041 (0.001) | 0.002 J (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | - | - | - | - | - | - | - | - | - | - | 0.038 (0.001) | ND (0.002) (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | - | - | - | - | - | - | - | - | - | - | 0.150 (0.001) | ND (0.002) (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | - | - | - | - | - | - | - | - | - | - | 0.110 (0.001) | 0.002 J (0.001) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | 0.50 (0.003) | 8.0 (0.003) | 0.42 (0.003) | 1.2 (0.003) | 0.67 (0.003) | 0.29 (0.003) | 1.0 J (0.003) | 0.97 (0.003) | 1.9 (0.003) | 0.089 (0.00067) | 0.380 (0.00067) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | - | 0.93 (0.003) | 9.3 (0.003) | 0.81 (0.003) | 2.9 (0.003) | 1.9 (0.003) | 0.68 (0.003) | 0.83 J (0.003) | 1.5 (0.003) | 0.61 J (0.003) | 0.540 (0.00033) | 2.9 (0.00033) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | - | 0.93 (0.003) | 5.2 (0.003) | 0.87 (0.003) | 3.8 (0.003) | 1.9 (0.003) | 0.56 (0.003) | 1.5 (0.003) | 0.86 (0.003) | 0.59 J (0.003) | 0.640 (0.00033) | 2.8 (0.00033) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | - | 1.1 (0.003) | 2.6 (0.003) | 1.2 (0.003) | 4.2 (0.003) | 2.2 (0.003) | 0.40 (0.003) | 0.61 J (0.003) | 0.46 (0.003) | 0.66 J (0.003) | 0.570 (0.00027) | 2.6 (0.00027) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | 0.75 (0.003) | 1.7 (0.003) | 0.66 (0.003) | 2.9 (0.003) | 1.3 (0.003) | 0.25 (0.003) | 1.2 (0.003) | 0.36 (0.003) | 0.67 J (0.003) | 0.830 (0.0020) | 3.3 (0.0020) |
| Chrysene | mg/kg | 760[A] | 230[B] | - | 0.99 (0.003) | 15 (0.003) | 0.99 (0.003) | 3.0 (0.003) | 2.0 (0.003) | 1.2 (0.003) | 3.1 (0.003) | 2.2 (0.003) | 0.99 J (0.003) | 0.890 (0.0030) | 4.0 (0.0030) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | - | 0.24 (0.003) | 9.8 (0.003) | 0.39 (0.003) | 0.46 (0.003) | 0.27 (0.003) | 0.28 (0.003) | 1.0 J (0.003) | 0.85 (0.003) | 3.1 (0.003) | 0.160 J (0.0033) | 0.370 J (0.0033) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | 1.3 (0.003) | 38 (0.003) | 1.0 (0.003) | 3.4 (0.003) | 1.3 (0.003) | 1.3 (0.003) | 4.0 (0.003) | 3.4 (0.003) | 13 (0.003) | 0.490 (0.0020) | 1.4 (0.0020) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | - | 1.2 (0.003) | 18 (0.003) | 1.0 (0.003) | 3.1 (0.003) | 2.0 (0.003) | 1.4 (0.003) | 3.7 (0.003) | 2.8 (0.003) | 2.6 (0.003) | 1.2 (0.0033) | 5.0 (0.0033) |
| **Metals** | | | | | | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | - | - | - | - | - | - | - | - | - | - | ***1120*** [B] (0.220) | ***898*** [B] (0.220) |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | 26.4 (0.50) | 17.3 (0.50) | 32.3 (0.50) | 28.9 (0.50) | 17.9 (0.50) | 18.6 (0.50) | 16.9 (0.50) | 23.2 (0.50) | 22.8 (0.50) | 31.1 (0.50) | 37.4 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | 7.99 (0.01) | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4a**

**Historical Soil Analytical Results Summary - AOI 6 (0-2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | SR-31-3 | SR-31-4 | SR-31-5 | SR-31-6 | SR-31-7 | SR-31-8 | SR-31-9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 7-Jun-11 | 7-Jun-11 | 7-Jun-11 | 7-Jun-11 | 7-Jun-11 | 7-Jun-11 | 7-Jun-11 |
| Sample ID | | | | SR-31-3(0.8-1.3) | SR-31-4(0.9-1.4) | SR-31-5(0.8-1.3) | SR-31-6(1.0-1.5) | SR-31-7(1.1-1.6) | SR-31-8(0.5-1.0) | SR-31-9(1.2-1.7) |
| Sample Depth | | | | 0.8 - 1.3 ft | 0.9 - 1.4 ft | 0.8 - 1.3 ft | 1 - 1.5 ft | 1.1 - 1.6 ft | 0.5 - 1 ft | 1.2 - 1.7 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1250778 | 1250778 | 1250778 | 1250778 | 1250778 | 1250778 | 1250778 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 6311680 | 6311681 | 6311682 | 6311683 | 6311684 | 6311685 | 6311686 |
| **Volatile Organic Compounds** | | | | | | | | | | |
| Benzene | mg/kg | 290[A] | 0.5[B] | 0.003 J (0.0005) | 0.001 J (0.0005) | ND (0.065) (0.0005) | ND (0.045) (0.0005) | 0.001 J (0.0005) | 0.005 J (0.0005) | ND (0.0006) (0.0005) |
| 1,2-Dibromoethane (EDB) | mg/kg | 3.7[A] | 0.005[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | *ND (0.130)* (0.001) | *ND (0.089)* (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| 1,2-Dichloroethane (EDC) | mg/kg | 86[A] | 0.5[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| Ethylbenzene | mg/kg | 890[A] | 70[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| m, p-Xylenes | mg/kg | n/v | n/v | - | - | - | - | - | - | - |
| Methyl Tertiary Butyl Ether | mg/kg | 8600[A] | 2[B] | ND (0.0008) (0.0005) | ND (0.0008) (0.0005) | ND (0.065) (0.0005) | ND (0.045) (0.0005) | ND (0.0009) (0.0005) | ND (0.0007) (0.0005) | ND (0.0006) (0.0005) |
| Naphthalene | mg/kg | 760[A] | 25[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | 0.200 J (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| o-Xylene (1,2-Dimethylbenzene) | mg/kg | n/v | n/v | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.002 J (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | 0.002 J (0.001) | ND (0.001) (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 560[A] | 35[B] | 0.002 J (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 8000[A] | 1000[B] | ND (0.002) (0.001) | ND (0.002) (0.001) | ND (0.130) (0.001) | ND (0.089) (0.001) | ND (0.002) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.180 (0.00067) | 0.034 J (0.00067) | 0.110 (0.00067) | 0.260 (0.00067) | 0.100 (0.00067) | 0.050 J (0.00067) | 0.140 (0.00067) |
| Benzo(a)Anthracene | mg/kg | 130[A] | 130[B] | 0.730 (0.00033) | 0.190 (0.00033) | 0.340 (0.00033) | 2.0 (0.00033) | 0.380 (0.00033) | 0.370 (0.00033) | 0.580 (0.00033) |
| Benzo(a)Pyrene | mg/kg | 12[A] | 12[B] | 0.810 (0.00033) | 0.220 (0.00033) | 0.420 (0.00033) | 1.8 (0.00033) | 0.440 (0.00033) | 0.470 (0.00033) | 0.770 (0.00033) |
| Benzo(b)Fluoranthene | mg/kg | 76[A] | 76[B] | 0.620 (0.00027) | 0.190 (0.00027) | 0.350 (0.00027) | 1.6 (0.00027) | 0.360 (0.00027) | 0.380 (0.00027) | 0.680 (0.00027) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.950 (0.0020) | 0.330 (0.0020) | 0.610 (0.0020) | 2.2 (0.0020) | 0.590 (0.0020) | 0.620 (0.0020) | 1.0 (0.0020) |
| Chrysene | mg/kg | 760[A] | 230[B] | 1.2 (0.0030) | 0.360 (0.0030) | 0.680 (0.0030) | 2.5 (0.0030) | 0.570 (0.0030) | 0.590 (0.0030) | 1.0 (0.0030) |
| Fluorene | mg/kg | 130000[A] | 3800[B] | ND (0.190) (0.0033) | ND (0.100) (0.0033) | ND (0.120) (0.0033) | 0.180 J (0.0033) | ND (0.110) (0.0033) | ND (0.093) (0.0033) | 0.120 J (0.0033) |
| Naphthalene | mg/kg | 760[A] | 25[B] | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.660 (0.0020) | 0.130 J (0.0020) | 0.250 (0.0020) | 1.0 (0.0020) | 0.420 (0.0020) | 0.200 (0.0020) | 0.480 (0.0020) |
| Pyrene | mg/kg | 96000[A] | 2200[B] | 1.5 (0.0033) | 0.460 (0.0033) | 0.730 (0.0033) | 3.6 (0.0033) | 0.690 (0.0033) | 0.660 (0.0033) | 1.2 (0.0033) |
| **Metals** | | | | | | | | | | |
| Lead | µg/L | n/v | n/v | - | - | - | - | - | - | - |
| Lead | mg/kg | 2240[A] | 450[B] | ***774*** [B] (0.220) | ***2210*** [B] (0.220) | ***1890*** [B] (0.220) | ***780*** [B] (0.220) | ***1370*** [B] (0.220) | ***1560*** [B] (0.220) | ***830*** [B] (0.220) |
| **General Chemistry** | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 33.3 (0.50) | 36.1 (0.50) | 46.5 (0.50) | 28.1 (0.50) | 36.8 (0.50) | 28.3 (0.50) | 25.4 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific |
| A | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Surface Soil (0-2 ft). Lead value is the site-specific standard. |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016 |
| B | PADEP Non-Residential Statewide Health Standards (0-2 ft bgs) (Unsaturated Soil) |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| D | Indicates an identified compound in an analysis that has been diluted. This flag alerts the data user to any differences between the concentrations reported in the two analyses. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram |
| µg/L | Micrograms per liter. |
| S.U. | Standard Units. |
| ft | Feet |
| LL | Eurofins Lancaster Laboratories Environmental |
| PIP | Pace Analytical Services, Inc. Method detection limit is shown in second set of parentheses. |

**Table 4b**

**Historical Soil Analytical Results Summary - AOI 6 (>2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6 BH-12-101 | AOI6 BH-12-102 | AOI6 BH-12-105 | AOI6 BH-12-106 | AOI6 BH-12-107 | AOI6 BH-12-108 | AOI6 BH-12-109 | AOI6 BH-12-110 | AOI6 BH-12-114 | AOI6 BH-12-116 | AOI6 BH-12-117 | AOI6 BH-12-118 | AOI6 BH-12-121 | AOI6 BH-12-122 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Dec-12 | 4-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 3-Dec-12 | 4-Dec-12 | 3-Dec-12 | 3-Dec-12 |
| Sample ID | | | | BH-12-101_2-3' | BH-12-102_2-2.5' | BH-12-105_2-2.5' | BH-12-106_2-2.5' | BH-12-107_2.5-3' | BH-12-108_2-2.5' | BH-12-109_3' | BH-12-110_3-3.5' | BH-12-114_3-3.5' | BH-12-116_3.5' | BH-12-117_2-2.5' | BH-12-118_2-2.5' | BH-12-121_2-2.5' | BH-12-122_2.5-3' |
| Sample Depth | | | | 2 - 3 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2.5 - 3 ft | 2 - 2.5 ft | 2.5 - 3 ft | 3 - 3.5 ft | 3 - 3.5 ft | 3 - 3.5 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2.5 - 3 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | | JB22962 | JB22962 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22822 | JB22962 | JB22822 | JB22822 |
| Laboratory Sample ID | Units | A MSC-PA | B SHS-PA | JB22962-19 | JB22962-18 | JB22822-7 | JB22822-9 | JB22822-4 | JB22822-13 | JB22822-16 | JB22822-5 | JB22822-14 | JB22822-17 | JB22822-19 | JB22962-17 | JB22822-21 | JB22822-20 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 330[A] | 0.5[B] | 0.121 (0.0075) | ND (0.13) (0.016) | ***5.21*** [B] (0.042) | 0.0011 (0.00011) | 0.00066 J (0.00013) | ***11.2*** [B] (0.028) | 0.476 (0.0073) | ***4.09*** [B] (0.042) | 0.245 (0.0070) | 0.0680 (0.0066) | 0.157 (0.0082) | 0.00051 J (0.00012) | 0.0100 (0.00010) | ***1.83*** [B] (0.0066) |
| Cyclohexane | mg/kg | 10000[A] | 6900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | *ND (0.063)* (0.0080) | *ND (0.13)* (0.017) | *ND (0.36)* (0.045) | ND (0.00094) (0.00012) | ND (0.0011) (0.00014) | *ND (0.23)* (0.030) | *ND (0.061)* (0.0078) | *ND (0.35)* (0.045) | *ND (0.059)* (0.0075) | *ND (0.056)* (0.0071) | *ND (0.069)* (0.0088) | ND (0.00099) (0.00013) | ND (0.00084) (0.00011) | *ND (0.056)* (0.0071) |
| 1,2-Dichloroethane (EDC) | mg/kg | 98[A] | 0.5[B] | ND (0.063) (0.0086) | ND (0.13) (0.018) | ND (0.36) (0.048) | ND (0.00094) (0.00013) | ND (0.0011) (0.00014) | ND (0.23) (0.032) | ND (0.061) (0.0082) | ND (0.35) (0.048) | ND (0.059) (0.0080) | ND (0.056) (0.0075) | ND (0.069) (0.0093) | ND (0.00099) (0.00013) | ND (0.00084) (0.00011) | ND (0.056) (0.0075) |
| Ethylbenzene | mg/kg | 1000[A] | 70[B] | 0.0679 (0.017) | ND (0.13) (0.035) | 0.976 (0.094) | ND (0.00094) (0.00025) | ND (0.0011) (0.00028) | ***109*** [B] (0.61) | 0.153 (0.016) | 0.712 (0.093) | 0.107 (0.016) | 0.0714 (0.015) | 0.0258 J (0.018) | ND (0.00099) (0.00026) | 0.00029 J (0.00022) | 0.191 (0.015) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.382 (0.0047) | 1.18 (0.0098) | 5.76 (0.026) | 0.00068 J (0.000070) | ND (0.0053) (0.000079) | 58.7 (0.17) | 1.55 (0.0045) | 23.1 (0.026) | 0.387 (0.0044) | 0.524 (0.0041) | 0.797 (0.0051) | 0.00031 J (0.000074) | 0.0017 J (0.000062) | 0.720 (0.0041) |
| Methyl Tertiary Butyl Ether | mg/kg | 9900[A] | 2[B] | ND (0.063) (0.015) | ND (0.13) (0.031) | ND (0.36) (0.084) | ND (0.00094) (0.00022) | ND (0.0011) (0.00025) | ND (0.23) (0.055) | ND (0.061) (0.014) | ND (0.35) (0.083) | ND (0.059) (0.014) | ND (0.056) (0.013) | ND (0.069) (0.016) | ND (0.00099) (0.00023) | ND (0.00084) (0.00020) | ND (0.056) (0.013) |
| Hexane | mg/kg | 10000[A] | 5600[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | 0.0387 J (0.0077) | ND (0.66) (0.016) | 0.966 J (0.043) | 0.0020 J (0.00011) | ND (0.0053) (0.00013) | ***65.2*** [B] (0.28) | 0.512 (0.0074) | 2.49 (0.043) | 0.197 J (0.0072) | 0.161 J (0.0068) | 0.0757 J (0.0084) | ND (0.0050) (0.00012) | 0.0018 J (0.00010) | 0.500 (0.0068) |
| Butylbenzene, Sec- | mg/kg | 10000[A] | 2800[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Butylbenzene, Tert- | mg/kg | 10000[A] | 2200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.0940 (0.0067) | 0.0547 J (0.014) | 0.330 J (0.037) | ND (0.00094) (0.000098) | ND (0.0011) (0.00011) | 5.26 (0.025) | 0.0993 (0.0064) | 0.889 (0.037) | 0.224 (0.0062) | 0.100 (0.0058) | 0.0813 (0.0072) | 0.00026 J (0.00010) | 0.0020 (0.000088) | 0.261 (0.0058) |
| 1,2,4-Trimethylbenzene | mg/kg | 640[A] | 35[B] | 0.0245 J (0.013) | ND (0.66) (0.027) | 3.11 (0.074) | ND (0.0047) (0.00020) | ND (0.0053) (0.00022) | ***455*** [B] (2.0) | 0.121 J (0.013) | 4.23 (0.074) | 0.131 J (0.012) | 0.135 J (0.012) | 0.0555 J (0.014) | ND (0.0050) (0.00021) | 0.0022 J (0.00018) | 0.291 (0.012) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.32) (0.010) | ND (0.66) (0.021) | 1.01 J (0.057) | ND (0.0047) (0.00015) | ND (0.0053) (0.00017) | 191 (0.37) | 0.0553 J (0.0098) | 1.13 J (0.057) | 0.0385 J (0.0094) | 0.0469 J (0.0089) | ND (0.35) (0.011) | ND (0.0050) (0.00016) | 0.0018 J (0.00013) | 0.105 J (0.0089) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 9100[A] | 1000[B] | 0.276 (0.0088) | 0.0965 J (0.018) | 4.24 (0.050) | ND (0.00094) (0.00013) | ND (0.0011) (0.00015) | 675 (0.32) | 0.170 (0.0085) | 2.72 (0.049) | 0.612 (0.0082) | 0.245 (0.0077) | 0.0616 J (0.0096) | ND (0.00099) (0.00014) | 0.00097 (0.00012) | 0.407 (0.0077) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg | 190000[A] | 4700[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000[A] | 350[B] | 0.0217 J (0.013) | 1.02 (0.017) | 0.746 (0.012) | 2.34 (0.012) | 1.97 (0.012) | 2.23 (0.011) | 3.49 (0.025) | 8.81 (0.52) | 0.310 (0.013) | 0.142 (0.012) | 0.262 (0.014) | 0.151 (0.012) | 3.43 (0.11) | 0.625 (0.011) |
| Benzo(a)Anthracene | mg/kg | 190000[A] | 430[B] | 0.0907 (0.012) | 0.276 (0.016) | 1.85 (0.011) | 10.9 (0.23) | 4.21 (0.11) | 6.04 (0.10) | 10.9 (0.23) | 22.3 (0.48) | 0.699 (0.013) | 0.233 (0.011) | 0.436 (0.013) | 0.608 (0.012) | 9.60 (0.10) | 1.05 (0.010) |
| Benzo(a)Pyrene | mg/kg | 190000[A] | 46[B] | 0.112 (0.011) | 0.246 (0.015) | 1.55 (0.011) | 11.6 (0.22) | 3.59 (0.11) | 5.93 (0.097) | 10.5 (0.22) | 20.6 (0.45) | 0.653 (0.012) | 0.269 (0.011) | 0.534 (0.012) | 0.602 (0.011) | 9.39 (0.098) | 1.06 (0.0097) |
| Benzo(b)Fluoranthene | mg/kg | 190000[A] | 170[B] | 0.122 (0.012) | 0.376 (0.016) | 1.48 (0.012) | 14.0 (0.24) | 3.49 (0.12) | 8.41 (0.11) | 13.9 (0.24) | 24.3 (0.49) | 0.615 (0.013) | 0.328 (0.012) | 0.446 (0.013) | 0.616 (0.012) | 9.66 (0.11) | 1.21 (0.011) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 0.0816 (0.014) | 0.304 (0.018) | 1.15 (0.013) | 7.06 (0.26) | 2.53 (0.013) | 4.07 (0.12) | 6.29 (0.027) | 11.9 (0.55) | 0.537 (0.014) | 0.302 (0.013) | 0.488 (0.014) | 0.343 (0.013) | 5.39 (0.12) | 0.764 (0.012) |
| Benzo(k)Fluoranthene | mg/kg | 190000[A] | 610[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,1'-Biphenyl | mg/kg | 190000[A] | 190[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Bis(2-Ethylhexyl) Phthalate | mg/kg | 10000[A] | 130[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Di-n-Butyl Phthalate | mg/kg | 10000[A] | 4900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000[A] | 23[B] | 0.0917 (0.012) | 0.400 (0.017) | 1.82 (0.012) | 11.1 (0.24) | 3.92 (0.12) | 7.37 (0.11) | 13.7 (0.24) | 22.0 (0.50) | 0.872 (0.013) | 0.290 (0.012) | 0.664 (0.013) | 0.599 (0.012) | 10.5 (0.11) | 1.28 (0.011) |
| Dibenz(A,H)Anthracene | mg/kg | 190000[A] | 270[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Diethyl Phthalate | mg/kg | 10000[A] | 9300[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dimethylphenol | mg/kg | 10000[A] | 230[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000[A] | 23[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000[A] | 3200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000[A] | 3800[B] | 0.0199 J (0.012) | 5.64 (0.081) | 2.30 (0.011) | 0.818 (0.012) | 0.848 (0.011) | 15.8 (0.10) | 6.98 (0.023) | 11.4 (0.48) | 0.177 (0.013) | 0.120 (0.011) | 0.0701 (0.013) | 0.0297 J (0.012) | 2.89 (0.010) | 1.30 (0.010) |
| Indeno(1,2,3-c,d)Pyrene | mg/kg | 190000[A] | 22000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000[A] | 1900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, o- (2-Methylphenol) | mg/kg | 190000[A] | 580[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, p- (4-Methylphenol) | mg/kg | 190000[A] | 58[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000[A] | 6[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 0.0748 (0.017) | 10.4 (0.11) | 3.34 (0.016) | 10.7 (0.32) | 7.48 (0.16) | 18.5 (0.14) | 24.9 (0.32) | 44.4 (0.67) | 0.751 (0.017) | 0.318 (0.016) | 0.374 (0.018) | 0.248 (0.016) | 22.9 (0.15) | 2.03 (0.014) |
| Phenol | mg/kg | 18000[A] | 200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000[A] | 2200[B] | 0.121 (0.014) | 1.05 (0.019) | 2.89 (0.013) | 18.7 (0.27) | 7.59 (0.13) | 11.3 (0.12) | 19.7 (0.27) | 41.9 (0.57) | 1.24 (0.015) | 0.446 (0.013) | 0.984 (0.015) | 0.728 (0.014) | 23.1 (0.12) | 1.95 (0.012) |
| Pyridine | mg/kg | 10000[A] | 12[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg | 10000[A] | 0.37[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | | | |
| Cobalt | mg/kg | 190000[A] | 160[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000[A] | 450[B] | 56.3 (0.13) | 283 (0.18) | 341 (0.14) | ***960*** [B] (0.26) | ***546*** [B] (0.13) | 383 (0.13) | ***954*** [B] (0.13) | ***2930*** [B] (0.28) | 34.7 (0.14) | ***1070*** [B] (0.13) | 350 (0.14) | 93.1 (0.13) | 199 (0.12) | 173 (0.13) |
| Nickel | mg/kg | 190000[A] | 650[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000[A] | 820[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000[A] | 12000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | 84.2 () | 65.9 () | 79.4 () | 83.4 () | 83.9 () | 90.9 () | 83.2 () | 78.3 () | 83.5 () | 83.7 () | 77.6 () | 86.9 () | 90.1 () | 88.1 () |

Notes:

| | |
|---|---|
| MSC-PA [A] | Pennsylvania Department of Environmental Protection - 2016. Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Subsurface Soil (2-15 ft). |
| SHS-PA [B] | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016. PADEP Non-Residential Statewide Health Standards (>2 ft bgs) (Unsaturated Soil). |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2 | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram. |
| ft | Feet. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4b**

**Historical Soil Analytical Results Summary - AOI 6 (>2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6 BH-12-123 | AOI6 BH-12-124 | AOI6 BH-12-125 | AOI6 BH-12-126 | AOI6 BH-12-127 | AOI6 BH-12-128 | AOI6 BH-12-129 | AOI6 BH-12-135 | AOI6 BH-12-138 | AOI6 BH-12-149 | AOI6-BH-16-007 | AOI6-BH-16-008 | AOI6-BH-16-014 | | AOI6-BH-16-015 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 4-Dec-12 | 5-Dec-12 | 5-Dec-12 | 4-Dec-12 | 8-Apr-16 | 8-Apr-16 | 5-Apr-16 | 11-Jul-16 | 5-Apr-16 | 11-Jul-16 |
| Sample ID | | | | BH-12-123_2-2.5' | BH-12-124_3-3.5' | BH-12-125_2.5-3' | BH-12-126_2.5-3' | BH-12-127_2.5-3' | BH-12-128_3-3.5' | BH-12-129_2.5-3' | BH-12-135_2-2.5' | BH-12-138_2-2.5' | BH-12-149_2.5-3' | AOI6-BH-16-007-2-4-SOIL | AOI6-BH-16-008-2-4-SOIL | AOI6-BH-16-014-2-4-SOIL | AOI6-BH-16-014-2-4-071116 | AOI6-BH-16-015-2-4-SOIL | AOI6-BH-16-015-2-4-071116 |
| Sample Depth | | | | 2 - 2.5 ft | 3 - 3.5 ft | 2.5 - 3 ft | 2.5 - 3 ft | 2.5 - 3 ft | 3 - 3.5 ft | 2.5 - 3 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2.5 - 3 ft | 2 - 2.25 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.25 ft | 2 - 2.1 ft | 2 - 2.2 ft |
| Sampling Company | | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | | | JB22962 | JB22962 | JB22962 | JB22962 | JB22962 | JB22962 | JB22962 | JB23100 | JB23100 | JB22962 | 1649742 | 1649742 | 1647893 | 1682991 | 1647893 | 1682991 |
| Laboratory Sample ID | Units | A MSC-PA | B SHS-PA | JB22962-2 | JB22962-3 | JB22962-12 | JB22962-8 | JB22962-10 | JB22962-9 | JB22962-7 | JB23100-12 | JB23100-7 | JB22962-5 | 8329538 | 8329541 | 8321193 | 8475491 | 8321191 | 8475489 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 330[A] | 0.5[B] | ***2.07*** [B] (0.0059) | ***1380*** [AB] (2.8) | *ND (2.5)* (0.29) | ***87.2*** [B] (3.0) | ***149*** [B] (0.30) | ***535*** [AB] (1.5) | ***1850*** [AB] (6.5) | ND (0.0013) (0.00015) | ND (0.0014) (0.00017) | ***517*** [AB] (0.33) | 0.004 J (0.0005) | 0.001 J (0.0005) | ND (0.440) (0.0005) | - | ND (0.270) (0.0005) | - |
| Cyclohexane | mg/kg | 10000[A] | 6900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | *ND (0.049)* (0.0062) | *ND (0.47)* (0.060) | *ND (2.5)* (0.31) | *ND (0.26)* (0.032) | *ND (0.050)* (0.0064) | *ND (0.050)* (0.0064) | *ND (0.27)* (0.035) | ND (0.0013) (0.00016) | ND (0.0014) (0.00018) | *ND (1.4)* (0.18) | ND (0.005) (0.001) | ND (0.004) (0.001) | *ND (0.440)* (0.001) | - | *ND (0.270)* (0.001) | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 98[A] | 0.5[B] | ND (0.049) (0.0066) | ND (0.47) (0.064) | *ND (2.5)* (0.33) | ND (0.26) (0.034) | ND (0.050) (0.0068) | ND (0.050) (0.0068) | ND (0.27) (0.037) | ND (0.0013) (0.00017) | ND (0.0014) (0.00020) | *ND (1.4)* (0.19) | ND (0.005) (0.001) | ND (0.004) (0.001) | ND (0.440) (0.001) | - | ND (0.270) (0.001) | - |
| Ethylbenzene | mg/kg | 1000[A] | 70[B] | 0.464 (0.013) | 5.87 (0.12) | ND (2.5) (0.65) | 14.6 (0.067) | 18.7 (0.66) | 57.8 (0.33) | 12.6 (0.072) | ND (0.0013) (0.00034) | ND (0.0014) (0.00038) | ND (1.4) (0.37) | ND (0.005) (0.001) | ND (0.004) (0.001) | ND (0.440) (0.001) | - | ND (0.270) (0.001) | - |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 16.9 (0.018) | 2110 (1.8) | 64.2 (0.18) | 678 (1.9) | 374 (0.19) | 919 (0.94) | ***6600*** [B] (4.0) | ND (0.0065) (0.000096) | ND (0.0072) (0.00011) | 74.7 (0.10) | ND (0.005) (0.001) | ND (0.004) (0.001) | ND (0.440) (0.001) | - | 0.230 J (0.001) | - |
| Methyl Tertiary Butyl Ether | mg/kg | 9900[A] | 2[B] | ND (0.049) (0.012) | ND (0.47) (0.11) | *ND (2.5)* (0.58) | ND (0.26) (0.060) | ND (0.050) (0.012) | ND (0.050) (0.012) | ND (0.27) (0.064) | 0.00071 J (0.00030) | ND (0.0014) (0.00034) | ND (1.4) (0.33) | ND (0.005) (0.0005) | ND (0.004) (0.0005) | ND (0.440) (0.0005) | - | ND (0.270) (0.0005) | - |
| Hexane | mg/kg | 10000[A] | 5600[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | 1.11 (0.0060) | 0.479 J (0.058) | ND (12) (0.30) | 0.304 J (0.031) | 0.103 J (0.0061) | 0.154 J (0.0062) | 0.898 J (0.033) | - | - | ND (7.0) (0.17) | - | - | - | - | - | - |
| Butylbenzene, Sec- | mg/kg | 10000[A] | 2800[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Butylbenzene, Tert- | mg/kg | 10000[A] | 2200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.722 (0.0052) | ***1640*** [B] (2.5) | ND (2.5) (0.26) | ***197*** [B] (2.7) | ***339*** [B] (0.26) | ***1050*** [B] (1.3) | ***2070*** [B] (5.7) | ND (0.0013) (0.00014) | ND (0.0014) (0.00015) | 21.2 (0.15) | ND (0.005) (0.001) | ND (0.004) (0.001) | 0.290 J (0.001) | - | ND (0.270) (0.001) | - |
| 1,2,4-Trimethylbenzene | mg/kg | 640[A] | 35[B] | 0.593 (0.010) | 3.46 (0.099) | ND (12) (0.51) | 4.62 (0.053) | 3.04 (0.011) | 6.32 (0.011) | 9.43 (0.057) | ND (0.0065) (0.00027) | ND (0.0072) (0.00030) | ND (7.0) (0.29) | ND (0.005) (0.001) | ND (0.004) (0.001) | ND (0.440) (0.001) | - | ND (0.270) (0.001) | - |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | 0.240 J (0.0079) | 1.21 J (0.076) | ND (12) (0.39) | 2.08 (0.041) | 1.41 (0.0080) | 2.92 (0.0081) | 3.38 (0.044) | ND (0.0065) (0.00021) | ND (0.0072) (0.00023) | ND (7.0) (0.23) | ND (0.005) (0.001) | ND (0.004) (0.001) | ND (0.440) (0.001) | - | ND (0.270) (0.001) | - |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 9100[A] | 1000[B] | 0.924 (0.0068) | 22.6 (0.066) | 0.738 J (0.34) | 68.5 (0.035) | 83.6 (0.35) | 248 (0.18) | 51.6 (0.038) | ND (0.0013) (0.00018) | ND (0.0014) (0.00020) | ND (1.4) (0.20) | ND (0.005) (0.001) | ND (0.004) (0.001) | 0.100 J (0.001) | - | 0.092 J (0.001) | - |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg | 190000[A] | 4700[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000[A] | 350[B] | 2.32 (0.012) | ND (0.033) (0.012) | ND (0.035) (0.012) | ND (0.073) (0.026) | ND (0.032) (0.011) | ND (0.035) (0.012) | ND (0.070) (0.024) | 0.485 (0.015) | 0.180 (0.032) | ND (0.036) (0.013) | 0.840 (0.003) | 1.800 (0.003) | - | 12.000 (0.003) | - | 2.300 (0.003) |
| Benzo(a)Anthracene | mg/kg | 190000[A] | 430[B] | 8.99 (0.11) | 0.0210 J (0.011) | 0.0226 J (0.012) | 0.0707 J (0.024) | 0.0184 J (0.010) | ND (0.035) (0.011) | 0.177 (0.023) | 0.992 (0.014) | 0.424 (0.029) | 0.403 (0.012) | 2.200 (0.003) | 3.700 (0.003) | - | 25.000 (0.003) | - | 1.200 (0.003) |
| Benzo(a)Pyrene | mg/kg | 190000[A] | 46[B] | 7.91 (0.11) | 0.0179 J (0.010) | ND (0.035) (0.011) | 0.0491 J (0.022) | 0.0138 J (0.0097) | ND (0.035) (0.011) | 0.121 (0.021) | 1.33 (0.013) | 0.414 (0.027) | 0.452 (0.011) | 1.800 (0.003) | 2.900 (0.003) | - | 26.000 (0.003) | - | 1.200 (0.003) |
| Benzo(b)Fluoranthene | mg/kg | 190000[A] | 170[B] | 9.36 (0.12) | ND (0.033) (0.011) | ND (0.035) (0.012) | 0.0556 J (0.024) | ND (0.032) (0.011) | ND (0.035) (0.012) | 0.126 (0.023) | 1.20 (0.014) | 0.416 (0.030) | 0.708 (0.012) | 2.300 (0.003) | 4.000 (0.003) | - | 26.000 (0.003) | - | 1.200 (0.003) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | 3.58 (0.13) | ND (0.033) (0.012) | ND (0.035) (0.013) | 0.0291 J (0.027) | ND (0.032) (0.012) | ND (0.035) (0.013) | 0.0832 (0.026) | 1.27 (0.015) | 0.378 (0.034) | 0.458 (0.013) | 1.200 (0.003) | 2.000 (0.003) | - | 15.000 (0.003) | - | 1.600 (0.003) |
| Benzo(k)Fluoranthene | mg/kg | 190000[A] | 610[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,1'-Biphenyl | mg/kg | 190000[A] | 190[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Bis(2-Ethylhexyl) Phthalate | mg/kg | 10000[A] | 130[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Di-n-Butyl Phthalate | mg/kg | 10000[A] | 4900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000[A] | 230[B] | 8.28 (0.12) | 0.0197 J (0.011) | 0.0298 J (0.012) | 0.0845 (0.025) | 0.0164 J (0.011) | ND (0.035) (0.012) | 0.243 (0.024) | 1.07 (0.014) | 0.468 (0.030) | 0.493 (0.012) | 2.100 (0.003) | 3.700 (0.003) | - | 30.000 (0.003) | - | 2.400 (0.003) |
| Dibenz(A,H)Anthracene | mg/kg | 190000[A] | 270[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Diethyl Phthalate | mg/kg | 10000[A] | 9300[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dimethylphenol | mg/kg | 10000[A] | 230[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000[A] | 23[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000[A] | 3200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000[A] | 3800[B] | 3.39 (0.012) | ND (0.033) (0.011) | ND (0.035) (0.012) | 0.0340 J (0.024) | ND (0.032) (0.010) | ND (0.035) (0.012) | 0.182 (0.023) | 0.202 (0.014) | 0.0565 J (0.030) | ND (0.036) (0.012) | 0.310 (0.003) | 1.700 (0.003) | - | 12.000 (0.003) | - | 2.600 (0.003) |
| Indeno(1,2,3-c,d)Pyrene | mg/kg | 190000[A] | 22000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000[A] | 1900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, o- (2-Methylphenol) | mg/kg | 190000[A] | 580[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, p- (4-Methylphenol) | mg/kg | 190000[A] | 58[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | - | - | - | - | - | - | 0.524 (0.011) | 0.0426 J (0.025) | - | 0.710 (0.003) | 1.500 (0.003) | - | 24.000 (0.003) | - | 6.300 (0.003) |
| 4-Nitrophenol | mg/kg | 190000[A] | 6[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | 6.10 (0.16) | 0.0626 (0.015) | 0.0208 J (0.016) | 0.115 (0.033) | 0.0161 J (0.015) | ND (0.035) (0.016) | 0.437 (0.032) | 1.16 (0.019) | 0.609 (0.041) | 0.154 (0.016) | 2.600 (0.003) | 8.800 (0.003) | - | 37.000 (0.003) | - | 7.200 (0.003) |
| Phenol | mg/kg | 18000[A] | 200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000[A] | 2200[B] | 11.3 (0.14) | 0.0317 J (0.013) | 0.0363 (0.014) | 0.123 (0.028) | 0.0207 J (0.012) | ND (0.035) (0.013) | 0.406 (0.027) | 1.33 (0.016) | 0.730 (0.035) | 0.601 (0.014) | 3.400 (0.003) | 7.300 (0.003) | - | 39.000 (0.003) | - | 3.200 (0.003) |
| Pyridine | mg/kg | 10000[A] | 12[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg | 10000[A] | 0.37[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | | | | | |
| Cobalt | mg/kg | 190000[A] | 160[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000[A] | 450[B] | 133 (0.13) | 5.5 (0.13) | 11.4 (0.12) | 8.7 (0.13) | 13.8 (0.13) | 6.5 (0.14) | 107 (0.13) | 311 (0.15) | ***1150*** [B] (0.16) | 127 (0.13) | 243 (0.510) | 267 (0.510) | 352 (0.510) | - | 134 (0.510) | - |
| Nickel | mg/kg | 190000[A] | 650[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000[A] | 820[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000[A] | 12000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | 17.6 (0.50) | 14.8 (0.50) | 44.3 (0.50) | 34.8 (0.50) | 21.6 (0.50) | 30.5 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | 89.2 () | 89.6 () | 90.5 () | 89.4 () | 88.8 () | 88.1 () | 88.5 () | 74.4 () | 70.5 () | 85.0 () | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016. Medium-Specific |
| [A] | Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Subsurface Soil (2-15 ft). |
| SHS-PA | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016. |
| [B] | PADEP Non-Residential Statewide Health Standards (>2 ft bgs) (Unsaturated Soil). |
| ***6.5*** [A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram. |
| ft | Feet. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4b**

**Historical Soil Analytical Results Summary - AOI 6 (>2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | AOI6-BH-16-016 | | AOI6-BH-16-022 | AOI6-BH-16-027 | AOI6-BH-16-029 | AOI6-BH-16-030 | AOI6-BH-16-031 | AOI6-BH-16-032 | AOI6-BH-16-033 | AOI6-BH-16-034 | AOI6-BH-16-035 | AOI6-BH-16-036 | AOI6-BH-16-043 | B-166 | B-167 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 4-Apr-16 | 11-Jul-16 | 6-Apr-16 | 13-Apr-16 | 13-Apr-16 | 14-Apr-16 | 14-Apr-16 | 13-Apr-16 | 13-Apr-16 | 13-Apr-16 | 13-Apr-16 | 14-Apr-16 | 7-Apr-16 | 13-Dec-12 | 13-Dec-12 |
| Sample ID | | | | AOI6-BH-16-016-2-4-SOIL | AOI6-BH-16-016-2-4-071116 | AOI6-BH-16-022-2-4-SOIL | AOI6-BH-16-027-2-4-SOIL | AOI6-BH-16-029-2-4-SOIL | AOI6-BH-16-030-2-4-SOIL | AOI6-BH-16-031-2-4-SOIL | AOI6-BH-16-032-2-4-SOIL | AOI6-BH-16-033-2-4-SOIL | AOI6-BH-16-034-2-4-SOIL | AOI6-BH-16-035-2-4-SOIL | AOI6-BH-16-036-2-4-SOIL | AOI6-BH-16-043-2-4-SOIL | B-166_3' | B-167_4' |
| Sample Depth | | | | 2 - 2.5 ft | 2 - 2.25 ft | 2.25 - 2.5 ft | 2.5 - 2.75 ft | 2.25 - 2.5 ft | 2.5 - 2.75 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.5 ft | 2 - 2.25 ft | 2 - 2.25 ft | 2 - 2.5 ft | 2.5 - 3 ft | 3.5 - 4 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | UNKNOWN | UNKNOWN |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | A | B | 1647893 | 1682991 | 1648963 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1651423 | 1648963 | JB23816 | JB23816 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8321185 | 8475487 | 8325915 | 8336831 | 8336828 | 8336848 | 8336850 | 8336839 | 8336837 | 8336835 | 8336833 | 8336842 | 8325913 | JB23816-4 | JB23816-2 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 330[A] | 0.5[B] | ND (0.340) (0.0005) | - | ND (0.005) (0.0005) | ***2.500 J [B]*** (0.0005) | ***4.500 [B]*** (0.0005) | ***130.000 [B]*** (0.0005) | ***27.000 [B]*** (0.0005) | ***3.700 [B]*** (0.0005) | ND (0.210) (0.0005) | ***96.000 [B]*** (0.0005) | 0.002 J (0.0005) | ***0.700 J [B]*** (0.0005) | ***1.300 [B]*** (0.0005) | ND (0.0017) (0.00020) | 0.136 (0.0071) |
| Cyclohexane | mg/kg | 10000[A] | 6900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | *ND (0.340)* (0.001) | - | ND (0.005) (0.001) | *ND (5.300)* (0.001) | *ND (0.280)* (0.001) | *ND (4.300)* (0.001) | *ND (2.000)* (0.001) | *ND (0.770)* (0.001) | *ND (0.210)* (0.001) | *ND (4.700)* (0.001) | ND (0.004) (0.001) | *ND (4.200)* (0.001) | *ND (0.240)* (0.001) | ND (0.0017) (0.00021) | *ND (0.059)* (0.0075) |
| 1,2-Dichloroethane (EDC) | mg/kg | 98[A] | 0.5[B] | ND (0.340) (0.001) | - | ND (0.005) (0.001) | *ND (5.300)* (0.001) | ND (0.280) (0.001) | *ND (4.300)* (0.001) | *ND (2.000)* (0.001) | *ND (0.770)* (0.001) | ND (0.210) (0.001) | *ND (4.700)* (0.001) | ND (0.004) (0.001) | *ND (4.200)* (0.001) | ND (0.240) (0.001) | ND (0.0017) (0.00023) | ND (0.059) (0.0080) |
| Ethylbenzene | mg/kg | 1000[A] | 70[B] | ND (0.340) (0.001) | - | ND (0.005) (0.001) | ND (5.300) (0.001) | 0.810 (0.001) | ND (4.300) (0.001) | 2.900 (0.001) | 3.600 (0.001) | ND (0.210) (0.001) | 1.200 J (0.001) | ND (0.004) (0.001) | ND (4.200) (0.001) | 0.130 J (0.001) | ND (0.0017) (0.00044) | 0.309 (0.016) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | 0.440 (0.001) | - | ND (0.005) (0.001) | 360.000 (0.001) | 10.000 (0.001) | 710.000 (0.001) | 180.000 (0.001) | 110.000 (0.001) | 0.130 J (0.001) | 360.000 (0.001) | 0.083 (0.001) | 180.000 (0.001) | 0.230 J (0.001) | ND (0.0085) (0.00013) | 7.21 (0.0044) |
| Methyl Tertiary Butyl Ether | mg/kg | 9900[A] | 2[B] | ND (0.340) (0.0005) | - | ND (0.005) (0.0005) | *ND (5.300)* (0.0005) | ND (0.280) (0.0005) | *ND (4.300)* (0.0005) | ND (2.000) (0.0005) | ND (0.770) (0.0005) | ND (0.210) (0.0005) | *ND (4.700)* (0.0005) | ND (0.004) (0.0005) | *ND (4.200)* (0.0005) | ND (0.240) (0.0005) | ND (0.0017) (0.00040) | ND (0.059) (0.014) |
| Hexane | mg/kg | 10000[A] | 5600[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Butylbenzene, Sec- | mg/kg | 10000[A] | 2800[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Butylbenzene, Tert- | mg/kg | 10000[A] | 2200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.190 J (0.001) | - | ND (0.005) (0.001) | 3.900 J (0.001) | 1.200 (0.001) | 20.000 (0.001) | 22.000 (0.001) | 45.000 (0.001) | ND (0.210) (0.001) | 81.000 (0.001) | ND (0.004) (0.001) | ND (4.200) (0.001) | 0.320 (0.001) | ND (0.0017) (0.00018) | 0.163 (0.0062) |
| 1,2,4-Trimethylbenzene | mg/kg | 640[A] | 35[B] | 0.140 J (0.001) | - | ND (0.005) (0.001) | 10.000 (0.001) | 1.000 (0.001) | ND (4.300) (0.001) | 0.960 J (0.001) | 0.700 J (0.001) | ND (0.210) (0.001) | ND (4.700) (0.001) | ND (0.004) (0.001) | ND (4.200) (0.001) | 0.088 J (0.001) | ND (0.0085) (0.00035) | 0.481 (0.012) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.340) (0.001) | - | ND (0.005) (0.001) | 9.300 (0.001) | 0.480 (0.001) | ND (4.300) (0.001) | 0.440 J (0.001) | 0.370 J (0.001) | ND (0.210) (0.001) | ND (4.700) (0.001) | ND (0.004) (0.001) | ND (4.200) (0.001) | 0.081 J (0.001) | ND (0.0085) (0.00027) | 0.155 J (0.0095) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 9100[A] | 1000[B] | 0.160 J (0.001) | - | ND (0.005) (0.001) | 3.300 J (0.001) | 1.500 (0.001) | 2.900 J (0.001) | 12.000 (0.001) | 17.000 (0.001) | ND (0.210) (0.001) | 3.800 J (0.001) | ND (0.004) (0.001) | ND (4.200) (0.001) | 0.560 (0.001) | ND (0.0017) (0.00024) | 1.30 (0.0083) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg | 190000[A] | 4700[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | 3.400 (0.003) | 0.050 (0.003) | 3.400 (0.003) | 2.200 (0.003) | 0.160 (0.003) | 0.014 J (0.003) | 0.004 J (0.003) | 0.006 J (0.003) | ND (0.092) (0.003) | 0.004 J (0.003) | 0.036 (0.003) | 0.290 (0.003) | 0.110 (0.015) | 1.26 (0.013) |
| Benzo(a)Anthracene | mg/kg | 190000[A] | 430[B] | - | 3.300 (0.003) | 0.130 (0.003) | 2.300 (0.003) | 2.800 (0.003) | 0.079 (0.003) | 0.014 J (0.003) | 0.014 J (0.003) | 0.026 (0.003) | 0.050 J (0.003) | 0.015 J (0.003) | 0.086 (0.003) | 0.900 (0.003) | 0.0939 (0.014) | 2.36 (0.012) |
| Benzo(a)Pyrene | mg/kg | 190000[A] | 46[B] | - | 3.300 (0.003) | 0.140 (0.003) | 1.700 (0.003) | 2.600 (0.003) | 0.079 (0.003) | 0.012 J (0.003) | 0.013 J (0.003) | 0.028 (0.003) | 0.039 J (0.003) | 0.02 (0.003) | 0.088 (0.003) | 1.500 (0.003) | 0.0956 (0.013) | 2.07 (0.011) |
| Benzo(b)Fluoranthene | mg/kg | 190000[A] | 170[B] | - | 3.600 (0.003) | 0.200 (0.003) | 1.700 (0.003) | 3.500 (0.003) | 0.180 (0.003) | 0.019 (0.003) | 0.021 (0.003) | 0.032 (0.003) | 0.084 J (0.003) | 0.022 (0.003) | 0.120 (0.003) | 1.900 (0.003) | 0.0998 (0.014) | 2.42 (0.012) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | 3.500 (0.003) | 0.110 (0.003) | 1.000 (0.003) | 1.700 (0.003) | 0.073 (0.003) | 0.008 J (0.003) | 0.016 J (0.003) | 0.029 (0.003) | 0.042 J (0.003) | 0.024 (0.003) | 0.083 (0.003) | 1.400 (0.003) | 0.0802 (0.016) | 1.26 (0.014) |
| Benzo(k)Fluoranthene | mg/kg | 190000[A] | 610[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,1'-Biphenyl | mg/kg | 190000[A] | 190[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Bis(2-Ethylhexyl) Phthalate | mg/kg | 10000[A] | 130[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Di-n-Butyl Phthalate | mg/kg | 10000[A] | 4900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chrysene | mg/kg | 190000[A] | 230[B] | - | 3.700 (0.003) | 0.140 (0.003) | 4.000 (0.003) | 3.300 (0.003) | 0.094 (0.003) | 0.020 (0.003) | 0.018 J (0.003) | 0.032 (0.003) | 0.095 (0.003) | 0.020 (0.003) | 0.100 (0.003) | 1.100 (0.003) | 0.113 (0.014) | 2.25 (0.013) |
| Dibenz(A,H)Anthracene | mg/kg | 190000[A] | 270[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Diethyl Phthalate | mg/kg | 10000[A] | 9300[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dimethylphenol | mg/kg | 10000[A] | 230[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2,4-Dinitrophenol | mg/kg | 190000[A] | 23[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoranthene | mg/kg | 190000[A] | 3200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorene | mg/kg | 190000[A] | 3800[B] | - | 6.300 (0.003) | 0.019 J (0.003) | 6.300 (0.003) | 8.400 (0.003) | 0.034 (0.003) | 0.047 (0.003) | 0.008 J (0.003) | ND (0.018) (0.003) | 0.033 J (0.003) | ND (0.019) (0.003) | 0.010 J (0.003) | 0.090 J (0.003) | 0.126 (0.014) | 0.865 (0.012) |
| Indeno(1,2,3-c,d)Pyrene | mg/kg | 190000[A] | 22000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2-Methylnaphthalene | mg/kg | 190000[A] | 1900[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, o- (2-Methylphenol) | mg/kg | 190000[A] | 580[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cresol, p- (4-Methylphenol) | mg/kg | 190000[A] | 58[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | 18.000 (0.003) | 0.045 (0.003) | 7.800 (0.003) | 4.800 (0.003) | 2.400 (0.003) | 0.062 (0.003) | 0.029 (0.003) | 0.014 J (0.003) | 0.160 (0.003) | ND (0.019) (0.003) | 0.018 J (0.003) | 0.420 (0.003) | 0.0250 J (0.011) | 0.226 (0.010) |
| 4-Nitrophenol | mg/kg | 190000[A] | 6[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | 17.000 (0.003) | 0.160 (0.003) | 13.000 (0.003) | 10.000 (0.003) | 3.300 (0.003) | 0.059 (0.003) | 0.013 J (0.003) | 0.011 J (0.003) | 0.120 (0.003) | 0.014 J (0.003) | 0.077 (0.003) | 0.580 (0.003) | 0.314 (0.019) | 5.20 (0.067) |
| Phenol | mg/kg | 18000[A] | 200[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pyrene | mg/kg | 190000[A] | 2200[B] | - | 4.200 (0.003) | 0.210 (0.003) | 6.200 (0.003) | 5.800 (0.003) | 0.140 (0.003) | 0.033 (0.003) | 0.025 (0.003) | 0.042 (0.003) | 0.120 (0.003) | 0.026 (0.003) | 0.160 (0.003) | 0.900 (0.003) | 0.301 (0.016) | 4.87 (0.057) |
| Pyridine | mg/kg | 10000[A] | 12[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Quinoline | mg/kg | 10000[A] | 0.37[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals** | | | | | | | | | | | | | | | | | | |
| Cobalt | mg/kg | 190000[A] | 160[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | mg/kg | 190000[A] | 450[B] | 256 (0.510) | - | 101 (0.510) | 90.6 (0.510) | 137 (0.510) | 34.3 (0.510) | 6.19 (0.510) | 10.6 (0.510) | 9.85 (0.510) | 15.3 (0.510) | 10.9 (0.510) | 18.9 (0.510) | ***1720 [B]*** (0.510) | ***1020 [B]*** (0.16) | 204 (0.13) |
| Nickel | mg/kg | 190000[A] | 650[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Vanadium | mg/kg | 190000[A] | 820[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Zinc | mg/kg | 190000[A] | 12000[B] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 32.5 (0.50) | 32.3 (0.50) | 10.9 (0.50) | 15.0 (0.50) | 10.5 (0.50) | 11.6 (0.50) | 8.6 (0.50) | 9.0 (0.50) | 5.7 (0.50) | 8.9 (0.50) | 9.4 (0.50) | 8.0 (0.50) | 9.3 (0.50) | - | - |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | 8.84 (0.0100) | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | 67.2 () | 85.8 () |

Notes:

| | |
|---|---|
| MSC-PA [A] | Pennsylvania Department of Environmental Protection - 2016. Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Subsurface Soil (2-15 ft). |
| SHS-PA [B] | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016. PADEP Non-Residential Statewide Health Standards (>2 ft bgs) (Unsaturated Soil). |
| ***6.5 [A]*** | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram. |
| ft | Feet. |
| | Method detection limit is shown in second set of parentheses. |

**Table 4b**

**Historical Soil Analytical Results Summary - AOI 6 (>2 feet)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | | B-172 | | B-173 | | B-174 | | B-175 | | GP768-1 | GP768-2 | GP768-3 | GP768-4 | GP768-5 | GP768-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | 6-Apr-16 | 12-Jul-16 | 5-Apr-16 | 13-Jul-16 | 4-Apr-16 | 13-Jul-16 | 5-Apr-16 | 13-Jul-16 | 28-Apr-16 | 28-Apr-16 | 28-Apr-16 | 28-Apr-16 | 28-Apr-16 | 28-Apr-16 |
| Sample ID | | | | AOI6-B-172-2-4-SOIL | AOI6-B-172-2-4-071216 | AOI6-B-173-2-4-SOIL | AOI6-B-173-2-4-071316 | AOI6-B-174-2-4-SOIL | AOI6-B-174-2-4-071316 | AOI6-B-175-2-4-SOIL | AOI6-B-175-2-4-071316 | GP768-1-(3')-20160428 | GP768-2-(3')-20160428 | GP768-3-(3')-20160428 | GP768-4-(2')-20160428 | GP768-5-(2')-20160428 | GP768-6-(2')-20160428 |
| Sample Depth | | | | 2.5 - 3 ft | 2.5 - 3 ft | 3.5 - 4 ft | 3.5 - 4 ft | 3.5 - 4 ft | 3.5 - 4 ft | 2.7 - 3 ft | 2.7 - 3 ft | 3 ft | 3 ft | 3 ft | 2 ft | 2 ft | 2 ft |
| Sampling Company | | | | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC |
| Laboratory | | | | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | A | B | 1647893 | 1682991 | 1647893 | 1682991 | 1647893 | 1682991 | 1647893 | 1682991 | 1655907 | 1655907 | 1655907 | 1655907 | 1655907 | 1655907 |
| Laboratory Sample ID | Units | MSC-PA | SHS-PA | 8321195 | 8475493 | 8321187 | 8475495 | 8321183 | 8475497 | 8321189 | 8475499 | 8358315 | 8358316 | 8358317 | 8358318 | 8358319 | 8358320 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 330[A] | 0.5[B] | ND (0.410) (0.0005) | - | 0.054 J (0.0005) | - | 0.005 (0.0005) | - | 0.210 J (0.0005) | - | 0.0006 J (0.0005) | 0.0008 J (0.0005) | 0.001 J (0.0005) | ND (0.29) (0.0005) | 0.005 (0.0005) | ND (0.0005) (0.0005) |
| Cyclohexane | mg/kg | 10000[A] | 6900[B] | - | - | - | - | - | - | - | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.58) (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | *ND (0.41)* (0.001) | - | *ND (0.330)* (0.001) | - | ND (0.005) (0.001) | - | *ND (0.340)* (0.001) | - | - | - | - | - | - | - |
| 1,2-Dichloroethane (EDC) | mg/kg | 98[A] | 0.5[B] | ND (0.410) (0.001) | - | ND (0.330) (0.001) | - | ND (0.005) (0.001) | - | ND (0.340) (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | *ND (0.58)* (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Ethylbenzene | mg/kg | 1000[A] | 70[B] | ND (0.410) (0.001) | - | ND (0.330) (0.001) | - | ND (0.005) (0.001) | - | 0.230 J (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 0.72 J (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Isopropylbenzene (Cumene) | mg/kg | 10000[A] | 2500[B] | ND (0.410) (0.001) | - | ND (0.330) (0.001) | - | ND (0.005) (0.001) | - | 0.580 (0.001) | - | ND (0.0009) (0.001) | 0.004 J (0.001) | 0.001 J (0.001) | 70 (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Methyl Tertiary Butyl Ether | mg/kg | 9900[A] | 2[B] | ND (0.410) (0.0005) | - | ND (0.330) (0.0005) | - | ND (0.005) (0.0005) | - | ND (0.340) (0.0005) | - | ND (0.0004) (0.0005) | ND (0.0006) (0.0005) | ND (0.0005) (0.0005) | ND (0.29) (0.0005) | ND (0.0005) (0.0005) | ND (0.0005) (0.0005) |
| Hexane | mg/kg | 10000[A] | 5600[B] | - | - | - | - | - | - | - | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.58) (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | - | - | - | - | - | - | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 3.4 (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Butylbenzene, Sec- | mg/kg | 10000[A] | 2800[B] | - | - | - | - | - | - | - | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 1.8 J (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Butylbenzene, Tert- | mg/kg | 10000[A] | 2200[B] | - | - | - | - | - | - | - | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | ND (0.58) (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Toluene | mg/kg | 10000[A] | 100[B] | 0.410 (0.001) | - | 0.380 (0.001) | - | 0.001 J (0.001) | - | 0.500 (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | 0.001 J (0.001) | 1.7 J (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| 1,2,4-Trimethylbenzene | mg/kg | 640[A] | 35[B] | ND (0.410) (0.001) | - | ND (0.330) (0.001) | - | ND (0.005) (0.001) | - | 0.880 (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 19 (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| 1,3,5-Trimethylbenzene | mg/kg | 10000[A] | 210[B] | ND (0.410) (0.001) | - | ND (0.330) (0.001) | - | ND (0.005) (0.001) | - | 1.500 (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 15 (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| Xylenes, Total (Dimethylbenzene) | mg/kg | 9100[A] | 1000[B] | 0.091 J (0.001) | - | 0.074 J (0.001) | - | ND (0.005) (0.001) | - | 2.200 (0.001) | - | ND (0.0009) (0.001) | ND (0.001) (0.001) | ND (0.001) (0.001) | 16 (0.001) | ND (0.001) (0.001) | ND (0.0009) (0.001) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | |
| 1,2-Dibromoethane (EDB) | mg/kg | 4.3[A] | 0.005[B] | - | - | - | - | - | - | - | - | ND (0.00021) (0.00020) | ND (0.00021) (0.00020) | ND (0.00023) (0.00020) | ND (0.00020) (0.00020) | ND (0.00023) (0.00020) | ND (0.00021) (0.00020) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg | 190000[A] | 4700[B] | - | - | - | - | - | - | - | - | ND (0.0034) (0.0033) | 0.0056 J (0.0033) | 0.0050 J (0.0033) | 1.5 (0.0033) | ND (0.0038) (0.0033) | ND (0.0035) (0.0033) |
| Anthracene | mg/kg | 190000[A] | 350[B] | - | 0.270 (0.003) | - | 0.190 J (0.003) | - | 0.140 J (0.003) | - | 4.300 (0.003) | 0.0059 J (0.0033) | 0.021 (0.0033) | 0.029 (0.0033) | 0.90 (0.0033) | 0.016 J (0.0033) | ND (0.0035) (0.0033) |
| Benzo(a)Anthracene | mg/kg | 190000[A] | 430[B] | - | 0.480 (0.003) | - | 0.450 (0.003) | - | 0.630 (0.003) | - | 5.600 (0.003) | 0.024 (0.0033) | 0.073 (0.0033) | 0.058 (0.0033) | 0.41 (0.0033) | 0.029 (0.0033) | 0.016 J (0.0033) |
| Benzo(a)Pyrene | mg/kg | 190000[A] | 46[B] | - | 0.360 (0.003) | - | 0.450 (0.003) | - | 0.520 (0.003) | - | 4.400 (0.003) | 0.026 (0.0033) | 0.12 (0.0033) | 0.079 (0.0033) | 0.33 (0.0033) | 0.050 (0.0033) | 0.021 (0.0033) |
| Benzo(b)Fluoranthene | mg/kg | 190000[A] | 170[B] | - | 0.500 (0.003) | - | 0.630 (0.003) | - | 0.650 (0.003) | - | 7.700 (0.003) | 0.037 (0.0033) | 0.14 (0.0033) | 0.15 (0.0033) | 0.31 (0.0033) | 0.062 (0.0033) | 0.025 (0.0033) |
| Benzo(g,h,i)Perylene | mg/kg | 190000[A] | 180[B] | - | 0.230 (0.003) | - | 0.470 (0.003) | - | 0.400 (0.003) | - | 3.300 (0.003) | 0.024 (0.0033) | 0.11 (0.0033) | 0.12 (0.0033) | 0.21 (0.0033) | 0.059 (0.0033) | 0.020 (0.0033) |
| Benzo(k)Fluoranthene | mg/kg | 190000[A] | 610[B] | - | - | - | - | - | - | - | - | 0.019 (0.0033) | 0.056 (0.0033) | 0.037 (0.0033) | 0.083 J (0.0033) | 0.021 (0.0033) | 0.011 J (0.0033) |
| 1,1'-Biphenyl | mg/kg | 190000[A] | 190[B] | - | - | - | - | - | - | - | - | ND (0.017) (0.017) | ND (0.018) (0.017) | ND (0.020) (0.017) | 1.0 (0.017) | ND (0.019) (0.017) | ND (0.018) (0.017) |
| Bis(2-Ethylhexyl) Phthalate | mg/kg | 10000[A] | 130[B] | - | - | - | - | - | - | - | - | ND (0.069) (0.067) | ND (0.073) (0.067) | ND (0.081) (0.067) | ND (0.35) (0.067) | ND (0.077) (0.067) | ND (0.071) (0.067) |
| Di-n-Butyl Phthalate | mg/kg | 10000[A] | 4900[B] | - | - | - | - | - | - | - | - | ND (0.069) (0.067) | ND (0.073) (0.067) | ND (0.081) (0.067) | ND (0.35) (0.067) | ND (0.077) (0.067) | ND (0.071) (0.067) |
| Chrysene | mg/kg | 190000[A] | 230[B] | - | 0.510 (0.003) | - | 0.650 (0.003) | - | 0.670 (0.003) | - | 5.600 (0.003) | 0.026 (0.0033) | 0.084 (0.0033) | 0.067 (0.0033) | 0.88 (0.0033) | 0.033 (0.0033) | 0.014 J (0.0033) |
| Dibenz(A,H)Anthracene | mg/kg | 190000[A] | 270[B] | - | - | - | - | - | - | - | - | 0.0087 J (0.0033) | 0.029 (0.0033) | 0.034 (0.0033) | 0.088 J (0.0033) | 0.013 J (0.0033) | 0.0074 J (0.0033) |
| Diethyl Phthalate | mg/kg | 10000[A] | 9300[B] | - | - | - | - | - | - | - | - | ND (0.069) (0.067) | ND (0.073) (0.067) | ND (0.081) (0.067) | ND (0.35) (0.067) | ND (0.077) (0.067) | ND (0.071) (0.067) |
| 2,4-Dimethylphenol | mg/kg | 10000[A] | 230[B] | - | - | - | - | - | - | - | - | ND (0.017) (0.017) | ND (0.018) (0.017) | ND (0.020) (0.017) | ND (0.087) (0.017) | ND (0.019) (0.017) | ND (0.018) (0.017) |
| 2,4-Dinitrophenol | mg/kg | 190000[A] | 23[B] | - | - | - | - | - | - | - | - | ND (0.31) (0.30) | ND (0.33) (0.30) | ND (0.36) (0.30) | ND (1.6) (0.30) | ND (0.34) (0.30) | ND (0.32) (0.30) |
| Fluoranthene | mg/kg | 190000[A] | 3200[B] | - | - | - | - | - | - | - | - | 0.026 (0.0033) | 0.086 (0.0033) | 0.060 (0.0033) | 0.39 (0.0033) | 0.029 (0.0033) | 0.013 J (0.0033) |
| Fluorene | mg/kg | 190000[A] | 3800[B] | - | 0.110 (0.003) | - | 0.160 J (0.003) | - | 0.041 J (0.003) | - | 8.400 (0.003) | ND (0.0034) (0.0033) | 0.0056 J (0.0033) | 0.0069 J (0.0033) | 2.0 (0.0033) | 0.0061 J (0.0033) | ND (0.0035) (0.0033) |
| Indeno(1,2,3-c,d)Pyrene | mg/kg | 190000[A] | 22000[B] | - | - | - | - | - | - | - | - | 0.020 (0.0033) | 0.085 (0.0033) | 0.097 (0.0033) | 0.16 (0.0033) | 0.043 (0.0033) | 0.014 J (0.0033) |
| 2-Methylnaphthalene | mg/kg | 190000[A] | 1900[B] | - | - | - | - | - | - | - | - | 0.0049 J (0.0033) | 0.022 (0.0033) | 0.045 (0.0033) | 13 (0.0033) | 0.018 J (0.0033) | 0.0046 J (0.0033) |
| Cresol, o- (2-Methylphenol) | mg/kg | 190000[A] | 580[B] | - | - | - | - | - | - | - | - | ND (0.017) (0.017) | ND (0.018) (0.017) | ND (0.020) (0.017) | ND (0.087) (0.017) | ND (0.019) (0.017) | ND (0.018) (0.017) |
| Cresol, p- (4-Methylphenol) | mg/kg | 190000[A] | 58[B] | - | - | - | - | - | - | - | - | ND (0.017) (0.017) | ND (0.018) (0.017) | ND (0.020) (0.017) | ND (0.087) (0.017) | ND (0.019) (0.017) | ND (0.018) (0.017) |
| Naphthalene | mg/kg | 190000[A] | 25[B] | - | 0.120 (0.003) | - | 1.200 (0.003) | - | 0.140 J (0.003) | - | 3.900 (0.003) | - | - | - | - | - | - |
| 4-Nitrophenol | mg/kg | 190000[A] | 6[B] | - | - | - | - | - | - | - | - | ND (0.17) (0.17) | ND (0.18) (0.17) | ND (0.20) (0.17) | ND (0.87) (0.17) | ND (0.19) (0.17) | ND (0.18) (0.17) |
| Phenanthrene | mg/kg | 190000[A] | 10000[B] | - | 0.790 (0.003) | - | 0.880 (0.003) | - | 0.530 (0.003) | - | 22.000 (0.003) | 0.0095 J (0.0033) | 0.032 (0.0033) | 0.049 (0.0033) | 4.3 (0.0033) | 0.020 (0.0033) | 0.0060 J (0.0033) |
| Phenol | mg/kg | 18000[A] | 200[B] | - | - | - | - | - | - | - | - | ND (0.017) (0.017) | ND (0.018) (0.017) | ND (0.020) (0.017) | ND (0.087) (0.017) | ND (0.019) (0.017) | ND (0.018) (0.017) |
| Pyrene | mg/kg | 190000[A] | 2200[B] | - | 0.780 (0.003) | - | 0.810 (0.003) | - | 1.000 (0.003) | - | 6.300 (0.003) | 0.025 (0.0033) | 0.10 (0.0033) | 0.060 (0.0033) | 1.4 (0.0033) | 0.035 (0.0033) | 0.015 J (0.0033) |
| Pyridine | mg/kg | 10000[A] | 12[B] | - | - | - | - | - | - | - | - | ND (0.069) (0.067) | ND (0.073) (0.067) | ND (0.081) (0.067) | ND (0.35) (0.067) | ND (0.077) (0.067) | ND (0.071) (0.067) |
| Quinoline | mg/kg | 10000[A] | 0.37[B] | - | - | - | - | - | - | - | - | ND (0.034) (0.033) | ND (0.037) (0.033) | ND (0.040) (0.033) | ND (0.17) (0.033) | ND (0.038) (0.033) | ND (0.036) (0.033) |
| **Metals** | | | | | | | | | | | | | | | | | |
| Cobalt | mg/kg | 190000[A] | 160[B] | - | - | - | - | - | - | - | - | 4.34 (0.0810) | 6.41 (0.0810) | 9.74 (0.0810) | 4.11 (0.0810) | 6.66 (0.0810) | 3.67 (0.0810) |
| Lead | mg/kg | 190000[A] | 450[B] | 208 (0.510) | - | 315 (0.510) | - | ***1360***[B] (0.510) | - | 255 (0.510) | - | 18.6 (0.510) | 86.3 (0.510) | 91.7 (0.510) | 39.5 (0.510) | 27.8 (0.510) | 10.8 (0.510) |
| Nickel | mg/kg | 190000[A] | 650[B] | - | - | - | - | - | - | - | - | 43.1 (0.300) | 45.3 (0.300) | 149 (0.300) | 43.7 (0.300) | 15.2 (0.300) | 26.9 (0.300) |
| Vanadium | mg/kg | 190000[A] | 820[B] | - | - | - | - | - | - | - | - | 149 (0.230) | 214 (0.230) | 321 (0.230) | 169 (0.230) | 144 (0.230) | 34.6 (0.230) |
| Zinc | mg/kg | 190000[A] | 12000[B] | - | - | - | - | - | - | - | - | 62.5 (0.770) | 134 (0.770) | 157 (0.770) | 307 (0.770) | 60.0 (0.770) | 25.2 (0.770) |
| **General Chemistry** | | | | | | | | | | | | | | | | | |
| Moisture, Percent | % | n/v | n/v | 42.4 (0.50) | 16.7 (0.50) | 34.3 (0.50) | 14.4 (0.50) | 24.2 (0.50) | 15.1 (0.50) | 37.5 (0.50) | 29.6 (0.50) | 4.0 (0.50) | 9.2 (0.50) | 18.1 (0.50) | 4.1 (0.50) | 13.0 (0.50) | 7.3 (0.50) |
| pH, Laboratory Measured | S.U. | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Solids, Percent | % | n/v | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:

| | |
|---|---|
| MSC-PA [A] | Pennsylvania Department of Environmental Protection - 2016. Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Soil - Direct Contact - Non-Residential Subsurface Soil (2-15 ft). |
| SHS-PA [B] | Pennsylvania Department of Environmental Protection - Statewide Health Standards - 2016. PADEP Non-Residential Statewide Health Standards (>2 ft bgs) (Unsaturated Soil). |
| ***6.5***[A] | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (2.4) (1.2 | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| J | Indicates an estimated value. |
| mg/kg | milligrams per kilogram. |
| ft | Feet. Method detection limit is shown in second set of parentheses. |

**Table 5**

**Summary of PADEP Open Storage Tank Incidents AOI 6**
**Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Release/ Incident Date | PADEP Incident Number | Sun Tank Number | DEP Tank Number | Current PADEP Tank Number (PES) | Quantity Released (gallon) | Product Description | Regulatory Program |
|---|---|---|---|---|---|---|---|
| 9/12/1993 | 45692 | 81 | 121A | NA | 100 | Caustic Release | PADEP Chapter 245 Storage Tank Program |
| 7/19/1998 | 4844 | 676 | 130A | 045A | 2600 | #6 Fuel Oil | PADEP Chapter 245 Storage Tank Program |
| 6/10/2002 | 29122 | 797 | 097A | NA | 5 | Benzene | PADEP Chapter 245 Storage Tank Program |

Note:

1 NA indicated information not applicable or not available

2 PADEP Release Incident Number 37546 for Tank 250 was originally listed as on open incident by the PADEP in their 2014 summary of open incidents but was changed to closed in accordance with Mr. David Brown's Technical Review Memo dated August 29, 2017.

**Table 6**

**Existing Well Summary**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Former Well ID[2] | Well Status | Disposition of Well | Northing[3] | Easting[3] | Well Type[4] | Well Classification/ Hydrostratigraphic Unit[5] | Soil Boring Log Available (Y/N) | Construction Detail Available (Y/N) | Date of Well Completion | Well Construction Details[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Well Completion Depth (ft/bgs)[6] | Well Diameter (in)[7] | Top of Inner Casing Elevation (ft msl) (NAVD88)[8] | Ground Surface Elevation (ft msl) (NAVD88)[8] | Top of Screen Elev (ft msl) (NAVD88)[8] | Bottom of Screen Elevation (ft msl) (NAVD88)[8] | Depth to Screen (ft bgs)[8] | Screen Length (ft)[9] |
| AOI 6 | B-115 | | | | 218058.703 | 2682824.9 | MW | Shallow | | | | | | 7.5 | 4.88 | | | | |
| AOI 6 | B-116 | | | | 217899.153 | 2682925 | MW | Shallow | | | | | | 5.07 | 6.33 | | | | |
| AOI 6 | B-117 | | | | 217678.393 | 2682499.4 | MW | Shallow | | | | | | 5.97 | 8.89 | | | | |
| AOI 6 | B-123 | | | | 217145.729 | 2681457.9 | MW | Shallow | | | | | | 10.76 | 7.61 | | | | |
| AOI 6 | B-124 | | | | 216810.937 | 2681316.4 | RW | Shallow | Y | Y | 9/21/1992 | 15 | 4 | 8.97 | 5.91 | 0.91 | -9.09 | 5 | 10 |
| AOI 6 | B-125 | | | | 216828.873 | 2681099.2 | MW | Shallow | | | | | | 8.51 | 5.25 | | | | |
| AOI 6 | B-126 | | | | 217022.175 | 2680973.6 | MW | Shallow | | | | | | 8.51 | 5.52 | | | | |
| AOI 6 | B-129 | | | | 217874.097 | 2683017.7 | MW | Shallow | Y | Y | 8/20/1992 | 15 | 4 | 8.02 | 6.33 | 1.33 | -8.67 | 5 | 10 |
| AOI 6 | B-130 | | | | 217397.337 | 2680131.2 | MW | Shallow | Y | Y | 8/20/1992 | 16 | 4 | 9.69 | 8.11 | 3.11 | -6.89 | 5 | 10 |
| AOI 6 | B-131 | | | | 216460.204 | 2680692.6 | MW | Shallow | Y | Y | 8/20/1992 | 14 | 4 | 8.72 | 6.2 | 2.2 | -7.8 | 4 | 10 |
| AOI 6 | B-132 | | | | 217350.988 | 2681170.9 | MW | Shallow | Y | Y | 8/28/2001 | 11 | 4 | 6.87 | 2.27 | 1.27 | -8.73 | 1 | 10 |
| AOI 6 | B-133 | | | | 217307.146 | 2681206.8 | RW | Shallow | Y | Y | 8/28/2001 | 11 | | 7.33 | 3.3 | 2.3 | -7.7 | 1 | 10 |
| AOI 6 | B-134 | | | | 217285.225 | 2681162.9 | RW | Shallow | Y | Y | 8/28/2001 | 11 | | 6.52 | 3.38 | 2.38 | -7.62 | 1 | 10 |
| AOI 6 | B-135 | | | | 217329.067 | 2681137 | MW | Shallow | Y | Y | 8/28/2001 | 11 | | 6.38 | 3.31 | 2.31 | -7.69 | 1 | 10 |
| AOI 6 | B-136 | | | | 217259.319 | 2681252.6 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 9.15 | 6.31 | 4.31 | -5.69 | 2 | 10 |
| AOI 6 | B-137 | | | | 217187.578 | 2681298.4 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 8.73 | 6.22 | 4.22 | -5.78 | 2 | 10 |
| AOI 6 | B-138 | | | | 217137.758 | 2681330.3 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 9.33 | 6.06 | 4.06 | -5.94 | 2 | 10 |
| AOI 6 | B-139 | | Damaged | Casing damaged | 217339.031 | 2681270.5 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 9.4 | 6.93 | 4.93 | -5.07 | 2 | 10 |
| AOI 6 | B-140 | | Destroyed | | 217269.283 | 2681316.4 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 10.14 | 7.39 | 5.39 | -4.61 | 2 | 10 |
| AOI 6 | B-141 | | Damaged | new riser required | 217229.427 | 2681380.2 | MW | Shallow | Y | Y | 8/30/2001 | 12 | | 8.69 | 7.75 | 5.75 | -4.25 | 2 | 10 |
| AOI 6 | B-142 | | | | 217177.614 | 2681208.8 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 9.74 | 6.81 | 4.81 | -5.19 | 2 | 10 |
| AOI 6 | B-143 | | | | 217207.506 | 2681159 | RW | Shallow | Y | Y | 8/29/2001 | 12 | | 8.98 | 6.36 | 4.36 | -5.64 | 2 | 10 |
| AOI 6 | B-144 | | | | 217133.772 | 2681234.7 | MW | Shallow | Y | Y | 8/30/2001 | 12 | | 9.02 | 6.16 | 4.16 | -5.84 | 2 | 10 |
| AOI 6 | B-145 | | | | 217085.945 | 2681362.2 | MW | Shallow | Y | Y | 8/30/2001 | 12 | | 9.81 | 7.16 | 5.16 | -4.84 | 2 | 10 |
| AOI 6 | B-146 | | Unable to Locate | | 217211.491 | 2681455.9 | MW | Shallow | Y | Y | 8/30/2001 | 12 | | 7.77 | 7.8 | 5.8 | -4.2 | 2 | 10 |
| AOI 6 | B-147 | | | | 217145.729 | 2681125.1 | RW | Shallow | Y | Y | 8/30/2001 | 12 | | 8.9 | 6.6 | 4.6 | -5.4 | 2 | 10 |
| AOI 6 | B-148 | MW-1 | | | 217443.977 | 2681076.9 | MW | Shallow | Y | N | 9/17/2002 | 11 | | 7.22 | 5.19 | 4.19 | -5.81 | 1 | 10 |
| AOI 6 | B-149 | MW-2 | | | 217436.203 | 2680999.2 | MW | Shallow | Y | Y | 9/17/2002 | 11 | | 7.74 | 5.8 | 4.8 | -5.2 | 1 | 10 |
| AOI 6 | B-150 | MW-3 | | | 217480.252 | 2680965.5 | MW | Shallow | Y | Y | 9/16/2002 | 11 | | 7.8 | 5.83 | 4.83 | -5.17 | 1 | 10 |
| AOI 6 | B-151 | | | | 217738.379 | 2680728.9 | MW | Shallow | Y | Y | 2/23/2006 | 13 | 4 | 7.735 | 5.77 | 3.77 | -4.23 | 2 | 8 |
| AOI 6 | B-152 | | | | 217848.398 | 2680602.5 | MW | Shallow | Y | Y | 2/27/2006 | 10 | 4 | 5.036 | 5.5 | 3.5 | -4.5 | 2 | 8 |
| AOI 6 | B-153 | | | | 217475.27 | 2680101.7 | MW | Shallow | Y | Y | 2/24/2006 | 10 | 4 | 6.367 | 6.67 | 4.67 | -3.33 | 2 | 8 |
| AOI 6 | B-154 | | | | 217552.437 | 2680926.8 | MW | Shallow | Y | Y | 2/23/2006 | 13 | 4 | 8.68 | 6.43 | 4.43 | -3.57 | 2 | 8 |
| AOI 6 | B-155 | | | | 217399.88 | 2680974.7 | MW | Shallow | Y | Y | 2/24/2006 | 13 | 4 | 8.541 | 6.54 | 4.54 | -3.46 | 2 | 8 |
| AOI 6 | B-156 | | | | 217365.5 | 2680904.1 | MW | Shallow | Y | Y | 2/23/2006 | 13 | 4 | 8.856 | 6.65 | 4.65 | -3.35 | 2 | 8 |
| AOI 6 | B-157 | | Unable to Locate | | 217194.811 | 2680880.6 | MW | Shallow | Y | Y | 2/22/2006 | 12 | 4 | 4.924 | 5.26 | 3.26 | -6.74 | 2 | 10 |
| AOI 6 | B-158 | | | | 217966.981 | 2679968.9 | MW | Shallow | Y | Y | 2/22/2006 | 12 | 4 | 8.209 | 8.66 | 6.66 | -3.34 | 2 | 10 |
| AOI 6 | B-159 | | Destroyed | | 217268.172 | 2681614.1 | MW | Shallow | Y | Y | 4/20/2006 | 10 | 4 | 6.1924 | 8.51 | 3.9193 | -1.49 | 5 | 8 |
| AOI 6 | B-160 | | | | 217370.65 | 2681839.8 | MW | Shallow | Y | Y | 2/27/2006 | 10 | 4 | 8.532 | 8.95 | 6.95 | -1.05 | 2 | 8 |
| AOI 6 | B-161 | | | | 216894.044 | 2681270.4 | MW | Shallow | Y | Y | 2/21/2006 | 15 | 4 | 8.3 | 6.98 | 4.98 | -5.02 | 2 | 10 |
| AOI 6 | B-162 | | | | 217903.199 | 2682803.5 | MW | Shallow | Y | Y | 2/20/2006 | 18 | 4 | 7.589 | 4.93 | 2.93 | -10.07 | 2 | 13 |
| AOI 6 | B-163 | | | | 217531.251 | 2681198.8 | MW | Shallow | Y | Y | 2/28/2006 | 10 | 4 | 7.452 | 7.68 | 5.68 | -2.32 | 2 | 8 |

**Table 6**

**Existing Well Summary**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Former Well ID[2] | Well Status | Disposition of Well | Northing[3] | Easting[3] | Well Type[4] | Well Classification/ Hydrostratigraphic Unit[5] | Soil Boring Log Available (Y/N) | Construction Detail Available (Y/N) | Date of Well Completion | Well Construction Details[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Well Completion Depth (ft/bgs)[6] | Well Diameter (in)[7] | Top of Inner Casing Elevation (ft msl) (NAVD88)[8] | Ground Surface Elevation (ft msl) (NAVD88)[8] | Top of Screen Elev (ft msl) (NAVD88)[8] | Bottom of Screen Elevation (ft msl) (NAVD88)[8] | Depth to Screen (ft bgs)[8] | Screen Length (ft)[9] |
| AOI 6 | B-164 | | | | 216480.287 | 2680585.2 | MW | Shallow | Y | Y | 2/21/2006 | 15 | 4 | 8.822 | 5.86 | 3.86 | -6.14 | 2 | 10 |
| AOI 6 | B-165 | | | | 217152.414 | 2680186.5 | MW | Shallow | N | N | 12/31/1999 | | | 5.79 | 6.07 | | | | |
| AOI 6 | B-166 | | | Shallow | 217408.526 | 2682932.2 | MW | Shallow | N | N | 12/31/1999 | | | 7.47 | 7.89 | | | | |
| AOI 6 | B-167 | | | Shallow | 217814.189 | 2683187.9 | MW | Shallow | N | N | 12/31/1999 | | | 6.73 | 7.21 | | | | |
| AOI 6 | B-168 | | | | 217494.926 | 2680069.6 | MW | Shallow | N | N | 12/31/1999 | | | 6.46 | 6.77 | | | | |
| AOI 6 | B-169 | | | | 217416.456 | 2680092.2 | MW | Shallow | N | N | 12/31/1999 | | | 6.12 | 6.47 | | | | |
| AOI 6 | B-170 | | | Shallow | 217350.272 | 2680110.6 | MW | Shallow | N | N | 12/31/1999 | | | 0.04 | 0.15 | | | | |
| AOI 6 | B-171 | | Reserved | | | | MW | | | | | | | | | | | | |
| AOI 6 | B-172 | | | | 217412.384 | 2680736.1 | MW | Shallow | Y | Y | 4/7/2016 | 10 | 4 | 8.01 | 5.15 | 3.15 | -4.85 | 2 | 8 |
| AOI 6 | B-173 | | | | 216650.661 | 2681020.8 | MW | Shallow | Y | Y | 4/6/2016 | 12 | 4 | 8.18 | 5.7 | 3.7 | -6.3 | 2 | 10 |
| AOI 6 | B-174 | | | | 216387.568 | 2681059.3 | MW | Shallow | Y | Y | 4/8/2016 | 12 | 4 | 8.3 | 5.5 | 3.5 | -6.5 | 2 | 10 |
| AOI 6 | B-175 | | | | 216862.933 | 2681336.1 | MW | Shallow | Y | Y | 4/7/2016 | 12 | 4 | 8.77 | 5.9 | 3.9 | -6.1 | 2 | 10 |
| AOI 6 | B-39 | | | | 216614.006 | 2680589.9 | MW | Shallow | Y | Y | 2/19/1986 | 15 | 4 | 5.48 | 5.54 | 2.54 | -9.46 | 3 | 12 |
| AOI 6 | B-40 | | Destroyed | | 216938.477 | 2680955.7 | MW | Shallow | Y | Y | 2/18/1986 | 13 | 4 | 7.17 | 6.12 | 3.12 | -6.88 | 3 | 10 |
| AOI 6 | B-41 | | Destroyed | | 217614.988 | 2680836 | MW | Shallow | Y | Y | 2/21/1986 | 12 | 4 | 8.85 | 7.8 | 5.8 | -4.2 | 2 | 10 |
| AOI 6 | B-42 | | Destroyed | | 217060.496 | 2680219.3 | MW | Shallow | Y | Y | 2/19/1986 | 15 | 4 | 8.04 | 6.99 | 4.49 | -8.01 | 3 | 12.5 |
| AOI 6 | B-43 | | | | 217573.531 | 2680040.5 | MW | Shallow | Y | Y | 2/19/1986 | 14.5 | 4 | 7.21 | 7.14 | 4.14 | -7.36 | 3 | 11.5 |
| AOI 6 | B-44 | | Destroyed | | 217973.28 | 2680563.8 | MW | Shallow | Y | Y | 2/20/1986 | 15 | 4 | 8.21 | 7.16 | 4.16 | -5.84 | 3 | 10 |
| AOI 6 | B-45 | | | | 218353.448 | 2680392.9 | MW | Shallow | Y | Y | 2/20/1986 | 15 | 4 | 5.099 | 4.9 | 1.9 | -10.1 | 3 | 12 |
| AOI 6 | B-46 | | | | 218130.615 | 2681908.7 | MW | Shallow | Y | Y | 2/21/1986 | 12 | 4 | 8.03 | 8.32 | 6.32 | -3.68 | 2 | 10 |
| AOI 6 | B-47 | | | | 217433.612 | 2681963.1 | MW | Shallow | Y | Y | 2/21/1986 | 13 | 4 | 8.3 | 8 | 5 | -5 | 3 | 10 |
| AOI 6 | B-48 | | | | 217529.482 | 2682248.1 | MW | Shallow | Y | Y | 2/21/1986 | 14 | 4 | 6.5 | 6.8 | 2.8 | -7.2 | 4 | 10 |
| AOI 6 | B-92 | | | | 216966.376 | 2681497.7 | MW | Shallow | Y | Y | 10/21/1986 | 15.5 | 4 | 10.23 | 7.3 | 1.8 | -8.2 | 6 | 10 |
| AOI 6 | B-93 | | Destroyed | | 217477.661 | 2681561.5 | MW | Shallow | Y | Y | 10/22/1986 | 13.5 | 4 | 12.83 | 11.67 | 8.17 | -1.83 | 4 | 10 |
| AOI 6 | B-94 | | | | 217609.806 | 2683136.9 | MW | Shallow | Y | Y | 10/22/1986 | 14 | 4 | 10.35 | 7.21 | 3.21 | -6.79 | 4 | 10 |
| AOI 6 | B-95 | GP U 677-MW | | | 217541.104 | 2680372.6 | MW | Shallow | | | | | | 8.867 | 6.608 | | | | |
| AOI 6 | GP-19 | | Destroyed | | | | MW | Shallow | Y | Y | 9/11/2000 | 15 | | 7.8 | | | | 5 | 10 |
| AOI 6 | GP-22 | | Destroyed | | | | MW | Shallow | Y | Y | 9/11/2000 | 15 | | 7.5 | | | | 10 | 5 |
| AOI 6 | GP-3 | | Destroyed | | | | MW | Shallow | Y | Y | 9/8/2000 | 14 | | 7.6 | | | | 4 | 9 |
| AOI 6 | PH-36 | | Destroyed | | | | MW | | | | | | | | | | | | |
| AOI 6 | PH-37 | | Destroyed | | | | MW | | | | | | | | | | | | |
| AOI 6 | PH-39 | | Destroyed | | | | MW | | | | | | | | | | | | |
| AOI 6 | PH-42 | | Destroyed | | | | MW | | | | | | | | | | | | |
| AOI 6 | PS-1 | | Destroyed | | 217224.428 | 2681226.9 | MW | | N | N | | | | 9.02 | | | | | |
| AOI 6 | PZ-132A | | | | 216103.54 | 2680865.9 | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | 10.15 | 8.12 | 3.12 | -1.88 | 5 | 5 |
| AOI 6 | PZ-132B | | Destroyed | | | | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | | | | | 5 | 5 |
| AOI 6 | PZ-134A | | Destroyed | | | | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | | | | | 5 | 5 |
| AOI 6 | PZ-134B | | Destroyed | | | | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | | | | | 5 | 5 |
| AOI 6 | PZ-135A | | | | 216284.976 | 2680664 | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | 10.18 | 8.57 | 3.57 | -1.43 | 5 | 5 |
| AOI 6 | PZ-135B | | | | 216290.237 | 2680656.2 | Piezometer | Shallow | Y | Y | 3/8/2001 | 10 | 1 | 10.21 | | | | 5 | 5 |
| AOI 6 | RW-9 | | | | 216561.837 | 2681445.9 | RW | Shallow | Y | Y | | | | 8.76 | 5.88 | | | | |
| AOI 6 | SUMP-1 | | | | 217217.47 | 2681190.8 | RW | Shallow | Y | Y | 11/1/2001 | 10 | 6 | 10.7 | | | | 0 | 10 |
| AOI 6 | U-1 | | | | 216621.098 | 2681638.4 | MW | Shallow | N | N | | | | 10.7 | 7.22 | | | | |
| AOI 6 | U-2 | | | | 216693.553 | 2681797.9 | MW | Shallow | N | N | | | | 9.39 | 7.13 | | | | |
| AOI 6 | U-3 | | | | 216811.345 | 2681941 | MW | Shallow | N | N | | | | 9.8 | 6.84 | | | | |

**Table 6**

**Existing Well Summary**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Former Well ID[2] | Well Status | Disposition of Well | Northing[3] | Easting[3] | Well Type[4] | Well Classification/ Hydrostratigraphic Unit[5] | Soil Boring Log Available (Y/N) | Construction Detail Available (Y/N) | Date of Well Completion | Well Construction Details[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Well Completion Depth (ft/bgs)[6] | Well Diameter (in)[7] | Top of Inner Casing Elevation (ft msl) (NAVD88)[8] | Ground Surface Elevation (ft msl) (NAVD88)[8] | Top of Screen Elev (ft msl) (NAVD88)[8] | Bottom of Screen Elevation (ft msl) (NAVD88)[8] | Depth to Screen (ft bgs)[8] | Screen Length (ft)[9] |
| AOI 6 | U-4 | | | | 216875.006 | 2682042.6 | MW | Shallow | N | N | | | | 9.22 | 6.64 | | | | |
| AOI 6 | U-5 | | | | 216800.942 | 2681801.5 | MW | Shallow | N | N | | | | 9.79 | 7.6 | | | | |
| AOI 6 | URS-1 | B-132U | | | 216100.512 | 2680858.7 | MW | Shallow | N | N | | | | 10.02 | | | | | |
| AOI 6 | URS-2 | B-133U | Unable to Locate | | 216725.578 | 2681726.7 | MW | Shallow | N | N | | | | 7.89 | | | | | |
| AOI 6 | URS-3 | B-134U | | | 216761.463 | 2681038.8 | MW | Shallow | N | N | | 18 | | 7.6 | | | | | |
| AOI 6 | URS-4 | B-135U | | | 216277.495 | 2680670.6 | MW | Shallow | N | N | | | | 9.941 | | | | | |
| AOI 6 | URS-5 | B-136U | | | 216793.509 | 2680400.6 | MW | Shallow | N | N | | 14 | | 7.94 | | | | | |
| AOI 6 | WP10-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP10-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-10 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-11 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-12 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-3 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-4 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-5 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-6 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-7 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-8 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP11-9 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP12-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP12-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP12-3 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP12-4 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP12-5 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |

**Table 6**

**Existing Well Summary**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Former Well ID[2] | Well Status | Disposition of Well | Northing[3] | Easting[3] | Well Type[4] | Well Classification/ Hydrostratigraphic Unit[5] | Soil Boring Log Available (Y/N) | Construction Detail Available (Y/N) | Date of Well Completion | Well Construction Details[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Well Completion Depth (ft/bgs)[6] | Well Diameter (in)[7] | Top of Inner Casing Elevation (ft msl) (NAVD88)[8] | Ground Surface Elevation (ft msl) (NAVD88)[8] | Top of Screen Elev (ft msl) (NAVD88)[8] | Bottom of Screen Elevation (ft msl) (NAVD88)[8] | Depth to Screen (ft bgs)[8] | Screen Length (ft)[9] |
| AOI 6 | WP16-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP16-2 | | | | 216956.412 | 2682316.8 | MW | | | | | | | | 13.59 | | | | |
| AOI 6 | WP16-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | 13.59 | 13.09 | 3.09 | 1 | 10 |
| AOI 6 | WP16-3 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP16-4 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP16-5 | | Destroyed | | 216990.29 | 2682366.6 | Temporary Well Point | Shallow | Y | Y | 6/21/1993 | 10.5 | 2 | 13.57 | | | | 1 | 10 |
| AOI 6 | WP17-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP17-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP17-3 | | Destroyed | | | | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP8-1 | | Destroyed | | | | Temporary Well Point | | Y | Y | 5/25/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP8-2 | | Destroyed | | | | Temporary Well Point | | Y | Y | 5/25/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP8-3 | | Destroyed | | | | Temporary Well Point | | Y | Y | 5/25/1993 | 10.5 | | | | | | 1 | 10 |
| AOI 6 | WP9-1 | | Destroyed | | 216858.765 | 2681350.3 | Temporary Well Point | Shallow | Y | Y | 5/26/1993 | 9 | | | 7.9 | 7.4 | -2.1 | 1 | 9.5 |
| AOI 6 | WP9-2 | | Unable to Locate | | 216787.024 | 2681262.6 | Temporary Well Point | Shallow | Y | Y | 5/26/1993 | 10.5 | | 6.01 | | | | 1 | 10 |
| AOI 6 | WP9-3 | | Damaged | Obstruction in well | 216733.218 | 2681300.4 | Temporary Well Point | Shallow | Y | Y | 5/26/1993 | 9 | | 6.16 | | | | 1 | 9.5 |
| AOI 6 | WP9-4 | | | | 216537.48 | 2681422.1 | Temporary Well Point | Shallow | Y | Y | 6/14/1993 | 9 | | 9.04 | 5.8 | 5.3 | -4.2 | 1 | 9.5 |
| AOI 6 | WP9-5 | | Destroyed | | 216613.65 | 2681159 | Temporary Well Point | | Y | Y | 6/14/1993 | 10.5 | | | -1.05 | -1.55 | -11.55 | 1 | 10 |
| AOI 6 | WP9-6 | | Destroyed | | 216850.79 | 2681081.2 | Temporary Well Point | | Y | Y | 6/11/1993 | 10.5 | | | 10.02 | 9.52 | -0.48 | 1 | 10 |
| AOI 6 | WPM-1 | | Destroyed | | 217185.58 | 2682396.5 | Temporary Well Point | | | | | | | | 13.8 | | | | |
| AOI 6 | WPM-10 | | Destroyed | | 217022.175 | 2682342.7 | Temporary Well Point | | | | | | | | 9.99 | | | | |
| AOI 6 | WPM-11 | | | | 217105.984 | 2682370.8 | Temporary Well Point | Shallow | | | | | | 6.509 | 6.858 | | | | |
| AOI 6 | WPM-2 | | Repaired | Converted to Flush Mount | 217072.188 | 2682472.1 | Temporary Well Point | Shallow | | | | | | 7.47 | 7.964 | | | | |
| AOI 6 | WPM-3 | | | | 217085.439 | 2682433.1 | Temporary Well Point | Shallow | | | | | | 8.031 | 7.964 | | | | |

**Table 6**

**Existing Well Summary**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Former Well ID[2] | Well Status | Disposition of Well | Northing[3] | Easting[3] | Well Type[4] | Well Classification/ Hydrostratigraphic Unit[5] | Soil Boring Log Available (Y/N) | Construction Detail Available (Y/N) | Date of Well Completion | Well Construction Details[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Well Completion Depth (ft/bgs)[6] | Well Diameter (in)[7] | Top of Inner Casing Elevation (ft msl) (NAVD88)[8] | Ground Surface Elevation (ft msl) (NAVD88)[8] | Top of Screen Elev (ft msl) (NAVD88)[8] | Bottom of Screen Elevation (ft msl) (NAVD88)[8] | Depth to Screen (ft bgs)[8] | Screen Length (ft)[9] |
| AOI 6 | WPM-4 | | Destroyed | | 217323.088 | 2682639.6 | Temporary Well Point | | | | | | | 14.06 | 13.01 | | | | |
| AOI 6 | WPM-5 | | Destroyed | | | | Temporary Well Point | | | | | | | 14.18 | 13.13 | | | | |
| AOI 6 | WPM-6 | | Destroyed | | 217139.75 | 2682446.3 | Temporary Well Point | | | | | | | 14.35 | 13.3 | | | | |
| AOI 6 | WPM-7 | | Destroyed | | 217235.212 | 2682631 | Temporary Well Point | | | | | | | | 14.68 | | | | |
| AOI 6 | WPM-8 | RWM-8 | Destroyed | | 217025.191 | 2682447.5 | Temporary Well Point | | | | | | | 12.61 | | | | | |
| AOI 6 | WPM-9 | | Destroyed | | | | Temporary Well Point | | | | | | | 16.5 | 15.45 | | | | |

Notes:

1. Well construction details were obtained from well boring logs provided by historic reports.
2. Former Well IDs were derived from handwritten notes on boring logs or as referenced in historic reports.
3. Coordinate pairs are projected in the Pennsylvania State Plane Coordinate System (feet), referenced to the North American Datum of 1983 (NAD83).
4. MW = monitoring well; RW = recovery well
5. The hydrostratigraphic unit denotes the aquifer and/or mappable water-bearing stratum in which the well is interpreted to be screened by Stantec. Historic wells without lithologic logs, wells without as-built information, and/or destroyed wells were not assigned hydrostratigraphic units.
6. ft bgs = feet below ground surface
7. in = inches
8. NAVD88 = North American Vertical Datum of 1988
9. ft = feet

General Note:

Stantec presently maintains an electronic database from which these well records were extracted. Many of the well records in that database were translated from historic paper records, or from electronic tables received from other consultants. Maintenance of the electronic well database, including revisions to anomalous or missing information, is ongoing and as such this table may be subject to future revision.

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-39** | **B-39** | **B-39** | **B-43** | **B-43** | **B-45** | **B-115** | **B-116** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP Act2 Used Aquifer** | **GW-11109613-B39-05-11-16-MM-043** | **GW-11109613-B-39-082416-AC-022** | **GW-11109613-B-39-082416-KC-023** | **B-43-20160523** | **GW-11109613-B-43-082216-KC-005** | **GW-11109613-B45-05-05-16-RM-014** | **GW-11109613-B115-05-04-16-AC-007** | **GW-11109613-B116-05-04-16-RM-006** |
| **Sample Date:** | | | **05/11/2016** | **08/24/2016** | **08/24/2016** | **05/23/2016** | **08/22/2016** | **05/05/2016** | **05/04/2016** | **05/04/2016** |
| **Parameters** | **Units** | **NR MSC** | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | 1 J | 0.6 J | ND(0.5) | ND(2) | ND(2) | ND(2) | ND(2) |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(0.5) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(0.5) | ND(2) | ND(2) | ND(2) | ND(2) |
| Benzene | µg/L | 5 | 3 | 4 | 3 | ND(0.5) | ND(1) | ND(1) | ND(1) | ND(1) |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(0.5) | ND(1) | ND(1) | ND(1) | ND(1) |
| Isopropyl benzene | µg/L | 3500 | 11 | 26 | 17 | 4 | 6 | ND(2) | ND(2) | 0.5 J |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | ND(0.5) | ND(1) | ND(1) | ND(1) | ND(1) |
| Toluene | µg/L | 1000 | 0.7 J | 2 | 2 | ND(0.5) | ND(1) | ND(1) | ND(1) | ND(1) |
| Total BTEX | µg/L | | - | - | - | ND() ND | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | 4 | 5 | 4 | ND(0.5) | 0.6 J | ND(1) | ND(1) | ND(1) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Anthracene | µg/L | 66 | 5.8 | 1.6 | 0.41 | 0.7 | 0.22 | 0.042 J | 0.065 | 0.27 |
| Benzo(a)anthracene | µg/L | 4.9 | 3.0 | 0.48 | 0.086 | 2 | 0.89 | 0.021 J | 0.034 J | 0.058 |
| Benzo(a)pyrene | µg/L | 0.2 | **2.5** | **0.34** | 0.071 | **2** | **0.66 J** | 0.030 J | ND(0.052) | 0.013 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | **3.1** | 0.47 | 0.083 | **2** | 0.75 J | 0.043 J | 0.012 J | 0.017 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | **1.5** | 0.16 | 0.057 | **1** | **0.32 J** | 0.033 J | ND(0.052) | ND(0.050) |
| Chrysene | µg/L | 1.9 | **2.6** | 0.43 | 0.090 | **3** | 1.0 | 0.050 J | 0.035 J | 0.066 |
| Fluorene | µg/L | 1900 | 14 | 5.5 | 3.0 | 0.9 | 0.34 | 0.042 J | 0.13 | 1.5 |
| Naphthalene | µg/L | 100 | 8.0 | 4.4 | ND(0.064) | ND(0.1) | ND(0.063) | ND(0.061) | ND(0.063) | 0.070 |
| Phenanthrene | µg/L | 1100 | 25 | 6.0 | 0.86 | ND(0.1) | 0.24 | 0.065 | 0.40 | 0.054 J |
| Pyrene | µg/L | 130 | 6.4 | 1.1 | 0.35 | 7 | 2.9 | 0.085 | 0.24 | 0.65 |
| **Metals** | | | | | | | | | | |
| Lead | µg/L | 5 | **16.7** | - | - | - | - | - | ND(1.0) | 0.88 J |
| Lead (dissolved) | µg/L | 5 | - | 2.1 | 4.7 | ND(0.13) | 2.8 | 0.14 J | - | - |
| **Fumigant** | | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | **0.057** | ND(0.028) | ND(0.0097) | ND(0.028) | ND(0.029) | ND(0.028) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-116** | **B-116** | **B-116** | **B-117** | **B-117** | **B-125** | **B-125** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B-116-082416-AC-026** | **GW-11109613-B-116-082416-AC-027** | **GW-11109613-B-116D-082416-AC-028** | **GW-11109613-B117-05-04-16-AC-008** | **GW-11109613-B-117-082216-AC-006** | **GW-11109613-B125-05-09-16-MM-032** | **GW-11109613-B-125-082316-KC-010** |
| **Sample Date:** | | **Act2** | **08/24/2016** | **08/25/2016** | **08/25/2016** | **05/04/2016** | **08/22/2016** | **05/09/2016** | **08/23/2016** |
| | | **Used Aquifer** | | | **Duplicate** | | | | |
| **Parameters** | **Units** | **NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | 2 J | 0.8 J |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | 3 | 2 |
| Benzene | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | **9** | **9** |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | 0.6 J | ND(1) |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | 8 | 9 |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Toluene | µg/L | 1000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | 3 | 4 |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | 30 | 25 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.036 J | 0.11 | 0.080 | 1.8 | 1.0 | 1.5 | 1.9 |
| Benzo(a)anthracene | µg/L | 4.9 | 0.021 J | 0.045 J | 0.028 J | 0.46 | 0.25 | 0.45 | 0.16 |
| Benzo(a)pyrene | µg/L | 0.2 | ND(0.050) | 0.018 J | ND(0.051) | **0.34** | 0.19 J | **0.23** | 0.040 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | ND(0.050) | 0.023 J | ND(0.051) | 0.42 | 0.23 J | 0.25 | 0.046 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | ND(0.050) | ND(0.051) | ND(0.051) | 0.22 | 0.13 J | 0.070 | 0.012 J |
| Chrysene | µg/L | 1.9 | 0.031 J | 0.059 | 0.039 J | 0.54 | 0.34 | 0.34 | 0.13 |
| Fluorene | µg/L | 1900 | 0.054 | 1.1 | 0.91 | 0.74 | 0.24 | 4.8 | 6.6 |
| Naphthalene | µg/L | 100 | 0.031 J | ND(0.061) | ND(0.062) | 0.11 | ND(0.061) | 0.40 | 0.31 |
| Phenanthrene | µg/L | 1100 | ND(0.060) | ND(0.061) | ND(0.062) | 0.94 | 1.1 | 1.2 | 3.3 |
| Pyrene | µg/L | 130 | 0.29 | 0.39 | 0.32 | 3.3 | 2.4 | 2.1 | 1.4 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | - | - | - | ND(1.0) | - | 0.24 J | - |
| Lead (dissolved) | µg/L | 5 | ND(1.0) | 0.14 J | 0.16 J | - | 0.25 J | - | ND(1.0) |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.028) | ND(0.028) | ND(0.029) | ND(0.028) | ND(0.028) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-126** | **B-126** | **B-131** | **B-132** | **B-132** | **B-133** | **B-133** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B126-05-10-16-MM-035** | **GW-11109613-B-126-082316-KC-008** | **GW-11109613-B131-05-05-16-RM-012** | **GW-11109613-B132-05-11-16-AC-042** | **GW-11109613-B-132-082416-AC-018** | **GW-11109613-B133-05-05-16-RM-020** | **GW-11109613-B-133D-082416-AC-029** |
| **Sample Date:** | | **Act2** | **05/10/2016** | **08/23/2016** | **05/05/2016** | **05/11/2016** | **08/24/2016** | **05/05/2016** | **08/25/2016** |
| **Parameters** | **Units** | **Used Aquifer NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 8 J | 5 J | ND(2) | ND(2) | ND(2) | 0.7 J | ND(2) |
| 1,2-Dichloroethane | µg/L | 5 | **ND(10)** | ND(5) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | 7 J | 4 J | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| Benzene | µg/L | 5 | **95** | **78** | 1 | ND(1) | ND(1) | ND(1) | ND(1) |
| Ethylbenzene | µg/L | 700 | 13 | 9 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Isopropyl benzene | µg/L | 3500 | 60 | 40 | 8 | 8 | 5 | 59 | ND(2) |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(10) | ND(5) | ND(1) | ND(1) | ND(1) | 1 | ND(1) |
| Toluene | µg/L | 1000 | 40 | 29 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | 64 | 47 | 0.6 J | ND(1) | ND(1) | 2 | ND(1) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 9.1 | 6.6 | 0.76 | 13 | 1.5 | 11 | ND(0.050) |
| Benzo(a)anthracene | µg/L | 4.9 | 0.71 | 0.82 | 0.37 | **7.7** | 0.88 | 1.7 | ND(0.050) |
| Benzo(a)pyrene | µg/L | 0.2 | **0.38** | **0.39 J** | 0.090 | **4.4** | **0.49** | **0.72** | ND(0.050) |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.36 | 0.39 J | 0.12 | **5.6** | 0.57 | 0.81 | ND(0.050) |
| Benzo(g,h,i)perylene | µg/L | 0.26 | 0.11 | 0.14 J | 0.021 J | **1.5** | 0.17 | 0.23 J | ND(0.050) |
| Chrysene | µg/L | 1.9 | 0.60 | 0.67 | 0.29 | **5.1** | 0.61 | 1.3 | ND(0.050) |
| Fluorene | µg/L | 1900 | 43 | 39 | 1.9 | 51 | 27 | 33 | ND(0.050) |
| Naphthalene | µg/L | 100 | 22 | 5.4 | ND(0.061) | 1.4 | ND(0.060) | ND(0.61) | 0.039 J |
| Phenanthrene | µg/L | 1100 | 53 | 5.1 | 0.66 | 74 | 20 | 56 | ND(0.060) |
| Pyrene | µg/L | 130 | 4.7 | 5.7 | 2.3 | 19 | 3.4 | 7.4 | ND(0.050) |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | ND(1.0) | - | - | ND(1.0) | - | - | - |
| Lead (dissolved) | µg/L | 5 | - | ND(1.0) | ND(1.0) | - | 0.12 J | ND(1.0) | 0.48 J |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.028) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-133** | **B-134** | **B-144** | **B-145** | **B-145** | **B-150** | **B-150** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B-133D-082416-AC-030** | **GW-11109613-B134-05-11-16-MM-041** | **GW-11109613-B144-05-11-16-AC-044** | **GW-11109613-B145-05-09-16-AC-029** | **GW-11109613-B-145-082416-KC-016** | **GW-11109613-B150-05-11-16-AC-046** | **GW-11109613-B-150-082416-AC-019** |
| **Sample Date:** | | **Act2** | **08/25/2016** | **05/11/2016** | **05/11/2016** | **05/09/2016** | **08/24/2016** | **05/11/2016** | **08/24/2016** |
| **Parameters** | **Units** | **Used Aquifer NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | **460** | 1 J | 1 J | ND(400) | **76 J** |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(5) | ND(1) | ND(1) | ND(200) | ND(50) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | 0.7 J | 140 | 1 J | 2 J | ND(400) | 31 J |
| Benzene | µg/L | 5 | ND(1) | 2 | **130** | **6** | **6** | **480000** | **320000** |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | 260 | 1 | 1 | 320 | 270 |
| Isopropyl benzene | µg/L | 3500 | ND(2) | 100 | 35 | 77 | 74 | **12000** | **7500** |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | 1 | ND(1) | ND(5) | ND(1) | ND(1) | ND(200) | ND(50) |
| Toluene | µg/L | 1000 | ND(1) | 0.6 J | 74 | 2 | 2 | **55000** | **33000** |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | 0.5 J | 1600 | 6 | 6 | 1400 | 1100 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.18 | 2.0 | 5.4 | 7.4 | 13 | 0.86 | 0.15 J |
| Benzo(a)anthracene | µg/L | 4.9 | ND(0.050) | 0.46 | 2.0 | 0.68 | 0.67 | 0.52 | 0.10 J |
| Benzo(a)pyrene | µg/L | 0.2 | ND(0.050) | **0.25** | **1.2** | **0.33** | **0.22** | **0.40 J** | ND(0.50) |
| Benzo(b)fluoranthene | µg/L | 1.2 | ND(0.050) | 0.30 | **1.6** | 0.36 | 0.24 | 0.53 | ND(0.50) |
| Benzo(g,h,i)perylene | µg/L | 0.26 | ND(0.050) | 0.075 | **0.42 J** | 0.11 | 0.071 | 0.22 J | ND(0.50) |
| Chrysene | µg/L | 1.9 | ND(0.050) | 0.39 | **2.0** | 0.47 | 0.49 | 0.53 | ND(0.50) |
| Fluorene | µg/L | 1900 | 0.014 J | 8.7 | 1.1 | 34 | 50 | 2.8 | 0.90 |
| Naphthalene | µg/L | 100 | ND(0.060) | ND(0.062) | 19 | 4.4 | 3.3 | 52 | 31 |
| Phenanthrene | µg/L | 1100 | 0.55 | 7.1 | 6.6 | 23 | 41 | 4.5 | 1.2 |
| Pyrene | µg/L | 130 | ND(0.050) | 1.8 | 4.3 | 4.2 | 5.4 | 0.93 | 0.15 J |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | - | ND(1.0) | 0.24 J | 0.70 J | - | ND(1.0) | - |
| Lead (dissolved) | µg/L | 5 | ND(1.0) | - | - | - | 0.13 J | - | 0.12 J |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.030) | ND(0.028) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | | B-152 | B-152 | B-153 | B-154 | B-155 | B-156 | B-158 |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID: | | PADEP Act2 Used Aquifer NR MSC | GW-11109613-B152-05-09-16-AC-025 | GW-11109613-DUP3-05-09-16-AC-027 | GW-11109613-B153-05-04-16-RM-010 | GW-11109613-B154-05-10-16-MM-038 | GW-11109613-B155-05-05-16-AC-013 | GW-11109613-B154-05-10-16-MM-036 | GW-11109613-B158-05-09-16-AC-033 |
| Sample Date: | | | 05/09/2016 | 05/09/2016 Duplicate | 05/04/2016 | 05/10/2016 | 05/05/2016 | 05/10/2016 | 05/09/2016 |
| **Parameters** | **Units** | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 5 | 4 | ND(2) | **ND(400)** | 62 J | 4 | ND(2) |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | **ND(200)** | **ND(50)** | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | 3 | 3 | ND(2) | ND(400) | ND(100) | 5 | ND(2) |
| Benzene | µg/L | 5 | **42** | **39** | ND(1) | **51000** | **120000** | **49** | ND(1) |
| Ethylbenzene | µg/L | 700 | 3 | 3 | ND(1) | ND(200) | 120 | 4 | ND(1) |
| Isopropyl benzene | µg/L | 3500 | 120 | 110 | ND(2) | 150 J | 79 J | 120 | ND(2) |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | **ND(200)** | **ND(50)** | ND(1) | ND(1) |
| Toluene | µg/L | 1000 | 16 | 15 | ND(1) | 180 J | 820 | 13 | ND(1) |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | 28 | 25 | ND(1) | ND(200) | 150 | 22 | ND(1) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 2.6 | 2.1 | 0.099 | 1.5 | 3.7 | 4.7 | 0.027 J |
| Benzo(a)anthracene | µg/L | 4.9 | 0.12 | 0.14 | 0.052 | 0.12 | 0.31 | 1.7 | 0.058 |
| Benzo(a)pyrene | µg/L | 0.2 | 0.088 | 0.11 | 0.038 J | 0.10 | **0.25** | **1.4** | 0.045 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.11 | 0.13 | 0.040 J | 0.084 | 0.24 | **1.5** | 0.051 |
| Benzo(g,h,i)perylene | µg/L | 0.26 | 0.058 | 0.081 | 0.018 J | 0.054 | 0.088 | **0.50** | 0.029 J |
| Chrysene | µg/L | 1.9 | 0.13 | 0.14 | 0.058 | 0.099 | 0.27 | 1.4 | 0.051 |
| Fluorene | µg/L | 1900 | 2.3 | 2.3 | 0.018 J | 7.0 | 6.6 | 10 | 0.064 |
| Naphthalene | µg/L | 100 | ND(0.060) | ND(0.061) | ND(0.061) | 20 | 42 | 3.3 | 0.042 J |
| Phenanthrene | µg/L | 1100 | 4.9 | 3.8 | 0.043 J | 4.9 | 12 | 17 | 0.040 J |
| Pyrene | µg/L | 130 | 1.5 | 1.6 | 0.27 | 0.51 | 1.3 | 3.4 | 0.22 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | ND(1.0) | ND(1.0) | ND(1.0) | ND(1.0) | - | ND(1.0) | 1.2 |
| Lead (dissolved) | µg/L | 5 | - | - | - | - | ND(1.0) | - | - |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-158** | **B-162** | **B-163** | **B-164** | **B-164** | **B-165** | **B-168** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B-158-082216-AC-002** | **GW-11109613-B162-05-10-16-AC-039** | **GW-11109613-B163-05-10-16-AC-037** | **GW-11109613-B164-05-09-16-AC-031** | **GW-11109613-B-164-082316-KC-014** | **GW-11109613-B165-05-05-16-AC-015** | **GW-11109613-B168-05-04-16-AC-009** |
| **Sample Date:** | | **Act2** | **08/22/2016** | **05/10/2016** | **05/10/2016** | **05/09/2016** | **08/23/2016** | **05/05/2016** | **05/04/2016** |
| **Parameters** | **Units** | **Used Aquifer NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| Benzene | µg/L | 5 | ND(1) | ND(1) | 0.9 J | ND(1) | 1 | 4 | ND(1) |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | ND(2) | 5 | 5 | 5 | 2 J |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | 2 | ND(1) |
| Toluene | µg/L | 1000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | 0.5 J |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.037 J | 0.62 | 0.044 J | 0.026 J | 0.057 | 0.48 | 0.52 |
| Benzo(a)anthracene | µg/L | 4.9 | 0.055 | 0.41 | 0.097 | 0.027 J | 0.017 J | 0.17 | 0.066 |
| Benzo(a)pyrene | µg/L | 0.2 | 0.042 J | **0.32** | 0.090 | 0.047 J | 0.019 J | 0.039 J | 0.037 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.046 J | 0.34 | 0.17 | 0.049 J | 0.021 J | 0.050 J | 0.038 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | 0.027 J | 0.17 | 0.064 | 0.035 J | 0.018 J | 0.025 J | 0.016 J |
| Chrysene | µg/L | 1.9 | 0.045 J | 0.47 | 0.13 | 0.027 J | 0.013 J | 0.13 | 0.063 |
| Fluorene | µg/L | 1900 | 0.094 | 1.4 | 1.2 | 0.081 | 0.069 | 1.4 | 2.1 |
| Naphthalene | µg/L | 100 | 0.078 | 0.61 | ND(0.061) | ND(0.062) | 0.037 J | ND(0.063) | ND(0.061) |
| Phenanthrene | µg/L | 1100 | 0.043 J | 0.56 | 0.037 J | ND(0.062) | 0.045 J | 0.37 | 0.92 |
| Pyrene | µg/L | 130 | 0.31 | 1.1 | 0.27 | 0.043 J | 0.047 J | 1.2 | 0.41 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | - | 0.31 J | ND(1.0) | 1.1 | - | - | ND(1.0) |
| Lead (dissolved) | µg/L | 5 | 0.89 J | - | - | - | 1.9 | 1.0 | - |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.028) | ND(0.028) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-169** | **B-169** | **B-170** | **B-170** | **B-170** | **B-172** | **B-172** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B169-05-09-16-MM-024** | **GW-11109613-B-169-082216-KC-001** | **GW-11109613-B170-05-05-16-AC-017** | **GW-11109613-DUP2-05-05-16-AC-019** | **GW-11109613-B-170-082216-KC-003** | **GW-11109613-B172-05-05-16-AC-021** | **GW-11109613-B-172-082316-AC-009** |
| **Sample Date:** | | **Act2** | **05/09/2016** | **08/22/2016** | **05/05/2016** | **05/05/2016** | **08/22/2016** | **05/05/2016** | **08/23/2016** |
| | | **Used Aquifer** | | | | **Duplicate** | | | |
| **Parameters** | **Units** | **NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(10) |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(10) |
| Benzene | µg/L | 5 | 0.7 J | ND(1) | 5 | 5 | 3 | **13** | **160** |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(5) |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | 6 | 5 | 5 | 7 | ND(10) |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(5) |
| Toluene | µg/L | 1000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(5) |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | 2 | 1 | 0.7 J | 0.6 J | ND(5) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.084 | ND(0.057) | 0.36 | 0.37 | 0.26 | 0.33 | 0.33 J |
| Benzo(a)anthracene | µg/L | 4.9 | 0.17 | 0.013 J | 0.10 | 0.10 | 0.065 | 0.49 | 0.27 J |
| Benzo(a)pyrene | µg/L | 0.2 | 0.17 | 0.015 J | 0.11 | 0.090 | 0.043 J | **0.45** | 0.18 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.19 | 0.020 J | 0.12 | 0.088 | 0.044 J | 0.50 | 0.18 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | 0.12 | 0.016 J | 0.047 J | 0.043 J | 0.020 J | 0.19 | 0.085 J |
| Chrysene | µg/L | 1.9 | 0.17 | 0.017 J | 0.11 | 0.11 | 0.069 | 0.51 | 0.25 |
| Fluorene | µg/L | 1900 | 0.043 J | ND(0.057) | 2.5 | 2.3 | 0.61 | 0.42 | 0.56 J |
| Naphthalene | µg/L | 100 | 0.071 | ND(0.069) | 2.3 | 4.8 | ND(0.068) | 0.27 | ND(0.061) |
| Phenanthrene | µg/L | 1100 | 0.069 | ND(0.069) | 1.3 | 1.8 | 0.99 | 0.38 | 0.26 J |
| Pyrene | µg/L | 130 | 0.27 | 0.035 J | 0.35 | 0.34 | 0.31 | 1.4 | 1.0 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | **33.8** | - | - | - | - | - | - |
| Lead (dissolved) | µg/L | 5 | - | **6.5** | ND(1.0) | ND(1.0) | ND(1.0) | 0.18 J | 0.30 J |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.028) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **B-172** | **B-173** | **B-173** | **B-174** | **B-174** | **B-175** | **B-175** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-B-172D-082316-AC-011** | **GW-11109613-B173-05-05-16-RM-018** | **GW-11109613-B-173-082316-KC-012** | **GW-11109613-B174-05-05-16-RM-016** | **GW-11109613-B-174-082216-KC-007** | **GW-11109613-B175-05-11-16-MM-045** | **GW-11109613-B-175-082316-AC-015** |
| **Sample Date:** | | **Act2** | **08/23/2016** | **05/05/2016** | **08/23/2016** | **05/05/2016** | **08/22/2016** | **05/11/2016** | **08/23/2016** |
| | | **Used Aquifer** | **Duplicate** | | | | | | |
| **Parameters** | **Units** | **NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(10) | ND(20) | 5 | ND(2) | ND(2) | 4 J | 2 J |
| 1,2-Dichloroethane | µg/L | 5 | ND(5) | **ND(10)** | ND(1) | ND(1) | ND(1) | ND(5) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(10) | 13 J | 14 | ND(2) | ND(2) | 51 | 10 |
| Benzene | µg/L | 5 | **160** | **14** | **17** | ND(1) | ND(1) | **260** | **65** |
| Ethylbenzene | µg/L | 700 | ND(5) | ND(10) | 4 | ND(1) | ND(1) | 25 | 5 |
| Isopropyl benzene | µg/L | 3500 | ND(10) | 27 | 33 | ND(2) | ND(2) | 150 | 63 |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(5) | ND(10) | ND(1) | 5 | 7 | ND(5) | ND(1) |
| Toluene | µg/L | 1000 | ND(5) | 5 J | 5 | ND(1) | ND(1) | 70 | 15 |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(5) | ND(10) | 8 | ND(1) | ND(1) | 33 | 11 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.10 J | 6.0 | 6.1 | 0.096 | 0.095 | 1.7 | 0.78 |
| Benzo(a)anthracene | µg/L | 4.9 | 0.13 J | 2.1 | 1.2 | 0.048 J | 0.080 | 1.3 | 0.36 |
| Benzo(a)pyrene | µg/L | 0.2 | 0.092 J | **1.0** | **0.51 J** | 0.032 J | 0.060 J | **0.89** | **0.22 J** |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.094 J | 1.0 | 0.55 J | 0.038 J | 0.065 J | 1.1 | 0.27 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | 0.041 J | 0.25 J | 0.12 J | 0.015 J | 0.034 J | **0.38** | 0.096 J |
| Chrysene | µg/L | 1.9 | 0.15 | 1.4 | 0.90 | 0.042 J | 0.081 | 1.2 | 0.33 |
| Fluorene | µg/L | 1900 | 0.23 J | 16 | 18 | 0.25 | 0.27 | 5.9 | 3.2 |
| Naphthalene | µg/L | 100 | ND(0.064) | 13 | 12 | 0.099 | 0.083 | ND(0.061) | ND(0.062) |
| Phenanthrene | µg/L | 1100 | 0.036 J | 23 | 22 | 0.43 | 0.48 | 8.7 | 3.5 |
| Pyrene | µg/L | 130 | 0.86 | 6.4 | 4.8 | 0.19 | 0.33 | 2.3 | 0.93 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | - | - | - | - | - | **6.9** | - |
| Lead (dissolved) | µg/L | 5 | 0.25 J | 0.75 J | 1.4 | ND(1.0) | 1.9 | - | 3.1 |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.028) | 0.020 J | ND(0.028) | ND(0.029) | ND(0.028) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **U-4** | **U-4** | **URS-1** | **URS-1** | **URS-3** | **URS-3** | **URS-3** |
|---|---|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-U4-05-05-16-AC-022** | **GW-11109613-U-4-082216-AC-004** | **GW-11109613-URS1-05-09-16-MM-028** | **GW-11109613-URS-1-082316-AC-013** | **GW-11109613-URS3-05-09-16-MM-030** | **GW-11109613-URS-3-082416-KC-024** | **GW-11109613-URS-3-082416-KC-025** |
| **Sample Date:** | | **Act2** | **05/05/2016** | **08/22/2016** | **05/09/2016** | **08/23/2016** | **05/09/2016** | **08/24/2016** | **08/24/2016** |
| **Parameters** | **Units** | **Used Aquifer NR MSC** | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) | 0.5 J |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(2) | 0.8 J | 0.7 J | 0.8 J |
| Benzene | µg/L | 5 | 2 | ND(1) | ND(1) | ND(1) | 4 | 2 | 1 |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(1) | 0.6 J | ND(1) | ND(1) |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | ND(2) | ND(2) | 55 | 2 J | 17 |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Toluene | µg/L | 1000 | 0.9 J | ND(1) | ND(1) | ND(1) | 2 | 0.9 J | 1 |
| Total BTEX | µg/L | | - | - | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | ND(1) | ND(1) | 9 | 8 | 7 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.058 | 0.32 J | 0.33 | 0.62 | 21 | 0.17 | 9.6 |
| Benzo(a)anthracene | µg/L | 4.9 | 0.42 | 0.99 | 0.038 J | 0.017 J | **66** | **5.3** | **17** |
| Benzo(a)pyrene | µg/L | 0.2 | **0.78** | **2.7 J** | 0.028 J | ND(0.053) J | **47** | **4.5** | **12** |
| Benzo(b)fluoranthene | µg/L | 1.2 | 0.33 | 1.1 J | 0.034 J | ND(0.053) J | **56** | **5.4** | **14** |
| Benzo(g,h,i)perylene | µg/L | 0.26 | **0.44** | **2.4 J** | 0.012 J | ND(0.053) J | **14** | **1.4** | **3.2** |
| Chrysene | µg/L | 1.9 | 1.1 | **4.5** | 0.035 J | 0.012 J | **46** | **3.9** | **12** |
| Fluorene | µg/L | 1900 | 0.085 | 0.22 J | 5.2 | 16 | 27 | 4.9 | 28 |
| Naphthalene | µg/L | 100 | ND(0.062) | 9.3 | 0.29 | 4.4 | 3.2 | ND(0.065) | ND(0.061) |
| Phenanthrene | µg/L | 1100 | ND(0.062) | ND(0.60) | 0.73 | 0.98 | 55 | 2.5 | 40 |
| Pyrene | µg/L | 130 | 1.1 | 2.9 | 0.18 | 0.32 | 130 | 8.4 | 31 |
| **Metals** | | | | | | | | | |
| Lead | µg/L | 5 | - | - | ND(1.0) | - | 1.3 | - | - |
| Lead (dissolved) | µg/L | 5 | 0.50 J | 0.78 J | - | 0.22 J | - | - | 2.1 |
| **Fumigant** | | | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.028) | ND(0.029) | ND(0.029) | 0.011 J | ND(0.028) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7a**

**Groundwater Analytical Results Summary - Shallow Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | **URS-4** | **URS-4** | **URS-5** | **URS-5** | **URS-5** |
|---|---|---|---|---|---|---|---|
| **Sample ID:** | | **PADEP** | **GW-11109613-URS4-05-09-16-MM-026** | **GW-11109613-URS-4-082416-AC-017** | **GW-11109613-URS5-05-10-16-MM-040** | **GW-11109613-URS-5-082416-AC-020** | **GW-11109613-URS-5-082416-KC-021** |
| **Sample Date:** | | **Act2** | **05/09/2016** | **08/24/2016** | **05/10/2016** | **08/24/2016** | **08/24/2016** |
| **Parameters** | **Units** | **Used Aquifer NR MSC** | | | | | |
| **Volatile Organic Compounds** | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | **190** | **92** | **230** |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | **ND(25)** | **ND(10)** | **ND(20)** |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | 56 | 27 | 72 |
| Benzene | µg/L | 5 | ND(1) | ND(1) | **4000** | **2300** | **4900** |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | 560 | 280 | 530 |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | 22 J | 13 J | 31 J |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | 2 | 2 | **ND(25)** | ND(10) | ND(20) |
| Toluene | µg/L | 1000 | ND(1) | ND(1) | **8600** | **1500** | **6500** |
| Total BTEX | µg/L | | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | 3000 | 1500 | 2800 |
| **Semi-Volatile Organic Compounds** | | | | | | | |
| Anthracene | µg/L | 66 | 0.052 | 0.027 J | 5.6 | 3.3 | 4.8 |
| Benzo(a)anthracene | µg/L | 4.9 | 0.012 J | ND(0.050) | 0.96 | 0.23 | 0.46 J |
| Benzo(a)pyrene | µg/L | 0.2 | ND(0.050) | ND(0.050) | **0.27 J** | 0.058 | 0.15 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | ND(0.050) | ND(0.050) | 0.24 J | 0.056 | 0.14 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | ND(0.050) | ND(0.050) | **ND(0.51)** | 0.017 J | **ND(0.51)** |
| Chrysene | µg/L | 1.9 | ND(0.050) | ND(0.050) | 0.53 | 0.11 | 0.25 J |
| Fluorene | µg/L | 1900 | 0.019 J | 0.022 J | 14 | 1.5 | 14 |
| Naphthalene | µg/L | 100 | ND(0.060) | ND(0.060) | **260** | **150** | **220** |
| Phenanthrene | µg/L | 1100 | 0.055 J | ND(0.060) | 20 | 12 | 21 |
| Pyrene | µg/L | 130 | 0.074 | 0.067 | 3.5 | 1.7 | 2.8 |
| **Metals** | | | | | | | |
| Lead | µg/L | 5 | ND(1.0) | - | ND(1.0) | - | - |
| Lead (dissolved) | µg/L | 5 | - | ND(1.0) | - | ND(1.0) | 0.14 J |
| **Fumigant** | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.028) | ND(0.029) | **0.089** | ND(0.040) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 7b**

**Groundwater Analytical Results Summary - Semi-Confirmed (Lower) Aquifer**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location: | | | B-48D | B-132D | B-133D | B-134D | B-134D |
|---|---|---|---|---|---|---|---|
| Sample ID: | | PADEP Act2 Used Aquifer NR MSC | GW-11109613-B48D-05-03-16-AC-005 | GW-11109613-B132D-05-03-16-RM-002 | GW-11109613-B133D-05-03-16-RM-004 | GW-11109613-B134D-05-03-16-AC-001 | GW-11109613-DUP1-05-03-16-AC-003 |
| Sample Date: | | | 05/03/2016 | 05/03/2016 | 05/03/2016 | 05/03/2016 | 05/03/2016 |
| Parameters | Units | | | | | | Duplicate |
| **Volatile Organic Compounds** | | | | | | | |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| 1,2-Dichloroethane | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| Benzene | µg/L | 5 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Ethylbenzene | µg/L | 700 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Isopropyl benzene | µg/L | 3500 | ND(2) | ND(2) | ND(2) | ND(2) | ND(2) |
| Methyl tert butyl ether (MTBE) | µg/L | 20 | 12 | 2 | 1 | 2 | 1 |
| Toluene | µg/L | 1000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| Total BTEX | µg/L | | - | - | - | - | - |
| Xylenes (total) | µg/L | 10000 | ND(1) | ND(1) | ND(1) | ND(1) | ND(1) |
| **Semi-Volatile Organic Compounds** | | | | | | | |
| Anthracene | µg/L | 66 | 0.42 | 0.088 | 0.18 | 0.069 | 0.039 J |
| Benzo(a)anthracene | µg/L | 4.9 | 0.044 J | 0.018 J | 0.024 J | ND(0.051) | 0.011 J |
| Benzo(a)pyrene | µg/L | 0.2 | ND(0.050) | 0.017 J | 0.017 J | ND(0.051) | 0.012 J |
| Benzo(b)fluoranthene | µg/L | 1.2 | ND(0.050) | 0.018 J | 0.015 J | ND(0.051) | 0.013 J |
| Benzo(g,h,i)perylene | µg/L | 0.26 | ND(0.050) | 0.013 J | 0.010 J | ND(0.051) | 0.017 J |
| Chrysene | µg/L | 1.9 | 0.034 J | 0.015 J | 0.021 J | ND(0.051) | ND(0.051) |
| Fluorene | µg/L | 1900 | 2.3 | 0.018 J | 0.030 J | 0.012 J | 0.011 J |
| Naphthalene | µg/L | 100 | ND(0.060) | 0.082 | ND(0.060) | ND(0.061) | ND(0.061) |
| Phenanthrene | µg/L | 1100 | 2.4 | 0.18 | 0.49 | 0.27 | 0.27 |
| Pyrene | µg/L | 130 | 0.43 | 0.033 J | 0.047 J | 0.017 J | 0.020 J |
| **Metals** | | | | | | | |
| Lead | µg/L | 5 | ND(1.0) | ND(1.0) | 1.4 | 0.14 J | 0.14 J |
| Lead (dissolved) | µg/L | 5 | - | - | - | - | - |
| **Fumigant** | | | | | | | |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/L | 0.05 | ND(0.029) | ND(0.028) | ND(0.029) | ND(0.029) | ND(0.028) |

Notes:

| | |
|---|---|
| ND | Not detected at the associated reporting limit. |
| J | Estimated concentration. |
| **ND(10)** | Indicates the laboratory method detection limit (if available) was above the applicable standard. The reporting limit is shown if the laboratory method detection limit is not available. |
| **Value** | Concentration exceeds applicable criteria |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-39 | | | | | B-43 | | B-45 | | | B-46 | | B-48 | | B-48D | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 8-Jan-13 | 8-Jan-13 | 11-May-16 | 24-Aug-16 | 24-Aug-16 | 23-May-16 | 22-Aug-16 | 7-Jan-13 | 7-Jan-13 | 5-May-16 | 7-Jan-13 | 7-Jan-13 | 4-Jan-13 | 4-Jan-13 | 5-Feb-13 | 5-Feb-13 | 5-Feb-13 | 5-Feb-13 | 1-Apr-13 | 1-Apr-13 | 3-May-16 |
| Sample ID | | | B39_010813 | B39_010813 | GW-11109613-B39-05-11-16-MM-043 | GW-11109613-B-39-082416-AC-022 | GW-11109613-B-39-082416-KC-023 | B-43-20160523 | GW-11109613-B-43-082216-KC-005 | B-45_010713 | B-45_010713 | GW-11109613-B45-05-05-16-RM-014 | B46_010713 | B46_010713 | B48_010413 | B48_010413 | B-48D_020513 | B-48D_020513 | B-48D_020513 | B-48D_020513 | B-48D_40113 | B-48D_40113 | GW-11109613-B48D-05-03-16-AC-005 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | GHD | GHD | STANTEC | GHD | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | LANGAN | LANGAN | GHD |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | LL | LL | LL | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL |
| Laboratory Work Order | | | JB25964 | JB25964 | 1660120 | 1700681 | 1700681 | 1666456 | 1699628 | JB25835 | JB25835 | 1658374 | JB25834 | JB25834 | JB25729 | JB25729 | JB28204 | JB28204 | JB28204R | JB28204R | JB32976 | JB32976 | 1657425 |
| Laboratory Sample ID | Units | MSC-PA | JB25964-4 | JB25964-4F | 8378039 | 8553514 | 8553515 | 8402590 | 8548681 | JB25835-10 | JB25835-10F | 8370269 | JB25834-5 | JB25834-5F | JB25729-4 | JB25729-4F | JB28204-3 | JB28204-3F | JB28204-3FR | JB28204-3R | JB32976-7 | JB32976-7F | 8365508 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | NM | - | - | - | 0.34 | - | - | 3.48 | - | - | - | - | - | - | - | - | - | - | 0.62 |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | NM | - | - | 3.08 | 15.08 | - | - | 0 | - | - | - | - | - | - | - | - | - | - | 0 |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | NM | - | - | -138 | -135 | - | - | -140 | - | - | - | - | - | - | - | - | - | - | -83 |
| pH, FIELD MEASURED | S.U. | n/v | - | - | NM | - | - | 7.69 | 7.84 | - | - | 7.16 | - | - | - | - | - | - | - | - | - | - | 6.44 |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | 0.376 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | NM | - | - | 18.37 | 25.7 | - | - | 12.6 | - | - | - | - | - | - | - | - | - | - | 15.27 |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | 0.245 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | NM | - | - | 89.2 | 378 | - | - | 3 | - | - | - | - | - | - | - | - | - | - | 40.1 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | **44.0 (1.0)** | - | 3 (0.5) | 4 (0.5) | 3 (0.5) | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (1.0) (0.24) | - | ND (1) (0.5) |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (1.0) (0.26) | - | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | 2.0 (1.0) | - | 2.0 (1.0) | - | - | - | - | - | ND (1.0) (0.23) | - | ND (1) (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 30.1 (2.0) | - | 11 (0.5) | 26 (0.5) | 17 (0.5) | 4 (0.5) | 6 (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - | - | - | - | - | ND (2.0) (0.45) | - | ND (2) (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | - | - | - | - | 6.2 (0.16) | - | 12 (0.5) |
| Toluene | µg/L | 1000 | 3.1 (1.0) | - | 0.7 J (0.5) | 2 (0.5) | 2 (0.5) | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (1.0) (0.23) | - | ND (1) (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | - | ND | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND (2.0) (2.0) | - | ND (2) (0.5) | 1 J (0.5) | 0.6 J (0.5) | ND (0.5) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | 3.7 (2.0) | - | 3.7 (2.0) | - | - | - | - | - | ND (2.0) (0.19) | - | ND (2) (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (0.5) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - | - | - | - | - | ND (2.0) (0.36) | - | ND (2) (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 3.8 (1.0) | - | 4 (0.5) | 5 (0.5) | 4 (0.5) | ND (0.5) (0.5) | 0.6 J (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | 7.3 (1.0) | - | 7.4 (1.0) | - | - | - | - | - | ND (1.0) (0.24) | - | ND (1) (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | **0.057 (0.010)** | ND (0.028) (0.010) | ND (0.0097) (0.010) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - | - | - | - | - | ND (0.020) (0.011) | - | ND (0.029) (0.0096) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 14.2 (1.0) | - | 5.8 (0.10) | 1.6 (0.010) | 0.41 (0.010) | 0.7 (0.1) | 0.22 (0.010) | ND (0.10) (0.10) | - | 0.042 J (0.010) | ND (0.10) (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | 0.262 (0.020) | - | 0.42 (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | **8.27 (1.0)** | - | 3.0 (0.10) | 0.48 (0.010) | 0.086 (0.010) | 2 (0.1) | 0.89 (0.010) | ND (0.10) (0.10) | - | 0.021 J (0.010) | 0.175 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (0.10) (0.012) | - | 0.044 J (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | **6.03 (1.0)** | - | **2.5 (0.10)** | **0.34 (0.010)** | 0.071 (0.010) | **2 (0.1)** | **0.66 J (0.010)** | ND (0.10) (0.10) | - | 0.030 J (0.010) | 0.177 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (0.10) (0.012) | - | ND (0.050) (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | **6.09 (1.0)** | - | **3.1 (0.10)** | 0.47 (0.010) | 0.083 (0.010) | **2 (0.1)** | 0.75 J (0.010) | ND (0.10) (0.10) | - | 0.043 J (0.010) | 0.167 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (0.10) (0.010) | - | ND (0.050) (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | **2.89 (1.0)** | - | **1.5 (0.10)** | 0.16 (0.010) | 0.057 (0.010) | **1 (0.1)** | **0.32 J (0.010)** | ND (0.10) (0.10) | - | 0.033 J (0.010) | 0.120 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (0.10) (0.016) | - | ND (0.050) (0.010) |
| Chrysene | µg/L | 1.9 | **6.78 (1.0)** | - | **2.6 (0.10)** | 0.43 (0.010) | 0.090 (0.010) | **3 (0.1)** | 1.0 (0.010) | ND (0.10) (0.10) | - | 0.050 J (0.010) | 0.190 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | ND (0.10) (0.012) | - | 0.034 J (0.010) |
| Fluorene | µg/L | 1900 | 36.6 (1.0) | - | 14 (0.10) | 5.5 (0.010) | 3.0 (0.010) | 0.9 (0.1) | 0.34 (0.010) | ND (0.10) (0.10) | - | 0.042 J (0.010) | 0.319 (0.10) | - | 2.12 (1.0) | - | - | - | - | - | 1.07 (0.017) | - | 2.3 (0.010) |
| Naphthalene | µg/L | 100 | ND (0.10) (0.10) | - | 8.0 (0.30) | 4.4 (0.030) | ND (0.064) (0.030) | ND (0.1) (0.1) | ND (0.063) (0.030) | ND (0.10) (0.10) | - | ND (0.061) (0.031) | 0.914 (0.10) | - | 1.44 (1.0) | - | - | - | - | - | ND (0.10) (0.036) | - | ND (0.060) (0.030) |
| Phenanthrene | µg/L | 1100 | 74.9 (1.0) | - | 25 (0.30) | 6.0 (0.030) | 0.86 (0.030) | ND (0.1) (0.1) | 0.24 (0.030) | ND (0.10) (0.10) | - | 0.065 (0.031) | 0.219 (0.10) | - | 1.26 (1.0) | - | - | - | - | - | 0.920 (0.021) | - | 2.4 (0.030) |
| Pyrene | µg/L | 130 | 24.1 (1.0) | - | 6.4 (0.10) | 1.1 (0.010) | 0.35 (0.010) | 7 (0.1) | 2.9 (0.010) | 0.115 (0.10) | - | 0.085 (0.010) | 0.530 (0.10) | - | ND (1.0) (1.0) | - | - | - | - | - | 0.270 (0.015) | - | 0.43 (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | 2.3 J (0.97) | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (50) (50) | - | - | - | ND (50) (0.59) | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33700 (100) | - | - | - | 40100 (24) | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | **6.4 (1.7)** | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **950 (15)** | - | - | - | **2210 (0.40)** | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (0.20) (0.20) | ND (0.20) (0.089) | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | 1.8 J (0.97) | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (50) (50) | - | - | - | ND (50) (0.59) | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25200 (100) | - | - | - | 24800 (24) | - |
| Lead | µg/L | 5 | - | **5.7 (3.0)** | **16.7 (0.13)** | 2.1 (0.090) | 4.7 (0.090) | ND (0.13) (0.13) | 2.8 (0.09) | - | ND (3.0) (3.0) | 0.14 J (0.13) | - | 4.2 (3.0) | - | ND (3.0) (3.0) | - | ND (3.0) (3.0) | - | - | - | **5.2 (1.7)** | ND (1.0) (0.13) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2070 (15)** | - | - | - | **2110 (0.40)** | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (0.20) (0.20) | - | - | ND (0.20) (0.089) | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 350000 (5000) | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 350000 (3500) | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 64500 (48) | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 150 B (5.1) | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9500 (330) | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 20 B (5.6) | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 20 B (4.6) | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (10) (1) | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 380 B (380) | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 680 B (280) | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4800 (240) | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 300000 (1800) | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-92 | | B-94 | | B-95 | B-115 | | | B-116 | | | | | | B-117 | | B-123 | | B-125 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 8-Jan-13 | 8-Jan-13 | 7-Jan-13 | 7-Jan-13 | 23-May-16 | 4-Jan-13 | 4-Jan-13 | 4-May-16 | 4-Jan-13 | 4-Jan-13 | 4-May-16 | 24-Aug-16 | 25-Aug-16 | 25-Aug-16 | 4-May-16 | 22-Aug-16 | 8-Jan-13 | 8-Jan-13 | 8-Jan-13 | 8-Jan-13 | 9-May-16 | 23-Aug-16 |
| Sample ID | | | B92_010813 | B92_010813 | B94_010713 | B94_010713 | B-95-20160523 | B115_010413 | B115_010413 | GW-11109613-B115-05-04-16-AC-007 | B116_010413 | B116_010413 | GW-11109613-B116-05-04-16-RM-006 | GW-11109613-B-116-082416-AC-026 | GW-11109613-B-116-082416-AC-027 | GW-11109613-B-116D-082416-AC-028 | GW-11109613-B117-05-04-16-AC-008 | GW-11109613-B-117-082216-AC-006 | B123_010813 | B123_010813 | B125_010813 | B125_010813 | GW-11109613-B125-05-09-16-MM-032 | GW-11109613-B-125-082316-KC-010 |
| Sampling Company | | | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | STANTEC | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | GHD | GHD | GHD | GHD | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | GHD | GHD |
| Laboratory | | | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | LL | LL | LL | LL | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL |
| Laboratory Work Order | | | JB25963 | JB25963 | JB25834 | JB25834 | 1666456 | JB25729 | JB25729 | 1657425 | JB25729 | JB25729 | 1657425 | 1700681 | 1700681 | 1700681 | 1657425 | 1699628 | JB25963 | JB25963 | JB25964 | JB25964 | 1659064 | 1699628 |
| Laboratory Sample ID | Units | MSC-PA | JB25963-4 | JB25963-4F | JB25834-1 | JB25834-1F | 8402591 | JB25729-1 | JB25729-1F | 8365510 | JB25729-2 | JB25729-2F | 8365509 | 8553518 | 8553520 | 8553521 | 8365511 | 8548682 | JB25963-1 | JB25963-1F | JB25964-1 | JB25964-1F | 8373137 | 8548687 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | - | - | - | - | - | 0.866 | - | - | 1.44 | - | 1.42 | 1.42 | 1.67 | 1.4 | - | - | - | - | 5.06 | 5.81 |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | - | - | 2.5 | - | - | 4.88 | - | - | 0 | - | 7.38 | 7.38 | 0 | 1.83 | - | - | - | - | 0.68 | 2.72 |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | - | - | -83 | - | - | -22 | - | - | -66 | - | 111 | 111 | -49 | -128 | - | - | - | - | -152 | -146 |
| pH, FIELD MEASURED | S.U. | n/v | - | - | - | - | 7.49 | - | - | 6.67 | - | - | 6.29 | - | 6.55 | 6.55 | 6.11 | 6.57 | - | - | - | - | 6.8 | 6.92 |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | 0.518 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | - | - | 17.52 | - | - | 13 | - | - | 13.3 | - | 23 | 23 | 13.4 | 22.94 | - | - | - | - | 15.6 | 23.2 |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | 0.331 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | - | - | 74.2 | - | - | 10 | - | - | 470 | - | 282 | 282 | 42 | 365 | - | - | - | - | 0 | 0.1 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (0.5) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | **173 (1.0)** | - | **9 (0.5)** | **9 (0.5)** |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (0.5) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | 1.0 (1.0) | - | 1.2 (1.0) | - | ND (0.5) (0.5) | 2.0 (1.0) | - | ND (1) (0.5) | 1.7 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 1.4 (1.0) | - | 1.3 (1.0) | - | 0.6 J (0.5) | ND (1) (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 11.0 (2.0) | - | ND (2.0) (2.0) | - | ND (0.5) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | 0.5 J (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | 29.7 (2.0) | - | 14.0 (2.0) | - | 8 (0.5) | 9 (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | 12.3 (1.0) | - | ND (0.5) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| Toluene | µg/L | 1000 | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (0.5) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | 6.1 (1.0) | - | 3 (0.5) | 4 (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | ND | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 2.3 (2.0) | - | 2.5 (2.0) | - | ND (0.5) (0.5) | 3.7 (2.0) | - | ND (2) (0.5) | 3.4 (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | 2.4 (2.0) | - | ND (2.0) (2.0) | - | 2 J (0.5) | 0.8 J (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - | ND (0.5) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - | 3 (0.5) | 2 (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 4.8 (1.0) | - | 4.7 (1.0) | - | ND (0.5) (0.5) | 7.4 (1.0) | - | ND (1) (0.5) | 6.3 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 6.0 (1.0) | - | 9.0 (1.0) | - | 30 (0.5) | 25 (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - | ND (0.0097) (0.010) | ND (0.020) (0.020) | - | ND (0.028) (0.0095) | ND (0.020) (0.020) | - | ND (0.028) (0.0094) | ND (0.028) (0.010) | ND (0.028) (0.010) | ND (0.029) (0.010) | ND (0.028) (0.0095) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | ND (0.028) (0.010) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 6.00 (1.0) | - | 0.154 (0.10) | - | ND (0.1) (0.1) | ND (1.0) (1.0) | - | 0.065 (0.010) | 0.363 (0.10) | - | 0.27 (0.010) | 0.036 J (0.010) | 0.11 (0.010) | 0.080 (0.010) | 1.8 (0.010) | 1.0 (0.010) | 4.51 (0.11) | - | 2.15 (0.10) | - | 1.5 (0.010) | 1.9 (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | 0.360 (0.10) | - | ND (0.10) (0.10) | - | 0.2 J (0.1) | ND (1.0) (1.0) | - | 0.034 J (0.010) | ND (0.10) (0.10) | - | 0.058 (0.010) | 0.021 J (0.010) | 0.045 J (0.010) | 0.028 J (0.010) | 0.46 (0.010) | 0.25 (0.010) | ND (0.11) (0.11) | - | 0.559 (0.10) | - | 0.45 (0.010) | 0.16 (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | 0.133 (0.10) | - | ND (0.10) (0.10) | - | **0.3 J (0.1)** | ND (1.0) (1.0) | - | ND (0.052) (0.010) | ND (0.10) (0.10) | - | 0.013 J (0.010) | ND (0.050) (0.010) | 0.018 J (0.010) | ND (0.051) (0.010) | **0.34 (0.010)** | 0.19 J (0.010) | ND (0.11) (0.11) | - | **0.262 (0.10)** | - | **0.23 (0.010)** | 0.040 J (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.2 J (0.1) | ND (1.0) (1.0) | - | 0.012 J (0.010) | ND (0.10) (0.10) | - | 0.017 J (0.010) | ND (0.050) (0.010) | 0.023 J (0.010) | ND (0.051) (0.010) | 0.42 (0.010) | 0.23 J (0.010) | ND (0.11) (0.11) | - | 0.224 (0.10) | - | 0.25 (0.010) | 0.046 J (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.2 J (0.1) | ND (1.0) (1.0) | - | ND (0.052) (0.010) | ND (0.10) (0.10) | - | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.051) (0.010) | ND (0.051) (0.010) | 0.22 (0.010) | 0.13 J (0.010) | ND (0.11) (0.11) | - | ND (0.10) (0.10) | - | 0.070 (0.010) | 0.012 J (0.010) |
| Chrysene | µg/L | 1.9 | 0.315 (0.10) | - | ND (0.10) (0.10) | - | 0.4 J (0.1) | ND (1.0) (1.0) | - | 0.035 J (0.010) | ND (0.10) (0.10) | - | 0.066 (0.010) | 0.031 J (0.010) | 0.059 (0.010) | 0.039 J (0.010) | 0.54 (0.010) | 0.34 (0.010) | ND (0.11) (0.11) | - | 0.414 (0.10) | - | 0.34 (0.010) | 0.13 (0.010) |
| Fluorene | µg/L | 1900 | 28.0 (1.0) | - | 1.16 (0.10) | - | ND (0.1) (0.1) | ND (1.0) (1.0) | - | 0.13 (0.010) | 1.50 (0.10) | - | 1.5 (0.010) | 0.054 (0.010) | 1.1 (0.010) | 0.91 (0.010) | 0.74 (0.010) | 0.24 (0.010) | 14.4 (1.1) | - | 5.77 (1.0) | - | 4.8 (0.010) | 6.6 (0.010) |
| Naphthalene | µg/L | 100 | 1.18 (0.10) | - | 0.601 (0.10) | - | ND (0.1) (0.1) | 1.24 (1.0) | - | ND (0.063) (0.031) | 0.793 (0.10) | - | 0.070 (0.030) | 0.031 J (0.030) | ND (0.061) (0.030) | ND (0.062) (0.030) | 0.11 (0.031) | ND (0.061) (0.030) | 2.12 (0.11) | - | 1.16 (0.10) | - | 0.40 (0.030) | 0.31 (0.030) |
| Phenanthrene | µg/L | 1100 | 30.4 (1.0) | - | 1.18 (0.10) | - | ND (0.1) (0.1) | ND (1.0) (1.0) | - | 0.40 (0.031) | 0.946 (0.10) | - | 0.054 J (0.030) | ND (0.060) (0.030) | ND (0.061) (0.030) | ND (0.062) (0.030) | 0.94 (0.031) | 1.1 (0.030) | 5.34 (1.1) | - | 1.48 (0.10) | - | 1.2 (0.030) | 3.3 (0.030) |
| Pyrene | µg/L | 130 | 2.91 (0.10) | - | 0.384 (0.10) | - | 0.7 (0.1) | ND (1.0) (1.0) | - | 0.24 (0.010) | 0.383 (0.10) | - | 0.65 (0.010) | 0.29 (0.010) | 0.39 (0.010) | 0.32 (0.010) | 3.3 (0.010) | 2.4 (0.010) | 2.44 (0.11) | - | 2.55 (0.10) | - | 2.1 (0.010) | 1.4 (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | 4.1 (3.0) | - | ND (3.0) (3.0) | ND (0.13) (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | 0.88 J (0.13) | ND (1.0) (0.090) | 0.14 J (0.090) | 0.16 J (0.090) | ND (1.0) (0.13) | 0.25 J (0.09) | - | ND (3.0) (3.0) | - | 4.4 (3.0) | 0.24 J (0.13) | ND (1.0) (0.09) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-126 | | | | B-131 | | | | | | | | | B-132 | | B-132D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 7-Jan-13 | 7-Jan-13 | 10-May-16 | 23-Aug-16 | 8-Jan-13 | 8-Jan-13 | 8-Apr-13 | 8-Apr-13 | 8-Apr-13 | 2-Jun-14 | 2-Jun-14 | 20-May-15 | 5-May-16 | 11-May-16 | 24-Aug-16 | 29-Mar-13 | 29-Mar-13 | 3-May-16 |
| Sample ID | | | B-126_010713 | B-126_010713 | GW-11109613-B126-05-10-16-MM-035 | GW-11109613-B-126-082316-KC-008 | B131_010813 | B131_010813 | B-131 | B-131_040813 | B-131_040813 | B-131 | B-131 | B-131_20150520 | GW-11109613-B131-05-05-16-RM-012 | GW-11109613-B132-05-11-16-AC-042 | GW-11109613-B-132-082416-AC-018 | B-132D_32913 | B-132D_32913 | GW-11109613-B132D-05-03-16-RM-002 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | UNKNOWN | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC | GHD | GHD | GHD | LANGAN | LANGAN | GHD |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | UNKNOWN | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | LL | LL | ACCUTEST | ACCUTEST | LL |
| Laboratory Work Order | | | JB25835 | JB25835 | 1659064 | 1699628 | JB25964 | JB25964 | 20140718EZ | JB33644 | JB33644 | JB68336 | JB68336 | 1562821 | 1658374 | 1660120 | 1700681 | JB32843 | JB32843 | 1657425 |
| Laboratory Sample ID | Units | MSC-PA | JB25835-1 | JB25835-1F | 8373140 | 8548685 | JB25964-2 | JB25964-2F | UNKNOWN | JB33644-16 | JB33644-16F | JB68336-14 | JB68336-14F | 7896253 | 8370267 | 8378038 | 8553510 | JB32843-2 | JB32843-2F | 8365505 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 1.19 | 1.27 | - | - | - | - | - | - | - | - | 1.01 | NM | - | - | - | 1.12 |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 18.5 | 12.69 | - | - | - | - | - | - | - | 0.55 | 0 | NM | - | - | - | 0 |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -118 | -168 | - | - | - | - | - | - | - | -103 | -95 | NM | - | - | - | -77 |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 7.07 | 7.07 | - | - | - | - | - | - | - | 7.87 | 6.84 | NM | - | - | - | 6.13 |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | 0.956 | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 13.3 | 23.4 | - | - | - | - | - | - | - | 14.17 | 11.9 | NM | - | - | - | 14.8 |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | 0.611 | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 0 | 0 | - | - | - | - | - | - | - | 18.8 | 0 | NM | - | - | - | 170 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | **189 (5.0)** | - | **95 (5)** | **78 (0.5)** | **19.7 (1.0)** | - | - | 1.1 (0.24) | - | 0.29 J (0.21) | - | 2 (0.5) | 1 (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.24) | - | ND (1) (0.5) |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (10) (5) | ND (5) (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.26) | - | ND (1.0) (0.30) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.26) | - | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | 17.7 (1.0) | - | 13 (5) | 9 (0.5) | ND (1.0) (1.0) | - | - | 0.32 J (0.23) | - | ND (1.0) (0.40) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.23) | - | ND (1) (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 63.5 (2.0) | - | 60 (5) | 40 (0.5) | 10.6 (2.0) | - | - | 13 (0.45) | - | 12.1 (0.26) | - | 11 (0.5) | 8 (0.5) | 8 (0.5) | 5 (0.5) | ND (2.0) (0.45) | - | ND (2) (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | ND (10) (5) | ND (5) (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.16) | - | ND (1.0) (0.26) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 2.1 (0.16) | - | 2 (0.5) |
| Toluene | µg/L | 1000 | 43.1 (1.0) | - | 40 (5) | 29 (0.5) | ND (1.0) (1.0) | - | - | 0.61 J (0.23) | - | 0.30 J (0.22) | - | 0.9 J (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.23) | - | ND (1) (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | 2.65 () | - | - | - | - | 3.5 () | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 12.3 (2.0) | - | 8 J (5) | 5 J (0.5) | ND (2.0) (2.0) | - | - | ND (2) (0.19) | - | ND (2.0) (0.19) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (0.19) | - | ND (2) (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | 6.6 (2.0) | - | 7 J (5) | 4 J (0.5) | ND (2.0) (2.0) | - | - | ND (2) (0.36) | - | ND (2.0) (0.17) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (0.36) | - | ND (2) (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 76.2 (1.0) | - | 64 (5) | 47 (0.5) | 1.1 (1.0) | - | - | 0.62 J (0.24) | - | 0.56 J (0.20) | - | 0.6 J (0.5) | 0.6 J (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.24) | - | ND (1) (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | - | ND (0.02) (0.011) | - | ND (0.020) (0.011) | - | ND (0.0096) (0.010) | ND (0.029) (0.0097) | ND (0.029) (0.0096) | ND (0.029) (0.010) | ND (0.020) (0.011) | - | ND (0.028) (0.0094) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 10.5 (1.0) | - | 9.1 (0.010) | 6.6 (0.010) | 0.916 (0.10) | - | - | 0.477 (0.02) | - | 0.747 (0.020) | - | 0.7 (0.1) | 0.76 (0.010) | 13 (0.10) | 1.5 (0.010) | ND (0.10) (0.020) | - | 0.088 (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | 0.363 (0.10) | - | 0.71 (0.010) | 0.82 (0.010) | 0.356 (0.10) | - | - | 0.169 (0.012) | - | 0.258 (0.012) | - | 0.4 J (0.1) | 0.37 (0.010) | **7.7 (0.10)** | 0.88 (0.010) | ND (0.10) (0.012) | - | 0.018 J (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | 0.119 (0.10) | - | **0.38 (0.010)** | **0.39 J (0.010)** | ND (0.10) (0.10) | - | - | ND (0.1) (0.012) | - | ND (0.10) (0.012) | - | 0.2 J (0.1) | 0.090 (0.010) | **4.4 (0.10)** | **0.49 (0.010)** | ND (0.10) (0.012) | - | 0.017 J (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.10) | - | 0.36 (0.010) | 0.39 J (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.01) | - | ND (0.10) (0.010) | - | 0.2 J (0.1) | 0.12 (0.010) | **5.6 (0.10)** | 0.57 (0.010) | ND (0.10) (0.010) | - | 0.018 J (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | 0.11 (0.010) | 0.14 J (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.016) | - | ND (0.10) (0.016) | - | ND (0.1) (0.1) | 0.021 J (0.010) | **1.5 (0.10)** | 0.17 (0.010) | ND (0.10) (0.016) | - | 0.013 J (0.010) |
| Chrysene | µg/L | 1.9 | 0.296 (0.10) | - | 0.60 (0.010) | 0.67 (0.010) | 0.331 (0.10) | - | - | 0.132 (0.012) | - | 0.206 (0.012) | - | 0.4 J (0.1) | 0.29 (0.010) | **5.1 (0.10)** | 0.61 (0.010) | ND (0.10) (0.012) | - | 0.015 J (0.010) |
| Fluorene | µg/L | 1900 | 49.5 (1.0) | - | 43 (0.10) | 39 (0.010) | 1.41 (0.10) | - | - | 1.08 (0.017) | - | 1.74 (0.017) | - | 2 (0.1) | 1.9 (0.010) | 51 (0.10) | 27 (0.010) | ND (0.10) (0.017) | - | 0.018 J (0.010) |
| Naphthalene | µg/L | 100 | 25.3 (1.0) | - | 22 (0.31) | 5.4 (0.030) | ND (0.10) (0.10) | - | - | ND (0.1) (0.036) | - | ND (0.10) (0.036) | - | ND (0.1) (0.1) | ND (0.061) (0.030) | 1.4 (0.31) | ND (0.060) (0.030) | ND (0.10) (0.036) | - | 0.082 (0.030) |
| Phenanthrene | µg/L | 1100 | 54.4 (1.0) | - | 53 (0.31) | 5.1 (0.030) | 0.496 (0.10) | - | - | 0.43 (0.021) | - | 0.333 (0.021) | - | 0.4 J (0.1) | 0.66 (0.030) | 74 (0.31) | 20 (0.030) | 0.180 (0.021) | - | 0.18 (0.030) |
| Pyrene | µg/L | 130 | 3.88 (0.10) | - | 4.7 (0.010) | 5.7 (0.010) | 3.00 (0.10) | - | - | 1.13 (0.015) | - | 2.51 (0.015) | - | 3 (0.1) | 2.3 (0.010) | 19 (0.10) | 3.4 (0.010) | ND (0.10) (0.015) | - | 0.033 J (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.5 (0.97) | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (50) (0.59) | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 37100 (24) | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **5.8 (1.7)** | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 275 (0.40) | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (0.20) (0.095) | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.0 J (0.97) | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (50) (0.59) | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 28400 (24) | - |
| Lead | µg/L | 5 | - | ND (3.0) (3.0) | ND (1.0) (0.13) | ND (1.0) (0.09) | - | 3.5 (3.0) | - | - | ND (3) (1.7) | - | 1.6 J (1.3) | 0.13 J (0.082) | ND (1.0) (0.13) | ND (1.0) (0.13) | 0.12 J (0.090) | - | **6.4 (1.7)** | ND (1.0) (0.13) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 (0.40) | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (0.20) (0.095) | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 295000 (5000) | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 298000 (2800) | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 75500 (48) | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 170 B (5.1) | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24400 (1500) | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (110) (5.6) | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (100) (4.6) | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (10) (1) | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND (10000) (380) | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 410 B (280) | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6200 (240) | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 302000 (1800) | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-133 | | | | | B-133D | | | B-134 | | | B-134D | | | | | | | | B-135 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 9-Jan-13 | 9-Jan-13 | 5-May-16 | 25-Aug-16 | 25-Aug-16 | 29-Mar-13 | 29-Mar-13 | 3-May-16 | 9-Jan-13 | 9-Jan-13 | 11-May-16 | 5-Feb-13 | 5-Feb-13 | 5-Feb-13 | 5-Feb-13 | 1-Apr-13 | 1-Apr-13 | 3-May-16 | 3-May-16 | 9-Jan-13 | 9-Jan-13 |
| Sample ID | | | B133_010913 | B133_010913 | GW-11109613-B133-05-05-16-RM-020 | GW-11109613-B-133D-082416-AC-029 | GW-11109613-B-133D-082416-AC-030 | B-133D_32913 | B-133D_32913 | GW-11109613-B133D-05-03-16-RM-004 | B134_010913 | B134_010913 | GW-11109613-B134-05-11-16-MM-041 | B-134D_020513 | B-134D_020513 | B-134D_020513 | B-134D_020513 | B-134D_40113 | B-134D_40113 | GW-11109613-B134D-05-03-16-AC-001 | GW-11109613-DUP1-05-03-16-AC-003 | B135_010913 | B135_010913 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | GHD | GHD | LANGAN | LANGAN | GHD | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | LANGAN | LANGAN | GHD | GHD | UNKNOWN | UNKNOWN |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | LL | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | JB26467 | JB26467 | 1658374 | 1700681 | 1700681 | JB32843 | JB32843 | 1657425 | JB26467 | JB26467 | 1660120 | JB28204 | JB28204 | JB28204R | JB28204R | JB32976 | JB32976 | 1657425 | 1657425 | JB26467 | JB26467 |
| Laboratory Sample ID | Units | MSC-PA | JB26467-1 | JB26467-1F | 8370275 | 8553522 | 8553523 | JB32843-3 | JB32843-3F | 8365507 | JB26467-2 | JB26467-2F | 8378037 | JB28204-2 | JB28204-2F | JB28204-2FR | JB28204-2R | JB32976-8 | JB32976-8F | 8365504 | 8365506 | JB26467-3 | JB26467-3F |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 1.17 | - | 0.69 | - | - | 1.22 | - | - | NM | - | - | - | - | - | - | 0.698 | 0.698 | - | - |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 0 | - | 0 | - | - | 0 | - | - | NM | - | - | - | - | - | - | 2.17 | 2.17 | - | - |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -98 | - | -140 | - | - | -86 | - | - | NM | - | - | - | - | - | - | -76 | -76 | - | - |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 6.46 | - | 6.51 | - | - | 6.11 | - | - | NM | - | - | - | - | - | - | 6.63 | 6.63 | - | - |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 14.3 | - | 19.97 | - | - | 15.2 | - | - | NM | - | - | - | - | - | - | 14.95 | 14.95 | - | - |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 14 | - | 50.8 | - | - | 69 | - | - | NM | - | - | - | - | - | - | 50.2 | 50.2 | - | - |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.24) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | 2 (0.5) | - | - | - | - | ND (1.0) (0.24) | - | ND (1) (0.5) | ND (1) (0.5) | 2.9 (1.0) | - |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.26) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | - | - | - | - | ND (1.0) (0.26) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - |
| Ethylbenzene | µg/L | 700 | 1.7 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.23) | - | ND (1) (0.5) | 1.9 (1.0) | - | ND (1) (0.5) | - | - | - | - | ND (1.0) (0.23) | - | ND (1) (0.5) | ND (1) (0.5) | 3.2 (1.0) | - |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 52.0 (2.0) | - | 59 (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (0.45) | - | ND (2) (0.5) | 67.8 (2.0) | - | 100 (0.5) | - | - | - | - | ND (2.0) (0.45) | - | ND (2) (0.5) | ND (2) (0.5) | 33.6 (2.0) | - |
| Methyl Tertiary Butyl Ether | µg/L | 20 | 3.2 (1.0) | - | 1 (0.5) | ND (1) (0.5) | 1 (0.5) | 1.6 (0.16) | - | 1 (0.5) | 2.5 (1.0) | - | ND (1) (0.5) | - | - | - | - | 1.8 (0.16) | - | 2 (0.5) | 1 (0.5) | ND (1.0) (1.0) | - |
| Toluene | µg/L | 1000 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.23) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | 0.6 J (0.5) | - | - | - | - | ND (1.0) (0.23) | - | ND (1) (0.5) | ND (1) (0.5) | 1.9 (1.0) | - |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 3.6 (2.0) | - | 0.7 J (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (0.19) | - | ND (2) (0.5) | 4.7 (2.0) | - | ND (2) (0.5) | - | - | - | - | ND (2.0) (0.19) | - | ND (2) (0.5) | ND (2) (0.5) | 4.3 (2.0) | - |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (0.36) | - | ND (2) (0.5) | 2.0 (2.0) | - | 0.7 J (0.5) | - | - | - | - | ND (2.0) (0.36) | - | ND (2) (0.5) | ND (2) (0.5) | 2.0 (2.0) | - |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 9.1 (1.0) | - | 2 (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (0.24) | - | ND (1) (0.5) | 11.2 (1.0) | - | 0.5 J (0.5) | - | - | - | - | ND (1.0) (0.24) | - | ND (1) (0.5) | ND (1) (0.5) | 17.7 (1.0) | - |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | ND (0.029) (0.010) | ND (0.029) (0.010) | ND (0.020) (0.011) | - | ND (0.029) (0.0095) | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | - | - | - | - | ND (0.020) (0.011) | - | ND (0.029) (0.0095) | ND (0.028) (0.0095) | ND (0.020) (0.020) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 5.66 (1.0) | - | 11 (0.10) | ND (0.050) (0.010) | 0.18 (0.010) | 0.133 (0.020) | - | 0.18 (0.010) | 5.26 (1.0) | - | 2.0 (0.010) | - | - | - | - | ND (0.10) (0.020) | - | 0.069 (0.010) | 0.039 J (0.010) | 9.34 (1.0) | - |
| Benzo(a)Anthracene | µg/L | 4.9 | 0.866 (0.10) | - | 1.7 (0.10) | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.012) | - | 0.024 J (0.010) | 0.148 (0.10) | - | 0.46 (0.010) | - | - | - | - | ND (0.10) (0.012) | - | ND (0.051) (0.010) | 0.011 J (0.010) | **7.94 (1.0)** | - |
| Benzo(a)Pyrene | µg/L | 0.2 | **0.245 (0.10)** | - | **0.72 (0.10)** | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.012) | - | 0.017 J (0.010) | ND (0.10) (0.10) | - | **0.25 (0.010)** | - | - | - | - | ND (0.10) (0.012) | - | ND (0.051) (0.010) | 0.012 J (0.010) | **4.02 (0.10)** | - |
| Benzo(b)Fluoranthene | µg/L | 1.2 | 0.193 (0.10) | - | 0.81 (0.10) | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.010) | - | 0.015 J (0.010) | ND (0.10) (0.10) | - | 0.30 (0.010) | - | - | - | - | ND (0.10) (0.010) | - | ND (0.051) (0.010) | 0.013 J (0.010) | **4.35 (0.10)** | - |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | 0.23 J (0.10) | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.016) | - | 0.010 J (0.010) | ND (0.10) (0.10) | - | 0.075 (0.010) | - | - | - | - | ND (0.10) (0.016) | - | ND (0.051) (0.010) | 0.017 J (0.010) | **1.46 (0.10)** | - |
| Chrysene | µg/L | 1.9 | 0.663 (0.10) | - | 1.3 (0.10) | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.012) | - | 0.021 J (0.010) | 0.121 (0.10) | - | 0.39 (0.010) | - | - | - | - | ND (0.10) (0.012) | - | ND (0.051) (0.010) | ND (0.051) (0.010) | **4.87 (0.10)** | - |
| Fluorene | µg/L | 1900 | 26.4 (1.0) | - | 33 (0.10) | ND (0.050) (0.010) | 0.014 J (0.010) | ND (0.10) (0.017) | - | 0.030 J (0.010) | 31.9 (1.0) | - | 8.7 (0.010) | - | - | - | - | ND (0.10) (0.017) | - | 0.012 J (0.010) | 0.011 J (0.010) | 37.6 (1.0) | - |
| Naphthalene | µg/L | 100 | 1.41 (0.10) | - | ND (0.61) (0.30) | 0.039 J (0.030) | ND (0.060) (0.030) | ND (0.10) (0.036) | - | ND (0.060) (0.030) | 0.964 (0.10) | - | ND (0.062) (0.031) | - | - | - | - | ND (0.10) (0.036) | - | ND (0.061) (0.030) | ND (0.061) (0.030) | 1.86 (0.10) | - |
| Phenanthrene | µg/L | 1100 | 32.7 (1.0) | - | 56 (0.30) | ND (0.060) (0.030) | 0.55 (0.030) | 0.415 (0.021) | - | 0.49 (0.030) | 29.0 (1.0) | - | 7.1 (0.031) | - | - | - | - | 0.162 (0.021) | - | 0.27 (0.030) | 0.27 (0.030) | 32.7 (1.0) | - |
| Pyrene | µg/L | 130 | 4.45 (0.10) | - | 7.4 (0.10) | ND (0.050) (0.010) | ND (0.050) (0.010) | ND (0.10) (0.015) | - | 0.047 J (0.010) | 1.93 (0.10) | - | 1.8 (0.010) | - | - | - | - | ND (0.10) (0.015) | - | 0.017 J (0.010) | 0.020 J (0.010) | 19.6 (1.0) | - |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | **10.2 (0.97)** | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | 5.5 (0.97) | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | 1.1 J (0.59) | - | - | - | - | - | ND (50) (50) | - | - | - | ND (50) (0.59) | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | 35600 (24) | - | - | - | - | - | 27600 (100) | - | - | - | 33300 (24) | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | **8.5 (1.7)** | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | **7.3 (1.7)** | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | 249 (0.40) | - | - | - | - | - | 284 (15) | - | - | - | 238 (0.40) | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | ND (0.20) (0.095) | - | - | - | - | - | - | - | - | ND (0.20) (0.20) | ND (0.20) (0.089) | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | 5.6 (0.97) | - | - | - | - | - | ND (3.0) (3.0) | - | - | - | 2.0 J (0.97) | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | 0.80 J (0.59) | - | - | - | - | - | ND (50) (50) | - | - | - | 0.90 J (0.59) | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | 24600 (24) | - | - | - | - | - | 22000 (100) | - | - | - | 9890 (24) | - | - | - | - | - |
| Lead | µg/L | 5 | - | ND (3.0) (3.0) | ND (1.0) (0.13) | 0.48 J (0.090) | ND (1.0) (0.090) | - | **6.0 (1.7)** | 1.4 (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | - | - | - | **6.6 (1.7)** | 0.14 J (0.13) | 0.14 J (0.13) | - | ND (3.0) (3.0) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | 229 (0.40) | - | - | - | - | - | **1850 (15)** | - | - | - | 219 (0.40) | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | ND (0.20) (0.095) | - | - | - | - | - | - | ND (0.20) (0.20) | - | - | ND (0.20) (0.089) | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | 286000 (5000) | - | - | - | - | - | - | - | - | - | 416000 (5000) | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | 287000 (2800) | - | - | - | - | - | - | - | - | - | 417000 (3500) | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | 89600 (48) | - | - | - | - | - | - | - | - | - | 56800 (48) | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | 160 B (5.1) | - | - | - | - | - | - | - | - | - | 160 B (5.1) | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | 26600 (1500) | - | - | - | - | - | - | - | - | - | **31700 (1600)** | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | ND (110) (5.6) | - | - | - | - | - | - | - | - | - | 19 B (5.6) | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | ND (100) (4.6) | - | - | - | - | - | - | - | - | - | 19 B (4.6) | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | ND (10) (1) | - | - | - | - | - | - | - | - | - | ND (10) (1) | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | ND (10000) (380) | - | - | - | - | - | - | - | - | - | ND (10000) (380) | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | 680 B (280) | - | - | - | - | - | - | - | - | - | 540 B (280) | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | 6300 (240) | - | - | - | - | - | - | - | - | - | 5900 (240) | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | 367000 (1800) | - | - | - | - | - | - | - | - | - | 285000 (1800) | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-144 | | | B-145 | | | | B-149 | | B-150 | | B-151 | | B-152 | | | | B-153 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 8-Jan-13 | 8-Jan-13 | 11-May-16 | 8-Jan-13 | 8-Jan-13 | 9-May-16 | 24-Aug-16 | 7-Jan-13 | 7-Jan-13 | 11-May-16 | 24-Aug-16 | 7-Jan-13 | 7-Jan-13 | 7-Jan-13 | 7-Jan-13 | 9-May-16 | 9-May-16 | 4-Jan-13 | 4-Jan-13 | 4-May-16 |
| Sample ID | | | B144_010813 | B144_010813 | GW-11109613-B144-05-11-16-AC-044 | B145_010813 | B145_010813 | GW-11109613-B145-05-09-16-AC-029 | GW-11109613-B-145-082416-KC-016 | B-149_010713 | B-149_010713 | GW-11109613-B150-05-11-16-AC-046 | GW-11109613-B-150-082416-AC-019 | B-151_010713 | B-151_010713 | B-152_010713 | B-152_010713 | GW-11109613-B152-05-09-16-AC-025 | GW-11109613-DUP3-05-09-16-AC-027 | B-153_010413 | B-153_010413 | GW-11109613-B153-05-04-16-RM-010 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | GHD |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | LL |
| Laboratory Work Order | | | JB25963 | JB25963 | 1660120 | JB25963 | JB25963 | 1659064 | 1700681 | JB25835 | JB25835 | 1660120 | 1700681 | JB25835 | JB25835 | JB25835 | JB25835 | 1659064 | 1659064 | JB25728 | JB25728 | 1657425 |
| Laboratory Sample ID | Units | MSC-PA | JB25963-2 | JB25963-2F | 8378040 | JB25963-3 | JB25963-3F | 8373134 | 8553508 | JB25835-2 | JB25835-2F | 8378042 | 8553511 | JB25835-3 | JB25835-3F | JB25835-4 | JB25835-4F | 8373130 | 8373132 | JB25728-4 | JB25728-4F | 8365513 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | NM | - | - | 0.272 | 0.24 | - | - | NM | - | - | - | - | - | 0.433 | 0.433 | - | - | 1.17 |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | NM | - | - | 2.38 | 3.06 | - | - | NM | - | - | - | - | - | 1.96 | 1.96 | - | - | 0.41 |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | NM | - | - | -120 | -169 | - | - | NM | - | - | - | - | - | -108 | -108 | - | - | -38 |
| pH, FIELD MEASURED | S.U. | n/v | - | - | NM | - | - | 7.28 | 7.35 | - | - | NM | - | - | - | - | - | 6.69 | 6.69 | - | - | 6.8 |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | NM | - | - | 16.32 | 23.4 | - | - | NM | - | - | - | - | - | 15.65 | 15.65 | - | - | 13.9 |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | NM | - | - | 17.5 | 0 | - | - | NM | - | - | - | - | - | 12.1 | 12.1 | - | - | 0 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | **77.5 (1.0)** | - | **130 (3)** | **18.0 (1.0)** | - | **6 (0.5)** | **6 (0.5)** | **47400 (500)** | - | **480000 (10000)** | **320000 (0.5)** | **15.2 (1.0)** | - | **38.8 (1.0)** | - | **42 (0.5)** | **39 (0.5)** | ND (1.0) (1.0) | - | ND (1) (0.5) |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (5) (3) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (200) (200) | - | ND (200) (100) | ND (50) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | 101 (1.0) | - | 260 (3) | 2.3 (1.0) | - | 1 (0.5) | 1 (0.5) | ND (200) (200) | - | 320 (100) | 270 (0.5) | 1.3 (1.0) | - | 3.5 (1.0) | - | 3 (0.5) | 3 (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 60.0 (2.0) | - | 35 (3) | 58.8 (2.0) | - | 77 (0.5) | 74 (0.5) | 1750 (400) | - | **12000 (100)** | **7500 (0.5)** | 15.6 (2.0) | - | 104 (2.0) | - | 120 (0.5) | 110 (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | ND (5) (3) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (200) (200) | - | ND (200) (100) | ND (50) (0.5) | ND (1.0) (1.0) | - | 1.6 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) |
| Toluene | µg/L | 1000 | 35.6 (1.0) | - | 74 (3) | 2.9 (1.0) | - | 2 (0.5) | 2 (0.5) | 357 (200) | - | **55000 (1000)** | **33000 (0.5)** | 4.4 (1.0) | - | 16.8 (1.0) | - | 16 (0.5) | 15 (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | **212 (10)** | - | **460 (3)** | 2.9 (2.0) | - | 1 J (0.5) | 1 J (0.5) | ND (400) (400) | - | ND (400) (100) | **76 J (0.5)** | ND (2.0) (2.0) | - | 6.0 (2.0) | - | 5 (0.5) | 4 (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | 64.4 (2.0) | - | 140 (3) | 2.0 (2.0) | - | 1 J (0.5) | 2 J (0.5) | ND (400) (400) | - | ND (400) (100) | 31 J (0.5) | ND (2.0) (2.0) | - | 4.7 (2.0) | - | 3 (0.5) | 3 (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 506 (5.0) | - | 1600 (3) | 8.1 (1.0) | - | 6 (0.5) | 6 (0.5) | ND (200) (200) | - | 1400 (100) | 1100 (0.5) | 6.2 (1.0) | - | 29.0 (1.0) | - | 28 (0.5) | 25 (0.5) | 1.4 (1.0) | - | ND (1) (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.020) (0.020) | - | ND (0.030) (0.0099) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.029) (0.0097) | ND (0.020) (0.020) | - | ND (0.029) (0.0095) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.270 (0.10) | - | 5.4 (0.10) | 4.92 (0.10) | - | 7.4 (0.010) | 13 (0.010) | 1.33 (0.10) | - | 0.86 (0.10) | 0.15 J (0.010) | 0.522 (0.10) | - | 1.41 (0.10) | - | 2.6 (0.010) | 2.1 (0.010) | 0.190 (0.10) | - | 0.099 (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | ND (0.10) (0.10) | - | 2.0 (0.10) | 0.397 (0.10) | - | 0.68 (0.010) | 0.67 (0.010) | 0.193 (0.10) | - | 0.52 (0.10) | 0.10 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.12 (0.010) | 0.14 (0.010) | ND (0.10) (0.10) | - | 0.052 (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | ND (0.10) (0.10) | - | **1.2 (0.10)** | 0.141 (0.10) | - | **0.33 (0.010)** | **0.22 (0.010)** | 0.122 (0.10) | - | **0.40 J (0.10)** | ND (0.50) (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.088 (0.010) | 0.11 (0.010) | ND (0.10) (0.10) | - | 0.038 J (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.10) | - | **1.6 (0.10)** | 0.137 (0.10) | - | 0.36 (0.010) | 0.24 (0.010) | ND (0.10) (0.10) | - | 0.53 (0.10) | ND (0.50) (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.11 (0.010) | 0.13 (0.010) | ND (0.10) (0.10) | - | 0.040 J (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | **0.42 J (0.10)** | ND (0.10) (0.10) | - | 0.11 (0.010) | 0.071 (0.010) | ND (0.10) (0.10) | - | 0.22 J (0.10) | ND (0.50) (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.058 (0.010) | 0.081 (0.010) | ND (0.10) (0.10) | - | 0.018 J (0.010) |
| Chrysene | µg/L | 1.9 | ND (0.10) (0.10) | - | **2.0 (0.10)** | 0.341 (0.10) | - | 0.47 (0.010) | 0.49 (0.010) | 0.141 (0.10) | - | 0.53 (0.10) | ND (0.50) (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - | 0.13 (0.010) | 0.14 (0.010) | ND (0.10) (0.10) | - | 0.058 (0.010) |
| Fluorene | µg/L | 1900 | 2.14 (0.10) | - | 1.1 (0.10) | 19.4 (1.0) | - | 34 (0.10) | 50 (0.010) | 4.66 (0.10) | - | 2.8 (0.10) | 0.90 (0.010) | 1.64 (0.10) | - | 4.72 (0.10) | - | 2.3 (0.010) | 2.3 (0.010) | 0.192 (0.10) | - | 0.018 J (0.010) |
| Naphthalene | µg/L | 100 | 4.01 (0.10) | - | 19 (0.30) | 3.40 (0.10) | - | 4.4 (0.030) | 3.3 (0.030) | 27.7 (1.0) | - | 52 (0.31) | 31 (0.030) | 0.453 (0.10) | - | 1.46 (0.10) | - | ND (0.060) (0.030) | ND (0.061) (0.030) | 0.466 (0.10) | - | ND (0.061) (0.030) |
| Phenanthrene | µg/L | 1100 | 0.917 (0.10) | - | 6.6 (0.30) | 11.7 (1.0) | - | 23 (0.30) | 41 (0.030) | 7.35 (1.0) | - | 4.5 (0.31) | 1.2 (0.030) | 0.114 (0.10) | - | 2.30 (0.10) | - | 4.9 (0.030) | 3.8 (0.030) | ND (0.10) (0.10) | - | 0.043 J (0.030) |
| Pyrene | µg/L | 130 | 0.123 (0.10) | - | 4.3 (0.10) | 2.79 (0.10) | - | 4.2 (0.010) | 5.4 (0.010) | 1.01 (0.10) | - | 0.93 (0.10) | 0.15 J (0.010) | 0.433 (0.10) | - | 1.04 (0.10) | - | 1.5 (0.010) | 1.6 (0.010) | 0.213 (0.10) | - | 0.27 (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | 4.2 (3.0) | 0.24 J (0.13) | - | 3.7 (3.0) | 0.70 J (0.13) | 0.13 J (0.090) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | 0.12 J (0.090) | - | ND (3.0) (3.0) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-154 | | | B-155 | | | B-156 | | | B-158 | | | | | | | | | | B-160 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 7-Jan-13 | 7-Jan-13 | 10-May-16 | 7-Jan-13 | 7-Jan-13 | 5-May-16 | 7-Jan-13 | 7-Jan-13 | 10-May-16 | 7-Jan-13 | 7-Jan-13 | 8-Apr-13 | 8-Apr-13 | 8-Apr-13 | 2-Jun-14 | 2-Jun-14 | 20-May-15 | 9-May-16 | 22-Aug-16 | 7-Jan-13 | 7-Jan-13 |
| Sample ID | | | B-154_010713 | B-154_010713 | GW-11109613-B154-05-10-16-MM-038 | B-155_010713 | B-155_010713 | GW-11109613-B155-05-05-16-AC-013 | B-156_010713 | B-156_010713 | GW-11109613-B154-05-10-16-MM-036 | B-158_010713 | B-158_010713 | B-158 | B-158_040813 | B-158_040813 | B-158 | B-158 | B-158_20150520 | GW-11109613-B158-05-09-16-AC-033 | GW-11109613-B-158-082216-AC-002 | B160_010713 | B160_010713 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | UNKNOWN | STANTEC | STANTEC | STANTEC | STANTEC | STANTEC | GHD | GHD | UNKNOWN | UNKNOWN |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | UNKNOWN | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | LL | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | JB25835 | JB25835 | 1660120 | JB25835 | JB25835 | 1658374 | JB25835 | JB25835 | 1660120 | JB25835 | JB25835 | 20140718EZ | JB33644 | JB33644 | JB68336 | JB68336 | 1562821 | 1659064 | 1699628 | JB25834 | JB25834 |
| Laboratory Sample ID | Units | MSC-PA | JB25835-5 | JB25835-5F | 8378043 | JB25835-6 | JB25835-6F | 8370268 | JB25835-7 | JB25835-7F | 8378032 | JB25835-8 | JB25835-8F | UNKNOWN | JB33644-14 | JB33644-14F | JB68336-15 | JB68336-15F | 7896251 | 8373138 | 8548678 | JB25834-4 | JB25834-4F |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 0.246 | - | - | 0.593 | - | - | 0.629 | - | - | - | - | - | - | - | - | 0.376 | 0.4 | - | - |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 2.46 | - | - | 2.56 | - | - | 19.15 | - | - | - | - | - | - | - | 2.01 | 6.95 | 1.68 | - | - |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -71 | - | - | -70 | - | - | -90 | - | - | - | - | - | - | - | 52 | -70 | -88 | - | - |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 7.21 | - | - | 6.56 | - | - | 6.93 | - | - | - | - | - | - | - | 8.04 | 7.65 | 7.59 | - | - |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.479 | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 13.21 | - | - | 15.61 | - | - | 14.02 | - | - | - | - | - | - | - | 14.94 | 15.33 | 26.06 | - | - |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | NM | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 0 | - | - | 57.3 | - | - | 284 | - | - | - | - | - | - | - | 141 | 15.5 | 0 | - | - |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | 238000 (5000) | - | 51000 (1000) | 77800 (500) | - | 120000 (1000) | 301 (5.0) | - | 49 (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.24) | - | ND (0.50) (0.21) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1000) (1000) | - | ND (200) (100) | ND (500) (500) | - | ND (50) (25) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.26) | - | ND (1.0) (0.30) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - |
| Ethylbenzene | µg/L | 700 | ND (1000) (1000) | - | ND (200) (100) | ND (500) (500) | - | 120 (25) | 5.5 (1.0) | - | 4 (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.23) | - | ND (1.0) (0.40) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 4.1 (1.0) | - |
| Isopropylbenzene (Cumene) | µg/L | 3500 | ND (2000) (2000) | - | 150 J (100) | ND (1000) (1000) | - | 79 J (25) | 101 (2.0) | - | 120 (0.5) | ND (2.0) (2.0) | - | - | ND (2) (0.45) | - | ND (1.0) (0.26) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2) (0.5) | 2.9 (2.0) | - |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1000) (1000) | - | ND (200) (100) | ND (500) (500) | - | ND (50) (25) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.16) | - | ND (1.0) (0.26) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - |
| Toluene | µg/L | 1000 | 1100 (1000) | - | 180 J (100) | ND (500) (500) | - | 820 (25) | 21.0 (1.0) | - | 13 (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.23) | - | ND (1.0) (0.22) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 1.7 (1.0) | - |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | ND | - | - | - | - | ND | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND (2000) (2000) | - | ND (400) (100) | ND (1000) (1000) | - | 62 J (25) | 5.5 (2.0) | - | 4 (0.5) | ND (2.0) (2.0) | - | - | ND (2) (0.19) | - | ND (2.0) (0.19) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2) (0.5) | 7.9 (2.0) | - |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2000) (2000) | - | ND (400) (100) | ND (1000) (1000) | - | ND (100) (25) | 5.6 (2.0) | - | 5 (0.5) | ND (2.0) (2.0) | - | - | ND (2) (0.36) | - | ND (2.0) (0.17) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2) (0.5) | 2.2 (2.0) | - |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | ND (1000) (1000) | - | ND (200) (100) | ND (500) (500) | - | 150 (25) | 33.2 (1.0) | - | 22 (0.5) | ND (1.0) (1.0) | - | - | ND (1) (0.24) | - | ND (1.0) (0.20) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 15.3 (1.0) | - |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.029) (0.0095) | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.020) (0.020) | - | - | ND (0.02) (0.011) | - | ND (0.020) (0.011) | - | ND (0.0095) (0.010) | ND (0.029) (0.0096) | ND (0.028) (0.010) | ND (0.020) (0.020) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 3.10 (0.10) | - | 1.5 (0.010) | 1.74 (0.10) | - | 3.7 (0.010) | 1.79 (0.10) | - | 4.7 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.02) | - | ND (0.10) (0.020) | - | ND (0.1) (0.1) | 0.027 J (0.010) | 0.037 J (0.010) | ND (10) (10) | - |
| Benzo(a)Anthracene | µg/L | 4.9 | ND (0.10) (0.10) | - | 0.12 (0.010) | ND (0.10) (0.10) | - | 0.31 (0.010) | 0.184 (0.10) | - | 1.7 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.012) | - | ND (0.10) (0.012) | - | ND (0.1) (0.1) | 0.058 (0.010) | 0.055 (0.010) | ND (10) (10) | - |
| Benzo(a)Pyrene | µg/L | 0.2 | ND (0.10) (0.10) | - | 0.10 (0.010) | ND (0.10) (0.10) | - | 0.25 (0.010) | ND (0.10) (0.10) | - | 1.4 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.012) | - | ND (0.10) (0.012) | - | ND (0.1) (0.1) | 0.045 J (0.010) | 0.042 J (0.010) | ND (10) (10) | - |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.10) | - | 0.084 (0.010) | ND (0.10) (0.10) | - | 0.24 (0.010) | ND (0.10) (0.10) | - | 1.5 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.01) | - | ND (0.10) (0.010) | - | ND (0.1) (0.1) | 0.051 (0.010) | 0.046 J (0.010) | ND (10) (10) | - |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | 0.054 (0.010) | ND (0.10) (0.10) | - | 0.088 (0.010) | ND (0.10) (0.10) | - | 0.50 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.016) | - | ND (0.10) (0.016) | - | ND (0.1) (0.1) | 0.029 J (0.010) | 0.027 J (0.010) | ND (10) (10) | - |
| Chrysene | µg/L | 1.9 | ND (0.10) (0.10) | - | 0.099 (0.010) | ND (0.10) (0.10) | - | 0.27 (0.010) | 0.161 (0.10) | - | 1.4 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.012) | - | ND (0.10) (0.012) | - | ND (0.1) (0.1) | 0.051 (0.010) | 0.045 J (0.010) | ND (10) (10) | - |
| Fluorene | µg/L | 1900 | 15.8 (1.0) | - | 7.0 (0.010) | 6.74 (1.0) | - | 6.6 (0.010) | 8.16 (1.0) | - | 10 (0.010) | ND (0.10) (0.10) | - | - | ND (0.1) (0.017) | - | ND (0.10) (0.017) | - | ND (0.1) (0.1) | 0.064 (0.010) | 0.094 (0.010) | ND (10) (10) | - |
| Naphthalene | µg/L | 100 | 57.3 (1.0) | - | 20 (0.31) | 52.4 (1.0) | - | 42 (0.61) | 1.65 (0.10) | - | 3.3 (0.031) | 0.155 (0.10) | - | - | ND (0.1) (0.036) | - | ND (0.10) (0.036) | - | ND (0.1) (0.1) | 0.042 J (0.030) | 0.078 (0.030) | ND (10) (10) | - |
| Phenanthrene | µg/L | 1100 | 17.0 (1.0) | - | 4.9 (0.031) | 8.73 (1.0) | - | 12 (0.61) | 9.87 (1.0) | - | 17 (0.31) | ND (0.10) (0.10) | - | - | ND (0.1) (0.021) | - | ND (0.10) (0.021) | - | ND (0.1) (0.1) | 0.040 J (0.030) | 0.043 J (0.030) | ND (10) (10) | - |
| Pyrene | µg/L | 130 | 0.983 (0.10) | - | 0.51 (0.010) | 0.746 (0.10) | - | 1.3 (0.010) | 0.883 (0.10) | - | 3.4 (0.010) | 0.196 (0.10) | - | - | ND (0.1) (0.015) | - | 0.126 (0.015) | - | 0.2 J (0.1) | 0.22 (0.010) | 0.31 (0.010) | ND (10) (10) | - |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | - | - | ND (3) (1.7) | - | 1.7 J (1.3) | 0.14 J (0.082) | 1.2 (0.13) | 0.89 J (0.09) | - | ND (3.0) (3.0) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-162 | | | B-163 | | | B-164 | | | | B-165 | | | | | | B-166 | | B-167 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 4-Jan-13 | 4-Jan-13 | 10-May-16 | 7-Jan-13 | 7-Jan-13 | 10-May-16 | 8-Jan-13 | 8-Jan-13 | 9-May-16 | 23-Aug-16 | 4-Jan-13 | 4-Jan-13 | 3-Jun-14 | 3-Jun-14 | 20-May-15 | 5-May-16 | 7-Jan-13 | 7-Jan-13 | 7-Jan-13 | 7-Jan-13 |
| Sample ID | | | B162_010413 | B162_010413 | GW-11109613-B162-05-10-16-AC-039 | B-163_010713 | B-163_010713 | GW-11109613-B163-05-10-16-AC-037 | B164_010813 | B164_010813 | GW-11109613-B164-05-09-16-AC-031 | GW-11109613-B-164-082316-KC-014 | B-165_010413 | B-165_010413 | B-165 | B-165 | B-165_20150520 | GW-11109613-B165-05-05-16-AC-015 | B166_010713 | B166_010713 | B167_010713 | B167_010713 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | STANTEC | STANTEC | STANTEC | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | JB25729 | JB25729 | 1660120 | JB25835 | JB25835 | 1660120 | JB25964 | JB25964 | 1659064 | 1699628 | JB25728 | JB25728 | JB68336 | JB68336 | 1562821 | 1658374 | JB25834 | JB25834 | JB25834 | JB25834 |
| Laboratory Sample ID | Units | MSC-PA | JB25729-3 | JB25729-3F | 8378035 | JB25835-9 | JB25835-9F | 8378033 | JB25964-3 | JB25964-3F | 8373136 | 8548691 | JB25728-1 | JB25728-1F | JB68336-19 | JB68336-19F | 7896252 | 8370270 | JB25834-2 | JB25834-2F | JB25834-3 | JB25834-3F |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 0.658 | - | - | 0.391 | - | - | 0.406 | 0.48 | - | - | - | - | - | 0.687 | - | - | - | - |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 33.3 | - | - | 26.08 | - | - | 10.51 | 15.59 | - | - | - | - | 1.12 | 1.1 | - | - | - | - |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -74 | - | - | -83 | - | - | 120 | 53 | - | - | - | - | -115 | -122 | - | - | - | - |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 6.31 | - | - | 6.92 | - | - | 7.74 | 7.33 | - | - | - | - | 7.79 | 7.07 | - | - | - | - |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.04 | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 14.49 | - | - | 17.36 | - | - | 15.53 | 21.5 | - | - | - | - | 18.25 | 15.68 | - | - | - | - |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.663 | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 90.1 | - | - | 0 | - | - | 105 | 20.6 | - | - | - | - | 32.4 | 23.4 | - | - | - | - |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | **373 (5.0)** | - | 0.9 J (0.5) | **99.1 (1.0)** | - | ND (1) (0.5) | 1 (0.5) | ND (1.0) (1.0) | - | ND (0.50) (0.21) | - | ND (0.5) (0.5) | 4 (0.5) | ND (1.0) (1.0) | - | **10.2 (1.0)** | - |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (0.30) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - |
| Ethylbenzene | µg/L | 700 | 1.7 (1.0) | - | ND (1) (0.5) | 1.8 (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (0.40) | - | ND (0.5) (0.5) | ND (1) (0.5) | 1.1 (1.0) | - | 3.9 (1.0) | - |
| Isopropylbenzene (Cumene) | µg/L | 3500 | ND (2.0) (2.0) | - | ND (2) (0.5) | 3.5 (2.0) | - | ND (2) (0.5) | 7.2 (2.0) | - | 5 (0.5) | 5 (0.5) | 3.0 (2.0) | - | 3.4 (0.26) | - | 6 (0.5) | 5 (0.5) | 2.1 (2.0) | - | 81.6 (2.0) | - |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | 0.34 J (0.26) | - | 0.6 J (0.5) | 2 (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - |
| Toluene | µg/L | 1000 | ND (1.0) (1.0) | - | ND (1) (0.5) | 6.4 (1.0) | - | ND (1) (0.5) | 1.7 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (0.22) | - | ND (0.5) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | 4.5 (1.0) | - |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ND | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | 3.3 (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | 0.23 J (0.19) | - | ND (0.5) (0.5) | ND (2) (0.5) | 2.3 (2.0) | - | 4.0 (2.0) | - |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (0.17) | - | ND (0.5) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 6.3 (1.0) | - | ND (1) (0.5) | 3.5 (1.0) | - | ND (1) (0.5) | 1.2 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (0.20) | - | ND (0.5) (0.5) | ND (1) (0.5) | 3.9 (1.0) | - | 17.4 (1.0) | - |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.028) (0.0094) | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | ND (0.020) (0.020) | - | ND (0.029) (0.0096) | ND (0.029) (0.010) | ND (0.020) (0.020) | - | ND (0.020) (0.011) | - | ND (0.0096) (0.010) | ND (0.029) (0.0096) | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | ND (1.0) (1.0) | - | 0.62 (0.010) | 0.156 (0.10) | - | 0.044 J (0.010) | ND (0.10) (0.10) | - | 0.026 J (0.010) | 0.057 (0.010) | 0.790 (0.10) | - | 0.416 (0.020) | - | 0.6 (0.1) | 0.48 (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Benzo(a)Anthracene | µg/L | 4.9 | ND (1.0) (1.0) | - | 0.41 (0.010) | ND (0.10) (0.10) | - | 0.097 (0.010) | ND (0.10) (0.10) | - | 0.027 J (0.010) | 0.017 J (0.010) | 0.223 (0.10) | - | 0.196 (0.012) | - | 0.2 J (0.1) | 0.17 (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Benzo(a)Pyrene | µg/L | 0.2 | ND (1.0) (1.0) | - | **0.32 (0.010)** | ND (0.10) (0.10) | - | 0.090 (0.010) | ND (0.10) (0.10) | - | 0.047 J (0.010) | 0.019 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.012) | - | ND (0.1) (0.1) | 0.039 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (1.0) (1.0) | - | 0.34 (0.010) | ND (0.10) (0.10) | - | 0.17 (0.010) | ND (0.10) (0.10) | - | 0.049 J (0.010) | 0.021 J (0.010) | ND (0.10) (0.10) | - | 0.124 (0.010) | - | 0.1 J (0.1) | 0.050 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (1.0) (1.0) | - | 0.17 (0.010) | ND (0.10) (0.10) | - | 0.064 (0.010) | ND (0.10) (0.10) | - | 0.035 J (0.010) | 0.018 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.016) | - | ND (0.1) (0.1) | 0.025 J (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Chrysene | µg/L | 1.9 | ND (1.0) (1.0) | - | 0.47 (0.010) | ND (0.10) (0.10) | - | 0.13 (0.010) | ND (0.10) (0.10) | - | 0.027 J (0.010) | 0.013 J (0.010) | 0.148 (0.10) | - | 0.134 (0.012) | - | 0.2 J (0.1) | 0.13 (0.010) | ND (0.10) (0.10) | - | ND (0.10) (0.10) | - |
| Fluorene | µg/L | 1900 | 1.51 (1.0) | - | 1.4 (0.010) | 8.24 (1.0) | - | 1.2 (0.010) | 0.184 (0.10) | - | 0.081 (0.010) | 0.069 (0.010) | 2.03 (0.10) | - | 1.67 (0.017) | - | 2 (0.1) | 1.4 (0.010) | 0.420 (0.10) | - | 0.316 (0.10) | - |
| Naphthalene | µg/L | 100 | ND (1.0) (1.0) | - | 0.61 (0.030) | 0.491 (0.10) | - | ND (0.061) (0.031) | 0.304 (0.10) | - | ND (0.062) (0.031) | 0.037 J (0.030) | 1.29 (0.10) | - | ND (0.10) (0.036) | - | ND (0.1) (0.1) | ND (0.063) (0.031) | 0.438 (0.10) | - | 2.08 (0.10) | - |
| Phenanthrene | µg/L | 1100 | ND (1.0) (1.0) | - | 0.56 (0.030) | 0.170 (0.10) | - | 0.037 J (0.031) | ND (0.10) (0.10) | - | ND (0.062) (0.031) | 0.045 J (0.030) | 0.446 (0.10) | - | 0.223 (0.021) | - | 0.1 J (0.1) | 0.37 (0.031) | ND (0.10) (0.10) | - | 0.289 (0.10) | - |
| Pyrene | µg/L | 130 | ND (1.0) (1.0) | - | 1.1 (0.010) | 0.177 (0.10) | - | 0.27 (0.010) | 0.123 (0.10) | - | 0.043 J (0.010) | 0.047 J (0.010) | 1.65 (0.10) | - | 1.14 (0.015) | - | 2 (0.1) | 1.2 (0.010) | 0.135 (0.10) | - | ND (0.10) (0.10) | - |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | ND (3.0) (3.0) | 0.31 J (0.13) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | 1.1 (0.13) | 1.9 (0.09) | - | ND (3.0) (3.0) | - | 1.4 J (1.3) | 0.11 J (0.082) | 1.0 (0.13) | - | ND (3.0) (3.0) | - | ND (3.0) (3.0) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | B-168 | | | B-169 | | | | | | B-170 | | | B-172 | | | B-173 | | B-174 | | B-175 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | 4-Jan-13 | 4-Jan-13 | 4-May-16 | 4-Jan-13 | 4-Jan-13 | 9-Jan-13 | 9-Jan-13 | 9-May-16 | 22-Aug-16 | 5-May-16 | 5-May-16 | 22-Aug-16 | 5-May-16 | 23-Aug-16 | 23-Aug-16 | 5-May-16 | 23-Aug-16 | 5-May-16 | 22-Aug-16 | 11-May-16 | 23-Aug-16 |
| Sample ID | | | B-168_010413 | B-168_010413 | GW-11109613-B168-05-04-16-AC-009 | B-169_010413 | B-169_010413 | B-169_010913 | B-169_010913 | GW-11109613-B169-05-09-16-MM-024 | GW-11109613-B-169-082216-KC-001 | GW-11109613-B170-05-05-16-AC-017 | GW-11109613-DUP2-05-05-16-AC-019 | GW-11109613-B-170-082216-KC-003 | GW-11109613-B172-05-05-16-AC-021 | GW-11109613-B-172-082316-AC-009 | GW-11109613-B-172D-082316-AC-011 | GW-11109613-B173-05-05-16-RM-018 | GW-11109613-B-173-082316-KC-012 | GW-11109613-B174-05-05-16-RM-016 | GW-11109613-B-174-082216-KC-007 | GW-11109613-B175-05-11-16-MM-045 | GW-11109613-B-175-082316-AC-015 |
| Sampling Company | | | UNKNOWN | UNKNOWN | GHD | UNKNOWN | UNKNOWN | UNKNOWN | UNKNOWN | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | ACCUTEST | ACCUTEST | LL | ACCUTEST | ACCUTEST | ACCUTEST | ACCUTEST | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL | LL |
| Laboratory Work Order | | | JB25728 | JB25728 | 1657425 | JB25728 | JB25728 | JB26465 | JB26465 | 1659064 | 1699628 | 1658374 | 1658374 | 1699628 | 1658374 | 1699628 | 1699628 | 1658374 | 1699628 | 1658374 | 1699628 | 1660120 | 1699628 |
| Laboratory Sample ID | Units | MSC-PA | JB25728-2 | JB25728-2F | 8365512 | JB25728-3 | JB25728-3F | JB26465-4 | JB26465-4F | 8373129 | 8548677 | 8370272 | 8370274 | 8548679 | 8370276 | 8548686 | 8548688 | 8370273 | 8548689 | 8370271 | 8548683 | 8378041 | 8548692 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 0.472 | - | - | - | - | 0.317 | 0.58 | 0.596 | 0.596 | 0.55 | 418 | 0.45 | 0.45 | 1.64 | 1.56 | 1.57 | 1.66 | NM | - |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 9.68 | - | - | - | - | 19.8 | 14.4 | 1.17 | 1.17 | 6.44 | 2.38 | 4.72 | 4.72 | 0 | 1.61 | 0 | 3.26 | NM | - |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -67 | - | - | - | - | -135 | -207 | -125 | -125 | -157 | -25 | -99 | -99 | -96 | -146 | -92 | -133 | NM | - |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 7.35 | - | - | - | - | 7.11 | 6.75 | 8.27 | 8.27 | 6.76 | 7.2 | 7.07 | 7.07 | 6.47 | 6.61 | 7.02 | 6.85 | NM | - |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 13.65 | - | - | - | - | 14.25 | 21.8 | 14.25 | 14.25 | 21.7 | 13.44 | 24.7 | 24.7 | 13 | 20.7 | 12.6 | 24.6 | NM | - |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 13.1 | - | - | - | - | 14 | 8.9 | 0 | 0 | 9.4 | 26.6 | 10.9 | 10.9 | 130 | 0 | 2 | 49.2 | NM | - |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | 5.2 (1.0) | - | 6.4 (1.0) | - | 0.7 J (0.5) | ND (1) (0.5) | 5 (0.5) | 5 (0.5) | 3 (0.5) | 13 (0.5) | 160 (0.5) | 160 (0.5) | 14 (5) | 17 (0.5) | ND (1) (0.5) | ND (1) (0.5) | 260 (3) | 65 (0.5) |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (5) (0.5) | ND (5) (0.5) | ND (10) (5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (5) (3) | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | ND (1.0) (1.0) | - | ND (1) (0.5) | 1.8 (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (5) (0.5) | ND (5) (0.5) | ND (10) (5) | 4 (0.5) | ND (1) (0.5) | ND (1) (0.5) | 25 (3) | 5 (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 3.8 (2.0) | - | 2 J (0.5) | 8.3 (2.0) | - | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | 6 (0.5) | 5 (0.5) | 5 (0.5) | 7 (0.5) | ND (10) (0.5) | ND (10) (0.5) | 27 (5) | 33 (0.5) | ND (2) (0.5) | ND (2) (0.5) | 150 (3) | 63 (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (5) (0.5) | ND (5) (0.5) | ND (10) (5) | ND (1) (0.5) | 5 (0.5) | 7 (0.5) | ND (5) (3) | ND (1) (0.5) |
| Toluene | µg/L | 1000 | ND (1.0) (1.0) | - | ND (1) (0.5) | 2.0 (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (5) (0.5) | ND (5) (0.5) | 5 J (5) | 5 (0.5) | ND (1) (0.5) | ND (1) (0.5) | 70 (3) | 15 (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND (2.0) (2.0) | - | ND (2) (0.5) | 4.7 (2.0) | - | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (10) (0.5) | ND (10) (0.5) | ND (20) (5) | 5 (0.5) | ND (2) (0.5) | ND (2) (0.5) | 4 J (3) | 2 J (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (2) (0.5) | ND (10) (0.5) | ND (10) (0.5) | 13 J (5) | 14 (0.5) | ND (2) (0.5) | ND (2) (0.5) | 51 (3) | 10 (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 2.0 (1.0) | - | 0.5 J (0.5) | 6.3 (1.0) | - | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | 2 (0.5) | 1 (0.5) | 0.7 J (0.5) | 0.6 J (0.5) | ND (5) (0.5) | ND (5) (0.5) | ND (10) (5) | 8 (0.5) | ND (1) (0.5) | ND (1) (0.5) | 33 (3) | 11 (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.020) | - | ND (0.028) (0.0094) | ND (0.020) (0.020) | - | ND (0.020) (0.020) | - | ND (0.029) (0.0097) | ND (0.028) (0.010) | ND (0.029) (0.0095) | ND (0.029) (0.0096) | ND (0.029) (0.010) | ND (0.029) (0.0097) | ND (0.028) (0.010) | ND (0.028) (0.010) | 0.020 J (0.0097) | ND (0.028) (0.010) | ND (0.029) (0.0095) | ND (0.028) (0.010) | ND (0.029) (0.0096) | ND (0.028) (0.010) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | 0.503 (0.10) | - | 0.52 (0.010) | 0.377 (0.10) | - | 0.217 (0.10) | - | 0.084 (0.010) | ND (0.057) (0.010) | 0.36 (0.010) | 0.37 (0.010) | 0.26 (0.010) | 0.33 (0.010) | 0.33 J (0.010) | 0.10 J (0.010) | 6.0 (0.10) | 6.1 (0.010) | 0.096 (0.010) | 0.095 (0.010) | 1.7 (0.010) | 0.78 (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | 0.254 (0.10) | - | 0.066 (0.010) | 0.197 (0.10) | - | 0.187 (0.10) | - | 0.17 (0.010) | 0.013 J (0.010) | 0.10 (0.010) | 0.10 (0.010) | 0.065 (0.010) | 0.49 (0.010) | 0.27 J (0.010) | 0.13 J (0.010) | 2.1 (0.10) | 1.2 (0.010) | 0.048 J (0.010) | 0.080 (0.010) | 1.3 (0.010) | 0.36 (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | ND (0.10) (0.10) | - | 0.037 J (0.010) | ND (0.10) (0.10) | - | 0.223 (0.10) | - | 0.17 (0.010) | 0.015 J (0.010) | 0.11 (0.010) | 0.090 (0.010) | 0.043 J (0.010) | 0.45 (0.010) | 0.18 J (0.010) | 0.092 J (0.010) | 1.0 (0.10) | 0.51 J (0.010) | 0.032 J (0.010) | 0.060 J (0.010) | 0.89 (0.010) | 0.22 J (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.10) | - | 0.038 J (0.010) | ND (0.10) (0.10) | - | 0.222 (0.10) | - | 0.19 (0.010) | 0.020 J (0.010) | 0.12 (0.010) | 0.088 (0.010) | 0.044 J (0.010) | 0.50 (0.010) | 0.18 J (0.010) | 0.094 J (0.010) | 1.0 (0.10) | 0.55 J (0.010) | 0.038 J (0.010) | 0.065 J (0.010) | 1.1 (0.010) | 0.27 J (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.10) | - | 0.016 J (0.010) | ND (0.10) (0.10) | - | 0.173 (0.10) | - | 0.12 (0.010) | 0.016 J (0.010) | 0.047 J (0.010) | 0.043 J (0.010) | 0.020 J (0.010) | 0.19 (0.010) | 0.085 J (0.010) | 0.041 J (0.010) | 0.25 J (0.10) | 0.12 J (0.010) | 0.015 J (0.010) | 0.034 J (0.010) | 0.38 (0.010) | 0.096 J (0.010) |
| Chrysene | µg/L | 1.9 | 0.190 (0.10) | - | 0.063 (0.010) | 0.131 (0.10) | - | 0.268 (0.10) | - | 0.17 (0.010) | 0.017 J (0.010) | 0.11 (0.010) | 0.11 (0.010) | 0.069 (0.010) | 0.51 (0.010) | 0.25 (0.010) | 0.15 (0.010) | 1.4 (0.10) | 0.90 (0.010) | 0.042 J (0.010) | 0.081 (0.010) | 1.2 (0.010) | 0.33 (0.010) |
| Fluorene | µg/L | 1900 | 3.09 (0.10) | - | 2.1 (0.010) | 1.98 (0.10) | - | 0.527 (0.10) | - | 0.043 J (0.010) | ND (0.057) (0.010) | 2.5 (0.010) | 2.3 (0.010) | 0.61 (0.010) | 0.42 (0.010) | 0.56 J (0.010) | 0.23 J (0.010) | 16 (0.10) | 18 (0.010) | 0.25 (0.010) | 0.27 (0.010) | 5.9 (0.010) | 3.2 (0.010) |
| Naphthalene | µg/L | 100 | 1.38 (0.10) | - | ND (0.061) (0.030) | 41.7 (0.10) | - | 0.165 (0.10) | - | 0.071 (0.030) | ND (0.069) (0.030) | 2.3 (0.031) | 4.8 (0.031) | ND (0.068) (0.030) | 0.27 (0.031) | ND (0.061) (0.030) | ND (0.064) (0.030) | 13 (0.31) | 12 (0.030) | 0.099 (0.030) | 0.083 (0.030) | ND (0.061) (0.030) | ND (0.062) (0.030) |
| Phenanthrene | µg/L | 1100 | 0.172 (0.10) | - | 0.92 (0.030) | 1.44 (0.10) | - | 0.296 (0.10) | - | 0.069 (0.030) | ND (0.069) (0.030) | 1.3 (0.031) | 1.8 (0.031) | 0.99 (0.030) | 0.38 (0.031) | 0.26 J (0.030) | 0.036 J (0.030) | 23 (0.31) | 22 (0.030) | 0.43 (0.030) | 0.48 (0.030) | 8.7 (0.030) | 3.5 (0.030) |
| Pyrene | µg/L | 130 | 1.07 (0.10) | - | 0.41 (0.010) | 0.646 (0.10) | - | 0.587 (0.10) | - | 0.27 (0.010) | 0.035 J (0.010) | 0.35 (0.010) | 0.34 (0.010) | 0.31 (0.010) | 1.4 (0.010) | 1.0 (0.010) | 0.86 (0.010) | 6.4 (0.10) | 4.8 (0.010) | 0.19 (0.010) | 0.33 (0.010) | 2.3 (0.010) | 0.93 (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | ND (3.0) (3.0) | ND (1.0) (0.13) | - | ND (3.0) (3.0) | - | ND (3.0) (3.0) | 33.8 (0.13) | 6.5 (0.09) | ND (1.0) (0.13) | ND (1.0) (0.13) | ND (1.0) (0.09) | 0.18 J (0.13) | 0.30 J (0.09) | 0.25 J (0.09) | 0.75 J (0.13) | 1.4 (0.09) | ND (1.0) (0.13) | 1.9 (0.09) | 6.9 (0.13) | 3.1 (0.09) |
| Manganese | µg/L | 300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | C-134D | | | | U-4 | | | | URS-1 | | | | URS-2 | | URS-3 | | | URS-4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample Date** | | | 1-Apr-13 | 1-Apr-13 | 20-Jul-16 | 19-Aug-16 | 9-Jan-13 | 9-Jan-13 | 5-May-16 | 22-Aug-16 | 9-Jan-13 | 9-Jan-13 | 9-May-16 | 23-Aug-16 | 9-Jan-13 | 9-Jan-13 | 9-May-16 | 24-Aug-16 | 24-Aug-16 | 9-Jan-13 | 9-Jan-13 | 9-May-16 | 24-Aug-16 |
| **Sample ID** | | | C-134D_40113 | C-134D_40113 | GW-11109614-C-134D-072016-AC-002 | GW-11109614-C134D-081916-AC-02 | U4_010913 | U4_010913 | GW-11109613-U4-05-05-16-AC-022 | GW-11109613-U-4-082216-AC-004 | URS-1_010913 | URS-1_010913 | GW-11109613-URS1-05-09-16-MM-028 | GW-11109613-URS-1-082316-AC-013 | URS2_010913 | URS2_010913 | GW-11109613-URS3-05-09-16-MM-030 | GW-11109613-URS-3-082416-KC-024 | GW-11109613-URS-3-082416-KC-025 | URS-4_010913 | URS-4_010913 | GW-11109613-URS4-05-09-16-MM-026 | GW-11109613-URS-4-082416-AC-017 |
| **Sampling Company** | | | LANGAN | LANGAN | GHD | GHD | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | GHD | GHD | UNKNOWN | UNKNOWN | GHD | GHD | GHD | UNKNOWN | UNKNOWN | GHD | GHD |
| **Laboratory** | | | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | LL | LL | ACCUTEST | ACCUTEST | LL | LL | LL | ACCUTEST | ACCUTEST | LL | LL |
| **Laboratory Work Order** | | | JB32976 | JB32976 | 1686199 | 1698036 | JB26467 | JB26467 | 1658374 | 1699628 | JB26465 | JB26465 | 1659064 | 1699628 | JB26467 | JB26467 | 1659064 | 1700681 | 1700681 | JB26465 | JB26465 | 1659064 | 1700681 |
| **Laboratory Sample ID** | **Units** | **MSC-PA** | JB32976-6 | JB32976-6F | 8489350 | 8541532 | JB26467-4 | JB26467-4F | 8370277 | 8548680 | JB26465-1 | JB26465-1F | 8373133 | 8548690 | JB26467-5 | JB26467-5F | 8373135 | 8553516 | 8553517 | JB26465-2 | JB26465-2F | 8373131 | 8553509 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Conductivity | mS/cm | n/v | - | - | 0.725 | - | - | - | 0.597 | 0.66 | - | - | 0.352 | 0.44 | - | - | 0.72 | - | 0.68 | - | - | 0.34 | 0.41 |
| Dissolved Oxygen, Field Measured | mg/L | n/v | - | - | 2.83 | - | - | - | 2.6 | 2.76 | - | - | 7.7 | 0.12 | - | - | 0.75 | - | 33.82 | - | - | 2.45 | 2.79 |
| Oxidation Reduction Potential, Field Measured | mV | n/v | - | - | -48 | - | - | - | -103 | -153 | - | - | -101 | -135 | - | - | -146 | - | -154 | - | - | -96 | -142 |
| pH, FIELD MEASURED | S.U. | n/v | - | - | 6.58 | - | - | - | 7.59 | 7.56 | - | - | 6.89 | 7.17 | - | - | 6.46 | - | 6.79 | - | - | 6.64 | 6.99 |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | - | - | 22.45 | - | - | - | 13.7 | 28.07 | - | - | 13.9 | 21.9 | - | - | 14.5 | - | 22.6 | - | - | 18.98 | 24.11 |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Turbidity | NTU | n/v | - | - | 76.4 | - | - | - | 3.7 | 0 | - | - | 0 | 0 | - | - | 3.3 | - | 67.4 | - | - | 760 | 264 |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/L | 5 | ND (1.0) (0.24) | - | ND (1) (0.5) | ND (1) (0.5) | 1.4 (1.0) | - | 2 (0.5) | ND (1) (0.5) | **13.0 (1.0)** | - | ND (1) (0.5) | ND (1) (0.5) | 3.4 (1.0) | - | 4 (0.5) | 2 (0.5) | 1 (0.5) | **46.8 (1.0)** | - | ND (1) (0.5) | ND (1) (0.5) |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (1.0) (0.26) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| Ethylbenzene | µg/L | 700 | ND (1.0) (0.23) | - | ND (1) (0.5) | ND (1) (0.5) | 1.7 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | 3.8 (1.0) | - | 0.6 J (0.5) | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| Isopropylbenzene (Cumene) | µg/L | 3500 | ND (2.0) (0.45) | - | ND (2) (0.5) | ND (2) (0.5) | 3.4 (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | 7.7 (2.0) | - | 55 (0.5) | 2 J (0.5) | 17 (0.5) | 2.8 (2.0) | - | ND (2) (0.5) | ND (2) (0.5) |
| Methyl Tertiary Butyl Ether | µg/L | 20 | 0.92 J (0.16) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1) (0.5) | 4.7 (1.0) | - | 2 (0.5) | 2 (0.5) |
| Toluene | µg/L | 1000 | ND (1.0) (0.23) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | 0.9 J (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | 2.3 (1.0) | - | 2 (0.5) | 0.9 J (0.5) | 1 (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| Total BTEX | µg/L | n/v | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | ND (2.0) (0.19) | - | ND (2) (0.5) | ND (2) (0.5) | 2.9 (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | 6.2 (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | 0.5 J (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | ND (2.0) (0.36) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) | 2.2 (2.0) | - | 0.8 J (0.5) | 0.7 J (0.5) | 0.8 J (0.5) | ND (2.0) (2.0) | - | ND (2) (0.5) | ND (2) (0.5) |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | ND (1.0) (0.24) | - | ND (1) (0.5) | ND (1) (0.5) | 8.3 (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) | 19.9 (1.0) | - | 9 (0.5) | 8 (0.5) | 7 (0.5) | ND (1.0) (1.0) | - | ND (1) (0.5) | ND (1) (0.5) |
| **Volatile Organic Compounds (SW8011)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.020) (0.011) | - | ND (0.029) (0.010) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.029) (0.0095) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.029) (0.0098) | ND (0.029) (0.010) | ND (0.020) (0.020) | - | 0.011 J (0.0096) | ND (0.028) (0.010) | ND (0.028) (0.010) | ND (0.020) (0.020) | - | ND (0.029) (0.0098) | ND (0.028) (0.010) |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | µg/L | 66 | ND (0.10) (0.020) | - | 0.011 J (0.010) | ND (0.050) (0.010) | 1.18 (0.10) | - | 0.058 (0.010) | 0.32 J (0.010) | ND (0.10) (0.10) | - | 0.33 (0.010) | 0.62 (0.010) | 1.23 (0.10) | - | 21 (0.10) | 0.17 (0.010) | 9.6 (0.010) | ND (0.10) (0.10) | - | 0.052 (0.010) | 0.027 J (0.010) |
| Benzo(a)Anthracene | µg/L | 4.9 | ND (0.10) (0.012) | - | ND (0.051) (0.010) | ND (0.050) (0.010) | 0.997 (0.10) | - | 0.42 (0.010) | 0.99 (0.010) | ND (0.10) (0.10) | - | 0.038 J (0.010) | 0.017 J (0.010) | 0.787 (0.10) | - | **66 (0.10)** | **5.3 (0.010)** | **17 (0.010)** | ND (0.10) (0.10) | - | 0.012 J (0.010) | ND (0.050) (0.010) |
| Benzo(a)Pyrene | µg/L | 0.2 | ND (0.10) (0.012) | - | ND (0.051) (0.010) | ND (0.050) (0.010) | **0.686 (0.10)** | - | **0.78 (0.010)** | **2.7 J (0.010)** | ND (0.10) (0.10) | - | 0.028 J (0.010) | 0.053 UJ (0.010) | **0.407 (0.10)** | - | **47 (0.10)** | **4.5 (0.010)** | **12 (0.010)** | ND (0.10) (0.10) | - | ND (0.050) (0.010) | ND (0.050) (0.010) |
| Benzo(b)Fluoranthene | µg/L | 1.2 | ND (0.10) (0.010) | - | ND (0.051) (0.010) | ND (0.050) (0.010) | 0.350 (0.10) | - | 0.33 (0.010) | 1.1 J (0.010) | ND (0.10) (0.10) | - | 0.034 J (0.010) | 0.053 UJ (0.010) | 0.333 (0.10) | - | **56 (0.10)** | **5.4 (0.010)** | **14 (0.010)** | ND (0.10) (0.10) | - | ND (0.050) (0.010) | ND (0.050) (0.010) |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.10) (0.016) | - | ND (0.051) (0.010) | ND (0.050) (0.010) | **0.344 (0.10)** | - | **0.44 (0.010)** | **2.4 J (0.010)** | ND (0.10) (0.10) | - | 0.012 J (0.010) | 0.053 UJ (0.010) | **0.314 (0.10)** | - | **14 (0.10)** | **1.4 (0.010)** | **3.2 (0.010)** | ND (0.10) (0.10) | - | ND (0.050) (0.010) | ND (0.050) (0.010) |
| Chrysene | µg/L | 1.9 | ND (0.10) (0.012) | - | ND (0.051) (0.010) | ND (0.050) (0.010) | 1.59 (0.10) | - | 1.1 (0.010) | **4.5 (0.010)** | ND (0.10) (0.10) | - | 0.035 J (0.010) | 0.012 J (0.010) | 0.805 (0.10) | - | **46 (0.10)** | **3.9 (0.010)** | **12 (0.010)** | ND (0.10) (0.10) | - | ND (0.050) (0.010) | ND (0.050) (0.010) |
| Fluorene | µg/L | 1900 | ND (0.10) (0.017) | - | 0.075 (0.010) | ND (0.050) (0.010) | 1.91 (0.10) | - | 0.085 (0.010) | 0.22 J (0.010) | 1.37 (0.10) | - | 5.2 (0.010) | 16 (0.010) | 1.61 (0.10) | - | 27 (0.10) | 4.9 (0.010) | 28 (0.010) | 0.144 (0.10) | - | 0.019 J (0.010) | 0.022 J (0.010) |
| Naphthalene | µg/L | 100 | ND (0.10) (0.036) | - | ND (0.061) (0.030) | ND (0.060) (0.030) | 0.692 (0.10) | - | ND (0.062) (0.031) | 9.3 (0.030) | 1.74 (0.10) | - | 0.29 (0.030) | 4.4 (0.030) | 1.24 (0.10) | - | 3.2 (0.31) | ND (0.065) (0.030) | ND (0.061) (0.030) | 0.268 (0.10) | - | ND (0.060) (0.030) | ND (0.060) (0.030) |
| Phenanthrene | µg/L | 1100 | ND (0.10) (0.021) | - | ND (0.061) (0.030) | ND (0.060) (0.030) | 3.29 (0.10) | - | ND (0.062) (0.031) | ND (0.60) (0.030) | 0.127 (0.10) | - | 0.73 (0.030) | 0.98 (0.030) | 1.99 (0.10) | - | 55 (0.31) | 2.5 (0.030) | 40 (0.030) | 0.113 (0.10) | - | 0.055 J (0.030) | ND (0.060) (0.030) |
| Pyrene | µg/L | 130 | ND (0.10) (0.015) | - | 0.033 J (0.010) | ND (0.050) (0.010) | 2.59 (0.10) | - | 1.1 (0.010) | 2.9 (0.010) | 0.218 (0.10) | - | 0.18 (0.010) | 0.32 (0.010) | 2.09 (0.10) | - | 130 (0.51) | 8.4 (0.010) | 31 (0.010) | 0.443 (0.10) | - | 0.074 (0.010) | 0.067 (0.010) |
| **Metals** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | 4.9 (0.97) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | ND (50) (0.59) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | 17100 (24) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | **5.7 (1.7)** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Manganese | µg/L | 300 | **785 (0.40)** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | ND (0.20) (0.089) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | µg/L | 10 | - | 2.1 J (0.97) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | ND (50) (0.59) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Iron | µg/L | n/v | - | 1150 (24) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Lead | µg/L | 5 | - | **6.0 (1.7)** | ND (1.0) (0.090) | ND (1.0) (0.090) | - | ND (3.0) (3.0) | 0.50 J (0.13) | 0.78 J (0.09) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | 0.22 J (0.09) | - | 3.5 (3.0) | 1.3 (0.13) | - | 2.1 (0.090) | - | ND (3.0) (3.0) | ND (1.0) (0.13) | ND (1.0) (0.090) |
| Manganese | µg/L | 300 | - | **711 (0.40)** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Mercury | µg/L | 2 | - | ND (0.20) (0.089) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **General Chemistry** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | 382000 (5000) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | 383000 (3500) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | 136000 (48) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluoride | µg/L | 4000 | 740 (5.1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | 16200 (1200) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | 30 B (5.6) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | 30 B (4.6) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | ND (10) (1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | 11200 (380) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sulfide | µg/L | n/v | 410 B (280) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Carbon | µg/L | n/v | 2900 (240) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | 544000 (1800) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Table 8**

**Historical Groundwater Analytical Results Summary - AOI 6 2013 to present**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Sample Location | | | URS-5 | | | WPM-11 | |
|---|---|---|---|---|---|---|---|
| Sample Date | | | 10-May-16 | 24-Aug-16 | 24-Aug-16 | 9-Jan-13 | 9-Jan-13 |
| Sample ID | | | GW-11109613-URS5-05-10-16-MM-040 | GW-11109613-URS-5-082416-AC-020 | GW-11109613-URS-5-082416-KC-021 | WPM-11_010913 | WPM-11_010913 |
| Sampling Company | | | GHD | GHD | GHD | UNKNOWN | UNKNOWN |
| Laboratory | | | LL | LL | LL | ACCUTEST | ACCUTEST |
| Laboratory Work Order | | | 1660120 | 1700681 | 1700681 | JB26465 | JB26465 |
| Laboratory Sample ID | Units | MSC-PA | 8378036 | 8553512 | 8553513 | JB26465-3 | JB26465-3F |
| **Field Parameters** | | | | | | | |
| Conductivity | mS/cm | n/v | 1.24 | - | 0.94 | - | - |
| Dissolved Oxygen, Field Measured | mg/L | n/v | 1.29 | - | 3.22 | - | - |
| Oxidation Reduction Potential, Field Measured | mV | n/v | -319 | - | -319 | - | - |
| pH, FIELD MEASURED | S.U. | n/v | 7.77 | - | 7.59 | - | - |
| Specific Conductance Field | mS/cm | n/v | - | - | - | - | - |
| Temperature, Field Measured | deg c | n/v | 14.23 | - | 22.44 | - | - |
| Total Dissolved Solids, Field Measured | g/L | n/v | - | - | - | - | - |
| Turbidity | NTU | n/v | 70 | - | 413 | - | - |
| **Volatile Organic Compounds** | | | | | | | |
| Benzene | µg/L | 5 | **4000 (13)** | **2300 (0.5)** | **4900 (0.5)** | **20.5 (1.0)** | - |
| 1,2-Dichloroethane (EDC) | µg/L | 5 | ND (25) (13) | ND (10) (0.5) | ND (20) (0.5) | ND (1.0) (1.0) | - |
| Ethylbenzene | µg/L | 700 | 560 (13) | 280 (0.5) | 530 (0.5) | ND (1.0) (1.0) | - |
| Isopropylbenzene (Cumene) | µg/L | 3500 | 22 J (13) | 13 J (0.5) | 31 J (0.5) | ND (2.0) (2.0) | - |
| Methyl Tertiary Butyl Ether | µg/L | 20 | ND (25) (13) | ND (10) (0.5) | ND (20) (0.5) | ND (1.0) (1.0) | - |
| Toluene | µg/L | 1000 | **8600 (130)** | **1500 (0.5)** | **6500 (0.5)** | ND (1.0) (1.0) | - |
| Total BTEX | µg/L | n/v | - | - | - | - | - |
| 1,2,4-Trimethylbenzene | µg/L | 62 | **190 (13)** | **92 (0.5)** | **230 (0.5)** | ND (2.0) (2.0) | - |
| 1,3,5-Trimethylbenzene | µg/L | 1200 | 56 (13) | 27 (0.5) | 72 (0.5) | ND (2.0) (2.0) | - |
| Xylenes, Total (Dimethylbenzene) | µg/L | 10000 | 3000 (13) | 1500 (0.5) | 2800 (0.5) | 2.2 (1.0) | - |
| **Volatile Organic Compounds (SW8011)** | | | | | | | |
| 1,2-DIBROMOETHANE (EDB) | µg/L | 0.05 | ND (0.029) (0.0097) | **0.089 (0.010)** | ND (0.040) (0.010) | ND (0.020) (0.020) | - |
| **Semi-Volatile Organic Compounds** | | | | | | | |
| Anthracene | µg/L | 66 | 5.6 (0.10) | 3.3 (0.010) | 4.8 (0.010) | 24.8 (0.50) | - |
| Benzo(a)Anthracene | µg/L | 4.9 | 0.96 (0.10) | 0.23 (0.010) | 0.46 J (0.010) | **66.0 (5.0)** | - |
| Benzo(a)Pyrene | µg/L | 0.2 | **0.27 J (0.10)** | 0.058 (0.010) | 0.15 J (0.010) | **115 (5.0)** | - |
| Benzo(b)Fluoranthene | µg/L | 1.2 | 0.24 J (0.10) | 0.056 (0.010) | 0.14 J (0.010) | **161 (5.0)** | - |
| Benzo(g,h,i)Perylene | µg/L | 0.26 | ND (0.51) (0.10) | 0.017 J (0.010) | ND (0.51) (0.010) | **118 (5.0)** | - |
| Chrysene | µg/L | 1.9 | 0.53 (0.10) | 0.11 (0.010) | 0.25 J (0.010) | **149 (5.0)** | - |
| Fluorene | µg/L | 1900 | 14 (0.10) | 1.5 (0.010) | 14 (0.010) | 18.0 (0.50) | - |
| Naphthalene | µg/L | 100 | **260 (3.0)** | **150 (0.030)** | **220 (0.030)** | 1.86 (0.50) | - |
| Phenanthrene | µg/L | 1100 | 20 (0.30) | 12 (0.030) | 21 (0.030) | 96.5 (5.0) | - |
| Pyrene | µg/L | 130 | 3.5 (0.10) | 1.7 (0.010) | 2.8 (0.010) | **265 (5.0)** | - |
| **Metals** | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - |
| Lead | µg/L | 5 | - | - | - | - | - |
| Manganese | µg/L | 300 | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - |
| **Metals, Dissolved** | | | | | | | |
| Arsenic | µg/L | 10 | - | - | - | - | - |
| Cobalt | µg/L | 35 | - | - | - | - | - |
| Iron | µg/L | n/v | - | - | - | - | - |
| Lead | µg/L | 5 | ND (1.0) (0.13) | ND (1.0) (0.090) | 0.14 J (0.090) | - | ND (3.0) (3.0) |
| Manganese | µg/L | 300 | - | - | - | - | - |
| Mercury | µg/L | 2 | - | - | - | - | - |
| **General Chemistry** | | | | | | | |
| Alkalinity, Bicarbonate (As Caco3) | µg/L | n/v | - | - | - | - | - |
| Alkalinity, Total (As Caco3) | µg/L | n/v | - | - | - | - | - |
| Chloride (As Cl) | µg/L | n/v | - | - | - | - | - |
| Fluoride | µg/L | 4000 | - | - | - | - | - |
| Nitrogen, Ammonia (as n) | µg/L | 30000 | - | - | - | - | - |
| Nitrogen, Nitrate (as n) | µg/L | 10000 | - | - | - | - | - |
| Nitrogen, Nitrate-Nitrite | µg/L | n/v | - | - | - | - | - |
| Nitrogen, Nitrite | µg/L | 1000 | - | - | - | - | - |
| Sulfate (as SO4) | µg/L | n/v | - | - | - | - | - |
| Sulfide | µg/L | n/v | - | - | - | - | - |
| Total Carbon | µg/L | n/v | - | - | - | - | - |
| Total Dissolved Solids (Residue, Filterable) | µg/L | n/v | - | - | - | - | - |

Historical Groundwater Analytical Results Summary - AOI 6 2013 to present
Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC

**Notes:**

| | |
|---|---|
| MSC-PA | Pennsylvania Department of Environmental Protection - 2016 Medium-Specific Concentrations (MSCs) for Organic/Inorganic Regulated Substances in Groundwater - Used Aquifer, Non Residential, TDS ≤ 2500 |
| ***6.5*** | Concentration exceeds the indicated standard. |
| 15.2 | Measured concentration did not exceed the indicated standard. |
| *ND (0.50)* | Laboratory reporting limit was greater than the applicable standard. |
| ND (0.03) | Analyte was not detected at a concentration greater than the laboratory reporting limit. |
| n/v | No standard/guideline value in database - 2016 values have been populated for Evergreen Comprehensive List only. Criteria for other analytes may be available but may not be represented here. |
| - | Parameter not analyzed / not available. |
| NM | Not measured. |
| B | Indicates the analyte is detected in the associated blank as well as in the sample. |
| J | Indicates an estimated value. |
| UJ | The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise. |
| µg/L | Micrograms per liter. |
| mg/L | Milligrams per liter. |
| mV | Millivolts. |
| S.U. | Standard Units. |
| mS/cm | Microsiemens per centimeter. |
| deg c | Degrees Celcius. |
| g/L | Grams per liter. |
| NTU | Nephelometric Turbidity Units. |
| LL | Eurofins Lancaster Laboratories Environmental |
| | Method detection limit is shown in second set of parentheses. |

**Table 9**

**2016 Gauging Data for AOI 6**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| AOI | Well ID | Top Inner Casing Elevation (ft msl) (NAVD88) | Date | Depth to LNAPL (ft btoc) | Depth to Water (ft btoc) | Apparent NAPL Thickness (ft) | Corrected Groundwater Elevation (ft AMSL) | Assigned LNAPL Density | LNAPL Density Source Well | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| AOI 6 | B-115 | 7.5 | 05/02/2016 | | 2.49 | | 5.01 | | | |
| AOI 6 | B-116 | 5.07 | 05/04/2016 | | 5.38 | | -0.31 | 0.8654 | B-129 | |
| AOI 6 | B-117 | 5.97 | 05/02/2016 | | 8.15 | | -2.18 | | | |
| AOI 6 | B-125 | 8.51 | 05/02/2016 | | 4.92 | | 3.59 | | | |
| AOI 6 | B-126 | 8.51 | 05/02/2016 | | 5.19 | | 3.32 | | | |
| AOI 6 | B-131 | 8.72 | 05/02/2016 | | 5.31 | | 3.41 | | | |
| AOI 6 | B-132 | 6.87 | 05/02/2016 | 4.79 | 4.96 | 0.17 | 2.06 | 0.8654 | B-129 | LNAPL very viscous |
| AOI 6 | B-133 | 7.33 | 05/02/2016 | | 5.06 | | 2.27 | | | |
| AOI 6 | B-134 | 6.52 | 05/02/2016 | 4.77 | 4.81 | 0.04 | 1.71 | | | |
| AOI 6 | B-144 | 9.02 | 05/02/2016 | 5.26 | 5.28 | 0.02 | 3.76 | 0.8654 | B-144 | LNAPL very viscous |
| AOI 6 | B-145 | 9.81 | 05/02/2016 | | 5.16 | | 4.65 | | | |
| AOI 6 | B-150 | 7.8 | 05/02/2016 | 3.55 | 5.56 | 2.02 | 3.99 | 0.8668 | B-150 | |
| AOI 6 | B-152 | 5.036 | 05/02/2016 | | 1.09 | | 3.95 | | | |
| AOI 6 | B-153 | 6.367 | 05/02/2016 | | 2.77 | | 3.60 | | | |
| AOI 6 | B-154 | 8.68 | 05/02/2016 | | 3.92 | | 4.76 | | | |
| AOI 6 | B-155 | 8.541 | 05/02/2016 | | 5.37 | | 3.17 | | | |
| AOI 6 | B-156 | 8.856 | 05/02/2016 | | 5.91 | | 2.95 | | | |
| AOI 6 | B-158 | 8.209 | 05/02/2016 | | 3.71 | | 4.50 | | | |
| AOI 6 | B-162 | 7.589 | 05/10/2016 | | 2.25 | | 5.34 | | | |
| AOI 6 | B-163 | 7.452 | 05/02/2016 | | 1.62 | | 5.83 | | | |
| AOI 6 | B-164 | 8.822 | 05/02/2016 | | 5.28 | | 3.54 | | | |
| AOI 6 | B-165 | 5.79 | 05/02/2016 | | 3.07 | | 2.72 | | | |
| AOI 6 | B-168 | 6.46 | 05/02/2016 | | 2.96 | | 3.50 | | | |
| AOI 6 | B-169 | 6.12 | 05/02/2016 | | 2.31 | | 3.81 | | | |
| AOI 6 | B-170 | 0.04 | 05/02/2016 | | 2.37 | | -2.33 | | | |
| AOI 6 | B-39 | 5.48 | 05/02/2016 | 2.01 | 2.56 | 0.55 | 3.40 | 0.8734 | B-39 | LNAPL very viscous |
| AOI 6 | B-43 | 7.21 | 05/11/2016 | | 3.9 | | 3.31 | | | |
| AOI 6 | B-45 | 5.099 | 05/02/2016 | | 1.58 | | 3.52 | | | |
| AOI 6 | U-4 | 9.22 | 05/02/2016 | | 4.49 | | 4.73 | | | |
| AOI 6 | URS-1 | 10.02 | 05/02/2016 | | 6.63 | | 3.39 | | | |
| AOI 6 | URS-3 | 7.6 | 05/02/2016 | | 4.19 | | 3.41 | | | |
| AOI 6 | URS-4 | 9.941 | 05/02/2016 | | 6.87 | | 3.07 | | | |
| AOI 6 | URS-5 | 7.94 | 05/02/2016 | | 5.42 | | 2.52 | 0.8734 | B-39 | |
| AOI 6 | B-132D | 10.31 | 05/02/2016 | | 15.56 | | -5.25 | | | |
| AOI 6 | B-133D | 8.6 | 05/02/2016 | | 10.36 | | -1.76 | | | |
| AOI 6 | B-134D | 8.12 | 05/02/2016 | | 11.28 | | -3.16 | | | |
| AOI 6 | B-48D | 9.42 | 05/02/2016 | | 11.14 | | -1.72 | | | |

**Table 10**

**Generalized Stratigraphic Section and Interpreted Hydrostratigraphic Units**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

<table>
<tr><th>System</th><th>Series</th><th colspan="2">Hydrogeologic Unit</th><th>Hydrostratigraphic Unit</th></tr>
<tr><td rowspan="2">Quaternary</td><td>Holocene</td><td colspan="2">Alluvium</td><td rowspan="3">Unconfined<br>(Water-Table) aquifer</td></tr>
<tr><td>Pleistocene</td><td colspan="2">Trenton "gravel"</td></tr>
<tr><td rowspan="8">Cretaceous</td><td rowspan="6">Upper<br>Cretaceous</td><td rowspan="8">Potomac-Raritan-Magothy aquifer system</td><td>Upper clay unit</td></tr>
<tr><td>Upper sand unit</td></tr>
<tr><td>Middle clay unit</td><td></td></tr>
<tr><td>Middle sand unit</td><td rowspan="4">Lower aquifer</td></tr>
<tr><td>Lower clay unit</td></tr>
<tr><td rowspan="2">Lower sand unit</td></tr>
<tr><td>Lower<br>Cretaceous</td></tr>
<tr><td>Pre-Cretaceous</td><td></td><td>Wissahickon Formation</td><td></td><td></td></tr>
</table>

Notes:

1. Adopted from Figure 2 of Schreffler, 2001.
2. Hydrostratigraphic units interpreted by Stantec based on observed AOI 1 subsurface conditions.

**Table 11**

**Summary of LNAPL Characterization Results**
**(Generalized LNAPL Types)**
**Philadelphia Refinery Operations, a Series of Evergreen Resources Group, LLC**

| Generalized LNAPL Type | Well ID | Sample Date | LNAPL Sub Types | | Weathering | LNAPL Type Interpretation By |
|---|---|---|---|---|---|---|
| | | | | Proportions % | | |
| Middle Distillate | B-129 | 02/27/2004 | Light Distillate | 5 | Severe | TGI |
| | | | Heavier Material | 20 | Extreme | TGI |
| | | | Middle Distillate | 75 | Extreme | TGI |
| Middle Distillate | B-130 | 02/27/2004 | Middle Distillate | 20 | Severe | TGI |
| | | | Residual Oil | 80 | Extreme | TGI |
| Light Distillate | B-144 | 02/27/2004 | Light Distillate | 90 | Severe | TGI |
| | | | Residual Oil | 10 | Severe | TGI |
| Middle Distillate | B-39 | 02/27/2004 | Light Distillate | 2 | Severe | TGI |
| | | | Middle Distillate | 98 | Severe | TGI |
| Middle Distillate | B-43 | 02/27/2004 | Middle Distillate | 100 | Extreme | TGI |
| Light Distillate | WP 9-2 | 03/01/2004 | Aviation Gasoline | 80 | Severe | TGI |
| | | | Middle Distillate | 20 | Severe | TGI |
| Residual Oil | B-47 | 04/12/2006 | Residual Oil | 100 | Extreme | TGI |
| | | | Unknown Aromatics | Trace | Extreme | TGI |
| Light Distillate | B-150 | 04/12/2006 | Unknown Aromatics | 100 | Unknown | TGI |

**Table 12**

**Vapor Intrusion Screening Building Information**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| AOI | Building Number | Building Name | Approximate Footprint (square feet) | Height of Building | Basement | Description of Use | # Indoor Air Samples Collected |
|---|---|---|---|---|---|---|---|
| 6 | 651 | GP Training Bldg | 13420 | 4 | Yes | Fitness Center-3rd Floor | 1 |
| 6 | | | | | | Offices - 1st Floor East | 1 |
| 6 | | | | | | Offices - 1st Floor West | 1 |
| 6 | | | | | | Offices - Basement | 1 |
| 6 | 178 | Trade Shops | 5750 | 1 | No | Lockers, Plumbers/Carpenter Shops | 2 |
| 6 | 295 | 24 Gate Building | 2501 | 2 | No | 2 floors offices | 5 |
| 6 | 475 | North Tank Field | 1156 | 1 | No | Control Room Office | 2 |
| 6 | 650 | GP - MOB | 21558 | 4 | Yes | Basement Center | 1 |
| 6 | | | | | | Basement East | 1 |
| 6 | | | | | | Basement West | 1 |
| 6 | | | | | | 1st Floor Entrance | 1 |
| 6 | | | | | | 1st Floor West | 1 |
| 6 | | | | | | 2nd Floor East | 1 |
| 6 | | | | | | 2nd Floor West | 1 |
| 6 | 726 | Carpenter Shop | 1280 | 1 | No | Carpenter Shop | 2 |
| 6 | 739 | Control Room | 3150 | 1 | No | Control Room | 2 |
| 6 | 745 | WTP | 5700 | 1 | No | Prefab, 5' by 10' | 2 |
| 6 | 6627 | Control Room | 546 | 1 | No | Control Room | 2 |
| 6 | 6636 | New Scale House | 540 | 1 | No | Trailer | 2 |

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AA-16-001 | AOI6-AA-16-002 | AOI6-AI-16-001 | AOI6-AI-16-002 | AOI6-AI-16-003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | | | | | Outdoor 28-Mar-16 | Ambient Outdoor Near Carpenter Shop Open Area 29-Mar-16 | 475 Building 28-Mar-16 | 745 Building 28-Mar-16 | Control Room, 6627 Building 28-Mar-16 |
| Sample ID | | | | | | | | | | | | IA-AOI6-OUTDOOR 739 | IA-AOI6-OUTDOOR-032916 | IA-AOI6-475 | IA-AOI6-745 | IA-AOI6-6627 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | LL | ESC | LL | LL | LL |
| Laboratory Work Order | | | | | | | | | | | | MHF24 | L827327 | MHF24 | MHF24 | MHF24 |
| Laboratory Sample ID | | | | | | | | | | | | 8316897 | L827327-04 | 8316892 | 8316893 | 8316894 |
| **Sample Type** | **Units** | **PADEP SHS VI Screening Value a** | **1/10th PADEP SHS VI Screening Value b** | **OSHA PEL c** | **USEPA RSL d** | **USEPA RSL e** | **ACGIH TLV f** | **NIOSH REL g** | **Cal/ OSHA PEL h** | **MH Air Tox i** | **EPA Res IA j** | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | **1.8 J[bde]** | **3.95[bdei]** | **5.5[bdei]** | 1.3 J | **36[abdeij]** |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (11) | ND (1.54) | ND (7.7) | ND (7.7) | ND (7.7) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (5.6) | ND (0.810) | ND (4.0) | ND (4.0) | ND (4.0) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | ND (6.0) | ND (0.867) | **1.1 J[i]** | ND (4.3) | **2.0 J[i]** |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | 1.5 J | 1.72 | 9.1 | ND (4.9) | 7.8 |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (5.0) | ND (0.721) | ND (3.6) | ND (3.6) | ND (3.6) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | **4.1 J[abde]** | ND (3.30) | ND (5.2) | ND (5.2) | ND (5.2) |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | 2.1 J | 2.85 | 3.9 | 2.2 J | **13[i]** |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | ND (6.8) | ND (0.982) | **1.4 J[i]** | ND (4.9) | **3.6 J[bi]** |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (6.8) | ND (0.982) | ND (4.9) | ND (4.9) | **1.3 J[i]** |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | **3.7 J[i]** | ND (1.73) | **4.7 J[i]** | **3.3 J[i]** | **11.9[i]** |

Notes:

| | |
|---|---|
| VI-PA[A] | PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017). |
| [A] | Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| [B] | One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| OSHA[C] | Occupational Safety and Health Administration - Permissible Exposure Limits. |
| [C] | Permissible Exposure Limits. |
| USEPA RSL[D] | United States Environmental Protection Agency (June 2017). |
| [D] | Regional Screening Level for Non-residential indoor air Hazard Index of 1. |
| [E] | Regional Screening Level for Non-residential indoor air Hazard Index of 0.1. |
| ACGIH TLV[F] | American Conference of Governmental Industrial Hygienists. |
| [F] | Threshold Limit Value. |
| NIOSH[G] | National Institute for Occupational Safety and Health. |
| [G] | Recommended Exposure Limits. |
| Cal / OSHA[H] | California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants. |
| MH Air Tox[I] | Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016. |
| USEPA Res IA[J] | USEPA Background Residential Indoor Air 2011, 95th percentile. |
| * | 95th percentile value not provided, value is 90th percentile. |
| ***4.63*[B]** | Concentration exceeds the indicated standard. |
| 1.32 | Measured concentration did not exceed the indicated standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value. |
| J | Indicates an estimated value. |

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AI-16-004 | AOI6-AI-16-005 | AOI6-AI-16-006 | AOI6-AI-16-007 | AOI6-AI-16-008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | | | | | Truck Scale House, 6636 Building 28-Mar-16 | Control Room, 739 Building 28-Mar-16 | 726 Building, Carpenter Shop 29-Mar-16 | 178 Building, Carpenter Trade Shop 29-Mar-16 | 295 Gate Building 1st Floor 29-Mar-16 |
| Sample ID | | | | | | | | | | | | IA-AOI6-6636 | IA-AOI6-739 | IA-AOI6-726 | IA-AOI6-178 | IA-AOI6-295-1 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | LL | LL | ESC | ESC | ESC |
| Laboratory Work Order | | | | | | | | | | | | MHF24 | MHF24 | L827327 | L827327 | L827327 |
| Laboratory Sample ID | | | | | | | | | | | | 8316895 | 8316896 | L827327-02 | L827327-03 | L827327-05 |
| **Sample Type** | **Units** | **PADEP SHS VI Screening Value a** | **1/10th PADEP SHS VI Screening Value b** | **OSHA PEL c** | **USEPA RSL d** | **USEPA RSL e** | **ACGIH TLV f** | **NIOSH REL g** | **Cal/ OSHA PEL h** | **MH Air Tox i** | **EPA Res IA j** | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | 2.1 J[bde] | 4.5[bdei] | 3.46[bdei] | 5.05[bdei] | 3.97[bdei] |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (7.7) | ND (7.7) | ND (1.54) | ND (1.54) | ND (1.54) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (4.0) | ND (4.0) | ND (0.810) | ND (0.810) | ND (0.810) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | 2.1 J[i] | 3.2 J[i] | ND (0.867) | ND (0.867) | ND (0.867) |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | ND (4.9) | 2.8 J | 1.45 | 1.60 | ND (0.983) |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (3.6) | ND (3.6) | ND (0.721) | ND (0.721) | ND (0.721) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | ND (5.2) | ND (5.2) | ND (3.30) | ND (3.30) | ND (3.30) |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | 2.6 J | 3.9 | 2.06 | 2.57 | 3.12 |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | 1.1 J[i] | ND (4.9) | ND (0.982) | ND (0.982) | 2.18[i] |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (4.9) | ND (4.9) | ND (0.982) | ND (0.982) | ND (0.982) |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | 9.8[i] | 14.1[i] | ND (1.73) | 1.76 | 2.2 |

Notes:

VI-PA[A] PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017).
[A] Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential.
[B] One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential.
OSHA[C] Occupational Safety and Health Administration - Permissible Exposure Limits.
[C] Permissible Exposure Limits.
USEPA RSL United States Environmental Protection Agency (June 2017).
[D] Regional Screening Level for Non-residential indoor air Hazard Index of 1.
[E] Regional Screening Level for Non-residential indoor air Hazard Index of 0.1.
ACGIH TLV American Conference of Governmental Industrial Hygienists.
[F] Threshold Limit Value.
NIOSH National Institute for Occupational Safety and Health.
[G] Recommended Exposure Limits.
Cal / OSHA [H] California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants.
MH Air Tox [I] Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016.
USEPA Res IA [J] USEPA Background Residential Indoor Air 2011, 95th percentile.
* 95th percentile value not provided, value is 90th percentile.
***4.63*[B]** Concentration exceeds the indicated standard.
1.32 Measured concentration did not exceed the indicated standard.
ND (2.4) (1.2) Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis.
n/v No standard/guideline value.
J Indicates an estimated value.

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AI-16-009 | AOI6-AI-17-01 | AOI6-AI-17-02 | AOI6-AI-17-03 | AOI6-AI-17-04 | AOI6-AI-17-05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 295 Gate Building 2nd Floor | 651 GP Training Building 3rd Floor, Fitness Center | 651 GP Training Building 1st Floor, East | 651 GP Training Building 1st Floor, West | 651 GP Training Building Basement, Lunch Area | 178 Building, Carpenter Trade Shop |
| Sample Date | | | | | | | | | | | | 29-Mar-16 | 8-Mar-17 | 8-Mar-17 | 8-Mar-17 | 8-Mar-17 | 9-Mar-17 |
| Sample ID | | | | | | | | | | | | IA-AOI6-295-2 | AOI6-AI-17-01 | AOI6-AI-17-02 | AOI6-AI-17-03 | AOI6-AI-17-04 | AOI6-AI-17-05 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | ESC | LL | LL | LL | LL | PACE |
| Laboratory Work Order | | | | | | | | | | | | L827327 | 1775150 | 1775150 | 1775150 | 1775150 | 10381753 |
| Laboratory Sample ID | | | | | | | | | | | | L827327-06 | 8876948 | 8876950 | 8876949 | 8876953 | 10381753003 |
| Sample Type | Units | PADEP SHS VI Screening Value a | 1/10th PADEP SHS VI Screening Value b | OSHA PEL c | USEPA RSL d | USEPA RSL e | ACGIH TLV f | NIOSH REL g | Cal/ OSHA PEL h | MH Air Tox i | EPA Res IA j | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | **3.94**[bdei] | **6.9 (0.64)**[bdei] | **6.8 (0.64)**[bdei] | **7.1 (0.64)**[bdei] | **6.4 (0.64)**[bdei] | 0.76 J (0.16) |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (1.54) | ND (7.7) (1.5) | ND (7.7) (1.5) | ND (7.7) (1.5) | ND (7.7) (1.5) | ND (2.1) (1.0) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (0.810) | ND (4.0) (0.81) | ND (4.0) (0.81) | ND (4.0) (0.81) | ND (4.0) (0.81) | ND (1.1) (0.27) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | **0.960**[i] | ND (4.3) (0.87) | **0.93 J (0.87)**[i] | **1.0 J (0.87)**[i] | ND (4.3) (0.87) | **1.5 J (0.57)**[i] |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | ND (0.983) | 3.3 J (0.98) | 2.1 J (0.98) | 2.3 J (0.98) | 1.5 J (0.98) | ND (3.4) (0.18) |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (0.721) | ND (3.6) (0.72) | ND (3.6) (0.72) | ND (3.6) (0.72) | ND (3.6) (0.72) | ND (4.9) (0.41) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | ND (3.30) | **9.6 (2.6)**[abdej] | ND (5.2) (2.6) | ND (5.2) (2.6) | ND (5.2) (2.6) | **3.3 J (0.41)**[bde] |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | 3.11 | 3.7 J (0.75) | **5.2 (0.75)**[i] | 3.9 (0.75) | 3.0 J (0.75) | 1.7 (0.21) |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | **2.04**[i] | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) | **2.0 J (0.17)**[i] |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (0.982) | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (3.3) (0.25) |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | 2.29 | - | - | - | - | **4.5 (1.5)**[i] |

Notes:

| | |
|---|---|
| VI-PA[A] | PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017). |
| [A] | Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| [B] | One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| OSHA[C] | Occupational Safety and Health Administration - Permissible Exposure Limits. |
| [C] | Permissible Exposure Limits. |
| USEPA RSL | United States Environmental Protection Agency (June 2017). |
| [D] | Regional Screening Level for Non-residential indoor air Hazard Index of 1. |
| [E] | Regional Screening Level for Non-residential indoor air Hazard Index of 0.1. |
| ACGIH TLV | American Conference of Governmental Industrial Hygienists. |
| [F] | Threshold Limit Value. |
| NIOSH | National Institute for Occupational Safety and Health. |
| [G] | Recommended Exposure Limits. |
| Cal / OSHA [H] | California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants. |
| MH Air Tox [I] | Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016. |
| USEPA Res IA [J] | USEPA Background Residential Indoor Air 2011, 95th percentile. |
| * | 95th percentile value not provided, value is 90th percentile. |
| ***4.63*** [B] | Concentration exceeds the indicated standard. |
| 1.32 | Measured concentration did not exceed the indicated standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value. |
| J | Indicates an estimated value. |

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AI-17-06 | AOI6-AI-17-07 | | AOI6-AI-17-08 | AOI6-AI-17-09 | AOI6-AI-17-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | | | | | 295 Gate Building 2nd Floor 8-Mar-17 | 295 Gate Building 1st Floor 8-Mar-17 | 295 Gate Building 1st Floor 9-Mar-17 | 475 Building 8-Mar-17 | 650 GP Office Building Basement, Center 8-Mar-17 | 650 GP Office Building Basement, East 8-Mar-17 |
| Sample ID | | | | | | | | | | | | AOI6-AI-17-06 | AOI6-AI-17-07 | AOI6-AI-17-07R | AOI6-AI-17-08 | AOI6-AI-17-09 | AOI6-AI-17-22 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | PACE | LL | PACE | LL | PACE | PACE |
| Laboratory Work Order | | | | | | | | | | | | 10381907 | 1775150 | 10381907 | 1775150 | 10381907 | 10382287 |
| Laboratory Sample ID | | | | | | | | | | | | 10381907007 | 8876951 | 10381907008 | 8876947 | 10381907001 | 10382287008 |
| Sample Type | Units | PADEP SHS VI Screening Value a | 1/10th PADEP SHS VI Screening Value b | OSHA PEL c | USEPA RSL d | USEPA RSL e | ACGIH TLV f | NIOSH REL g | Cal/ OSHA PEL h | MH Air Tox i | EPA Res IA j | | | | | | FIELD DUPLICATE SAMPLE |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | **2.2 (0.16)$^{bde}$** | **6.2 (0.64)$^{bdei}$** | **8.2 (0.19)$^{bdei}$** | **4.3 (0.64)$^{bdei}$** | **6.4 (0.16)$^{bdei}$** | **10.3 (0.16)$^{bdei}$** |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (5.2) (1.0) | ND (7.7) (1.5) | ND (2.4) (1.2) | ND (7.7) (1.5) | ND (2.1) (1.0) | ND (2.1) (1.0) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (0.55) (0.27) | ND (4.0) (0.81) | ND (0.64) (0.32) | ND (4.0) (0.81) | ND (1.1) (0.27) | ND (0.55) (0.27) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | **2.2 J (0.57)$^{i}$** | ND (4.3) (0.87) | **1.7 (0.66)$^{i}$** | ND (4.3) (0.87) | **1.5 J (0.57)$^{i}$** | ND (1.2) (0.57) |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | ND (3.4) (0.18) | 2.6 J (0.98) | ND (3.9) (0.21) | **310 (0.98)$^{bei}$** | ND (3.4) (0.18) | ND (3.4) (0.18) |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (4.9) (0.41) | ND (3.6) (0.72) | ND (5.7) (0.47) | ND (3.6) (0.72) | ND (4.9) (0.41) | 0.47 J (0.41) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | **0.52 J (0.41)$^{bde}$** | ND (5.2) (2.6) | ND (4.1) (0.47) | ND (5.2) (2.6) | **3.5 J (0.41)$^{bde}$** | **1.6 J (0.41)$^{bde}$** |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | **10.4 (0.21)$^{i}$** | 3.6 J (0.75) | **7.3 (0.24)$^{i}$** | 2.4 J (0.75) | 2.1 (0.21) | 2.8 (0.21) |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | **2.8 J (0.17)$^{i}$** | ND (4.9) (0.98) | **4.4 (0.19)$^{bi}$** | **1.2 J (0.98)$^{i}$** | **2.1 J (0.17)$^{i}$** | **0.58 J (0.17)$^{i}$** |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (3.3) (0.25) | ND (4.9) (0.98) | ND (1.5) (0.28) | ND (4.9) (0.98) | ND (3.3) (0.25) | ND (1.3) (0.25) |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | **8.4 (1.5)$^{i}$** | - | **8.8 (1.8)$^{i}$** | - | **4.8 (1.5)$^{i}$** | ND (3.6) (1.5) |

Notes:

| | |
|---|---|
| VI-PA[A] | PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017). |
| [A] | Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| [B] | One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| OSHA[C] | Occupational Safety and Health Administration - Permissible Exposure Limits. |
| [C] | Permissible Exposure Limits. |
| USEPA RSL | United States Environmental Protection Agency (June 2017). |
| [D] | Regional Screening Level for Non-residential indoor air Hazard Index of 1. |
| [E] | Regional Screening Level for Non-residential indoor air Hazard Index of 0.1. |
| ACGIH TLV | American Conference of Governmental Industrial Hygienists. |
| [F] | Threshold Limit Value. |
| NIOSH | National Institute for Occupational Safety and Health. |
| [G] | Recommended Exposure Limits. |
| Cal / OSHA [H] | California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants. |
| MH Air Tox [I] | Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016. |
| USEPA Res IA [J] | USEPA Background Residential Indoor Air 2011, 95th percentile. |
| * | 95th percentile value not provided, value is 90th percentile. |
| ***4.63*** [B] | Concentration exceeds the indicated standard. |
| 1.32 | Measured concentration did not exceed the indicated standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value. |
| J | Indicates an estimated value. |

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AI-17-11 | AOI6-AI-17-12 | AOI6-AI-17-13 | AOI6-AI-17-14 | AOI6-AI-17-15 | AOI6-AI-17-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | | | | | 650 GP Office Building Basement, West 8-Mar-17 | 650 GP Office Building 1st Floor, Entrance 8-Mar-17 | 650 GP Office Building 1st Floor, West 8-Mar-17 | 650 GP Office Building 2nd Floor, East 8-Mar-17 | 650 GP Office Building 2nd Floor, West 9-Mar-17 | 726 Building, Carpenter Shop 8-Mar-17 |
| Sample ID | | | | | | | | | | | | AOI6-AI-17-11 | AOI6-AI-17-12 | AOI6-AI-17-13 | AOI6-AI-17-14 | AOI6-AI-17-15 | AOI6-AI-17-17 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | PACE | PACE | PACE | PACE | LL | LL |
| Laboratory Work Order | | | | | | | | | | | | 10381907 | 10381907 | 10381907 | 10381907 | 1777963 | 1775150 |
| Laboratory Sample ID | | | | | | | | | | | | 10381907003 | 10381907004 | 10381907005 | 10381907006 | 8889684 | 8876957 |
| Sample Type | Units | PADEP SHS VI Screening Value a | 1/10th PADEP SHS VI Screening Value b | OSHA PEL c | USEPA RSL d | USEPA RSL e | ACGIH TLV f | NIOSH REL g | Cal/ OSHA PEL h | MH Air Tox i | EPA Res IA j | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | **8.6 (0.18)$^{bdei}$** | **14.1 (0.22)$^{bdei}$** | **15.8 (0.16)$^{bdei}$** | **5.9 (0.16)$^{bdei}$** | **3.6 (0.64)$^{bdei}$** | 1.2 J (0.64) |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (5.6) (1.1) | ND (7.0) (1.4) | ND (5.2) (1.0) | ND (5.2) (1.0) | ND (7.7) (1.5) | ND (7.7) (1.5) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (0.59) (0.30) | ND (0.74) (0.37) | ND (0.55) (0.27) | ND (0.55) (0.27) | ND (4.0) (0.81) | ND (4.0) (0.81) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | ND (3.2) (0.61) | ND (4.0) (0.76) | ND (3.0) (0.57) | ND (3.0) (0.57) | ND (4.3) (0.87) | ND (4.3) (0.87) |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | ND (3.6) (0.20) | ND (4.5) (0.25) | ND (3.4) (0.18) | ND (3.4) (0.18) | ND (4.9) (0.98) | ND (4.9) (0.98) |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (5.3) (0.44) | ND (6.6) (0.55) | ND (4.9) (0.41) | ND (4.9) (0.41) | ND (3.6) (0.72) | ND (3.6) (0.72) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | **1.9 J (0.44)$^{bde}$** | **1.0 J (0.55)$^{bde}$** | **5.9 (0.41)$^{abdej}$** | **0.74 J (0.41)$^{bde}$** | ND (5.2) (2.6) | ND (5.2) (2.6) |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | 3.5 (0.22) | 4.1 (0.28) | **5.3 (0.21)$^{i}$** | 3.6 (0.21) | 2.0 J (0.75) | 1.4 J (0.75) |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | **2.5 J (0.18)$^{i}$** | **3.0 J (0.22)$^{i}$** | **2.4 J (0.17)$^{i}$** | **2.6 J (0.17)$^{i}$** | ND (4.9) (0.98) | ND (4.9) (0.98) |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (3.6) (0.26) | ND (4.5) (0.33) | ND (3.3) (0.25) | ND (3.3) (0.25) | ND (4.9) (0.98) | ND (4.9) (0.98) |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | **7.7 (1.6)$^{i}$** | **6.3 (2.0)$^{i}$** | **7.9 (1.5)$^{i}$** | **7.8 (1.5)$^{i}$** | - | - |

Notes:

VI-PA[A] PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017).
[A] Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential.
[B] One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential.
OSHA[C] Occupational Safety and Health Administration - Permissible Exposure Limits.
[C] Permissible Exposure Limits.
USEPA RSL United States Environmental Protection Agency (June 2017).
[D] Regional Screening Level for Non-residential indoor air Hazard Index of 1.
[E] Regional Screening Level for Non-residential indoor air Hazard Index of 0.1.
ACGIH TLV American Conference of Governmental Industrial Hygienists.
[F] Threshold Limit Value.
NIOSH National Institute for Occupational Safety and Health.
[G] Recommended Exposure Limits.
Cal / OSHA[H] California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants.
MH Air Tox[I] Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016.
USEPA Res IA[J] USEPA Background Residential Indoor Air 2011, 95th percentile.
* 95th percentile value not provided, value is 90th percentile.
***4.63*[B]** Concentration exceeds the indicated standard.
1.32 Measured concentration did not exceed the indicated standard.
ND (2.4) (1.2) Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis.
n/v No standard/guideline value.
J Indicates an estimated value.

**Table 13**

**Summary of Indoor and Outdoor Air from the Vapor Intrusion Sampling**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| Sample Location | | | | | | | | | | | | AOI6-AI-17-18 | AOI6-AI-17-19 | AOI6-AI-17-20 | AOI6-AI-17-21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | | | | | Control Room, 739 Building 8-Mar-17 | 745 Building 8-Mar-17 | Control Room, 6627 Building 8-Mar-17 | Truck Scale House, 6636 Building 8-Mar-17 |
| Sample ID | | | | | | | | | | | | AOI6-AI-17-18 | AOI6-AI-17-19 | AOI6-AI-17-20 | AOI6-AI-17-21 |
| Sampling Company | | | | | | | | | | | | GHD | GHD | GHD | GHD |
| Laboratory | | | | | | | | | | | | LL | LL | LL | LL |
| Laboratory Work Order | | | | | | | | | | | | 1775150 | 1775150 | 1775150 | 1775150 |
| Laboratory Sample ID | | | | | | | | | | | | 8876952 | 8876958 | 8876946 | 8876956 |
| **Sample Type** | **Units** | **PADEP SHS VI Screening Value a** | **1/10th PADEP SHS VI Screening Value b** | **OSHA PEL c** | **USEPA RSL d** | **USEPA RSL e** | **ACGIH TLV f** | **NIOSH REL g** | **Cal/ OSHA PEL h** | **MH Air Tox i** | **EPA Res IA j** | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Benzene | µg/m$^3$ | 16 | 1.6 | 3190 | 1.6 | 1.6 | 1600 | 319.47 | 319.47 | 2.59 | 29 | **10 (0.64)**[bdei] | 0.86 J (0.64) | **21 (0.64)**[abdei] | **5.0 (0.64)**[bdei] |
| 1,2-Dibromoethane (EDB) | µg/m$^3$ | 0.2 | 0.02 | 153700 | 0.02 | 0.02 | - | 345.79 | - | n/v | n/v | ND (7.7) (1.5) | ND (7.7) (1.5) | ND (7.7) (1.5) | ND (7.7) (1.5) |
| 1,2-Dichloroethane (EDC) | µg/m$^3$ | 4.7 | 0.47 | 202400 | 0.47 | 0.47 | 40500 | 4000 | 4000 | 0.16 | 0.2 | ND (4.0) (0.81) | ND (4.0) (0.81) | ND (4.0) (0.81) | ND (4.0) (0.81) |
| Ethylbenzene | µg/m$^3$ | 49 | 4.9 | 435000 | 4.9 | 4.9 | 86800 | 435000 | 435000 | 0.68 | 17 | ND (4.3) (0.87) | ND (4.3) (0.87) | **1.1 J (0.87)**[i] | ND (4.3) (0.87) |
| Isopropylbenzene (Cumene) | µg/m$^3$ | 1800 | 180 | 245000 | 1800 | 180 | 246000 | 245000 | 245000 | 11.2 | n/v | **15 (0.98)**[i] | ND (4.9) (0.98) | **34 (0.98)**[i] | 2.4 J (0.98) |
| Methyl Tert-Butyl Ether | µg/m$^3$ | 470 | 47 | - | 47 | 47 | 180000 | - | 144000 | n/v | 72 | ND (3.6) (0.72) | ND (3.6) (0.72) | ND (3.6) (0.72) | ND (3.6) (0.72) |
| Naphthalene | µg/m$^3$ | 3.6 | 0.36 | 50000 | 0.36 | 0.36 | 52000 | 50000 | 50000 | n/v | 4.8* | ND (5.2) (2.6) | ND (5.2) (2.6) | ND (5.2) (2.6) | ND (5.2) (2.6) |
| Toluene | µg/m$^3$ | 22000 | 2200 | 754000 | 22000 | 2200 | 75400 | 375000 | 37500 | 4.52 | 144 | 2.5 J (0.75) | 1.1 J (0.75) | 2.7 J (0.75) | 2.7 J (0.75) |
| 1,2,4-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 0.38 | 6.5 | ND (4.9) (0.98) | ND (4.9) (0.98) | **1.9 J (0.98)**[i] | ND (4.9) (0.98) |
| 1,3,5-Trimethylbenzene** | µg/m$^3$ | 31 | 3.1 | - | 260 | 26 | 123000 | 125000 | 125000 | 1.12 | 19 | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) | ND (4.9) (0.98) |
| Total Xylene | µg/m$^3$ | 440 | 44 | 435000 | 440 | 44 | 434000 | 435000 | 435000 | 3.14 | 63.5 | - | - | - | - |

Notes:

| | |
|---|---|
| VI-PA[A] | PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential (January 2017). |
| [A] | Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| [B] | One-tenth of PADEP Indoor Air Statewide Health Standard Vapor Intrusion Screening Values, Non-Residential. |
| OSHA[C] | Occupational Safety and Health Administration - Permissible Exposure Limits. |
| [C] | Permissible Exposure Limits. |
| USEPA RSL | United States Environmental Protection Agency (June 2017). |
| [D] | Regional Screening Level for Non-residential indoor air Hazard Index of 1. |
| [E] | Regional Screening Level for Non-residential indoor air Hazard Index of 0.1. |
| ACGIH TLV | American Conference of Governmental Industrial Hygienists. |
| [F] | Threshold Limit Value. |
| NIOSH | National Institute for Occupational Safety and Health. |
| [G] | Recommended Exposure Limits. |
| Cal / OSHA [H] | California Division of Occupational Safety and Health - Permissible Exposure Limits for chemical contaminants. |
| MH Air Tox [I] | Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016. |
| USEPA Res IA [J] | USEPA Background Residential Indoor Air 2011, 95th percentile. |
| * | 95th percentile value not provided, value is 90th percentile. |
| ***4.63*** [B] | Concentration exceeds the indicated standard. |
| 1.32 | Measured concentration did not exceed the indicated standard. |
| ND (2.4) (1.2) | Analyte was not detected at a concentration greater than the laboratory reporting limit. The first value in parenthesis is the reporting limit. The method detection limit is shown in the second set of parenthesis. |
| n/v | No standard/guideline value. |
| J | Indicates an estimated value. |

**Table 14**

**Summary of Outdoor Air Sampling Over NAPL**
**AOI 6 Remedial Investigation Report**
**Philadelphia Refinery Operations, a series of Evergreen Resources Group, LLC**

| **Sample Location:** | | | | **AOI6-AA-16-001** | **AOI6-AA-16-002** | **AOI6-AA-16-003** |
|---|---|---|---|---|---|---|
| **Sample ID:** | | | | **AOI6-AA16-001** | **AOI6-AA16-002** | **AOI6-AA16-003** |
| **Sample Date:** | | | | **08/25/2016** | **08/25/2016** | **08/25/2016** |
| **Parameters** | **Units** | **MH Air Tox** | **USEPA Res IA** | | | |
| **Volatile Organic Compounds** | | | | | | |
| 1,2,4-Trimethylbenzene | µg/m$^3$ | 1.12 | 19 | ND(4.9) | ND(4.9) | ND(4.9) |
| 1,2-Dibromoethane (Ethylene dibromide) | µg/m$^3$ | N/V | N/V | ND(7.7) | ND(7.7) | ND(7.7) |
| 1,2-Dichloroethane | µg/m$^3$ | 0.16 | 0.2 | ND(4.0) | ND(4.0) | ND(4.0) |
| 1,3,5-Trimethylbenzene | µg/m$^3$ | 0.38 | 6.5 | ND(4.9) | ND(4.9) | ND(4.9) |
| Benzene | µg/m$^3$ | 2.59 | 29 | ND(3.2) | ND(3.2) | ND(3.2) |
| Ethylbenzene | µg/m$^3$ | 0.68 | 17 | ND(4.3) | ND(4.3) | ND(4.3) |
| Isopropyl benzene | µg/m$^3$ | 11.2 | N/V | ND(4.9) | ND(4.9) | ND(4.9) |
| Methyl tert butyl ether (MTBE) | µg/m$^3$ | N/V | 72 | ND(3.6) | ND(3.6) | ND(3.6) |
| Naphthalene | µg/m$^3$ | N/V | 4.8* | ND(5.2) | ND(5.2) | ND(5.2) |
| Toluene | µg/m$^3$ | 4.52 | 144 | ND(3.8) | ND(3.8) | ND(3.8) |
| Xylenes (total) | µg/m$^3$ | 3.14 | 63.5 | ND | ND | 2.6 J |

Notes:

| | |
|---|---|
| J | Estimated concentration. |
| ND | Not detected at the associated reporting limit. |
| N/V | No criteria value. |
| MH Air Tox | Marcus Hook Air Toxics Monitor 2015, maximum value of PADEP data accessed February 5, 2016. |
| USEPA Res IA | USEPA Background Residential Indoor Air 2011, 95th percentile. |
| * | 95th percentile value not provided, value is 90th percentile. |