CORRECTIVE ACTION PROCESS REPORT/PLAN COVER SHEET

CHAPTER 245 - STORAGE TANK AND SPILL PREVENTION ACT

Storage Tank Facility ID #: 51-33620

Consultant Name: Terraphase Engineering

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Media of Concern: [X] **Soil** [X] **Groundwater**

Contaminant(s) (*e.g. unleaded gasoline*)**:** petroleum products

(check all that apply to the enclosed submission)

- [ ] **Remedial Action Progress Report**
- [ ] **Risk Assessment Report** (***e.g. vapor intrusion, ecological, or human health risk calculations***)
- [ ] **Site Characterization Report – Section 245.310(b)**
  - [ ] Residential [ ] Nonresidential
- [X] **Site Characterization Report – Statewide Health or Background Standard**
  - [ ] Residential [X] Nonresidential
- [X] **Site Characterization Report – Site Specific Standard**
  - [ ] Residential [X] Nonresidential
- [ ] **Remedial Action Plan – Statewide Health or Background Standard**
  - [ ] Residential [ ] Nonresidential
- [ ] **Remedial Action Plan – Site Specific Standard**
  - [ ] Residential [ ] Nonresidential
- [ ] **Remedial Action Completion Report – Statewide Health or Background Standard**
  - [ ] Residential [ ] Nonresidential
- [ ] **Remedial Action Completion Report – Site Specific Standard**
  - [ ] Residential [ ] Nonresidential
- [ ] **Post Remediation Care Report**
- [ ] **Environmental Covenant**
  - [ ] Draft [ ] Final
- [ ] **Other:** _____

FINAL

Site Characterization Report Addendum - Tank Group 02

Former Philadelphia Energy Solutions Refinery
3144 West Passyunk Avenue, Philadelphia, Pennsylvania
Incident No. 56377

Prepared for

Philadelphia Energy Solutions Refining and Marketing LLC
111 S. Wacker Drive, Suite 3000
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Prepared by

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May 2022

Project Number P044.001.002

File: 20220520-Terraphase-PESRM-SCR-Addendum-TG02-FINAL

terraphase engineering

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Acronyms and Abbreviations

§	Section
25 PA Code	Title 25 Pennsylvania Code
Act 2	Pennsylvania Land Recycling and Environmental Remediation Standards Act
Act 32	Storage Tank and Spill Prevention Act
Addendum	*Site Characterization Report Addendum for Tank Group 02*
AST	aboveground storage tank
bgs	below ground surface
COC	constituents of concern
DBA	dibromoethane
Evergreen	Evergreen Resources Group, LLC; includes Sunoco, Inc. n/k/a ETC Sunoco Holdings LLC, Sunoco, Inc. (R&M) n/k/a Sunoco (R&M), LLC n/k/a Energy Transfer (R&M), LLC and Evergreen collectively referred to as "Evergreen"
Facility	former Philadelphia Energy Solutions refinery facility
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSC	medium-specific concentrations
MTBE	methyl tert-butyl ether
Non-Res Soil DC	Non-Residential Soil Direct Contact
Non-Res UA	Non-Residential Used Aquifer Groundwater
Non-Res UA S-GW	Non-Residential Used Aquifer Soil-to-Groundwater
PA	Pennsylvania
PADEP	Pennsylvania Department of Environmental Protection
PNDI	Pennsylvania Natural Diversity Inventory
PESRM	Philadelphia Energy Solutions Refining and Marketing LLC
Site	Tank Group 02 located within the former Philadelphia Energy Solutions Refinery facility
SCR	*Site Characterization Report*
SHS	Statewide Health Standard
South Yard	Point Breeze Refinery South Yard
SSS	Site-Specific Standard
T	time
Terraphase	Terraphase Engineering, Inc.
TMB	trimethylbenzene
USEPA	United States Environmental Protection Agency
Work Plan	*Aboveground Storage Tank Closure Work Plan*

Certification

Pursuant to the requirements of the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2), adopted May 19, 1995, which states:

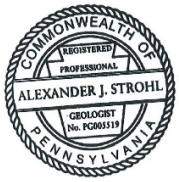
> Interpretation of geologic and hydrogeologic data shall be prepared by a professional geologist licensed in this Commonwealth.

I hereby attest that, as a Professional Geologist licensed in the Commonwealth of Pennsylvania, I am familiar with, and have reviewed and/or prepared the interpretation of the geology and hydrogeology presented in this report entitled *Site Characterization Report Addendum – Tank Group 02, Former Philadelphia Energy Solutions Refinery, 3144 West Passyunk Avenue, Philadelphia, Pennsylvania*, dated April 2022.

Based on the available data represented in the report, I believe that the geologic and hydrogeologic interpretations made herein are reasonable and accurate.

Alexander J. Strohl, PG
Senior Staff Geologist

May 20, 2022
Date



1 Introduction

Terraphase Engineering, Inc. (Terraphase) has prepared this *Site Characterization Report Addendum for Tank Group 02* (Addendum), on behalf of Philadelphia Energy Solutions Refining and Marketing LLC (PESRM), to serve as an addendum to the *Site Characterization Report for Tank Group 02* (SCR) submitted to the Pennsylvania Department of Environmental Protection (PADEP) on April 7, 2022. The Addendum presents additional information pertaining to the Site Assessment and Site Characterization activities which have been completed at Tank Group 02 (the Site), located within the former Philadelphia Energy Solutions refinery facility (Facility). The Facility, which is undergoing closure activities in preparation for redevelopment, is located at 3144 West Passyunk Avenue, Philadelphia, Pennsylvania (**Figure 1**). Remediation activities are being conducted at the Facility under the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) by both PESRM and Evergreen Resources Group, LLC (Evergreen)[1] in accordance with the 2012 Buyer-Seller Agreement and the 2020 First Amendment to that Agreement.

The Site Assessment and Site Characterization activities described in this Report were performed in accordance with the applicable provisions of The Storage Tank and Spill Prevention Act (Act 32), Title 25 of the Pennsylvania (PA) Code (25 PA Code) Chapter 245 (Subchapter D), and Terraphase's 2021 *Aboveground Storage Tank Closure Work Plan* (Work Plan) approved by the PADEP on April 23, 2021. As discussed in the Work Plan, closure of the above ground storage tanks (ASTs) under Act 32 is being pursued through a group closure process, in which ASTs in the same general area (e.g., tank farm) have been demolished, removed, investigated, and evaluated at about the same time. Demolition of the tanks has been proceeding in phases from the north to the south with eight tank groups in all.

The Site (**Figure 2**) is located within a larger area of the Facility referred to as the Point Breeze Refinery South Yard (South Yard). Evergreen is currently engaged in characterization and remediation work at the Facility under the Pennsylvania One Cleanup Program and oversight by the PADEP and the United States Environmental Protection Agency ([USEPA]; eFACTS PF Nos. 778374 and 778376). In its associated documentation, Evergreen has identified the Site within the South Yard as Areas of Interest 1 and 2. The specific ASTs addressed in this Report are shown on **Figure 3** and listed in **Table 1**.

The SCR submitted to PADEP on April 7, 2022 was prepared in accordance with Act 32 and 25 PA Code Chapter 245 (Subchapter D) and provides a summary of the Site Assessment and Site Characterization activities that were performed following the identification of potential releases to the environment during the demolition and removal of the on-site ASTs. This Addendum supplements the information in the SCR, supports the demonstration that adequate characterization has been performed to evaluate whether remedial action is warranted, and indicates whether PESRM will pursue closure under the Statewide Health Standard (SHS), the Site-Specific Standard (SSS) or a combination of these standards.

[1] Evergreen Resources Management Operations, a series of Evergreen, is managing the legacy remedial work for Philadelphia Refinery Operations, a series of Evergreen and Sunoco (R&M), LLC. For clarity, Sunoco, Inc. n/k/a ETC Sunoco Holdings LLC, Sunoco, Inc. (R&M) n/k/a Sunoco (R&M), LLC n/k/a Energy Transfer (R&M), LLC effective April 19, 2021, and Evergreen shall be referred to collectively as "Evergreen" in this Report.

Based upon feedback received from PADEP, this Addendum provides the following to supplement the information provided in the April 7, 2022 SCR:

- Selected Standard – As presented in Section 4.1 of this Addendum, PESRM has chosen to select a combination of standards to attain closure for chemicals of concern (COCs) identified in soil and groundwater in Tank Group 02. Specifically, PESRM has selected the non-residential SHS for all COCs that meet or are below the SHS. For COCs exceeding the SHS Medium Specific Concentrations (MSCs), the SSS via pathway elimination will be chosen as the remediation standard.
- Assessment of the S-GW Pathway and Characterization of COCs in Groundwater – This Addendum identifies the COCs which were found in soil at concentrations greater than the Non-residential Used Aquifer Soil-to-Groundwater (Non-Res UA S-GW) MSCs and discusses the nature and extent of these site-related COCs in groundwater. Fate and transport modeling was performed to determine the distance to which AST-related groundwater contamination may migrate before attenuating to concentrations equal to or less than applicable MSCs.
- Tank System Closure Report Forms – Aboveground Storage Tank System Closure Report forms (2630-FM-BECB0514) are being prepared and will be submitted under separate cover.
- Updated Ecological Screening Evaluation – This Addendum updates the ecological screening evaluation to include a Pennsylvania Natural Diversity Inventory (PNDI) search that was performed for the Site.

Details regarding the site setting are provided in the Work Plan and in the April 7, 2022 SCR and are not repeated herein.

2 Tank Infrastructure and Removal

The demolition of the following ASTs began in December 2020 and was completed in January 2022:

- PB 26 (PADEP No. 001A)
- PB 27 (PADEP No. 019A)
- PB 28 (PADEP No. 020A)
- PB 29 (PADEP No. 021A)
- PB 33 (PADEP No. 002A)
- PB 34 (PADEP No. 022A)
- PB 35 (PADEP No. 023A)
- PB 40 (PADEP No. 026A)
- PB 128 (PADEP No. 032A)
- PB 129 (PADEP No. 033A)
- PB 204 (PADEP No. 041A)
- PB 36 (PADEP No. 087A)
- PB 37 (PADEP No. 024A)
- PB 38 (PADEP No. 003A)
- PB 39 (PADEP No. 025A)
- PB 42 (PADEP No. 027A)
- PB 43 (PADEP No. 028A)
- PB 83 (PADEP No. 004A)
- PB 84 (PADEP No. 029A)
- PB 85 (PADEP No. 030A)

A summary of the tank infrastructure and removal effort was included in the April 7, 2022 SCR and is not repeated herein.

The Aboveground Storage Tank System Closure Report forms (2630-FM-BECB0514) are being prepared and will be submitted under separate cover.

3 Site Assessment

This section summaries the conclusions of the Site Assessment as presented in the SCR. They are provided in this Addendum for convenience.

Soil sampling results from the Site Assessment were compared to the following Non-residential MSCs[2] to help identify potential releases to the environment from the ASTs and their associated piping:

- Non-Residential Soil Direct Contact (Non-Res Soil DC) MSCs for surface soil
- Non-Res UA S-GW MSCs

Figure 4 identifies the Site Assessment sampling locations where COCs were identified at concentrations greater than the Non-residential MSCs. Overall, the screening evaluation identified 10 COCs in soil at concentrations greater than the applicable MSCs (i.e., benzene, 1,2-dibromoethane, ethyl benzene, methyl tert-butyl ether (MTBE), toluene, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB, xylenes [total], naphthalene, and lead). The lists of COCs identified in proximity to each AST at concentrations greater than the applicable MSCs, are provided below.

- **PB 26.** None
- **PB 27.** Benzene, ethyl benzene, MTBE, toluene, 1,2,4-TMB, 1,3,5-TMB, xylenes (total), naphthalene, and lead
- **PB 28.** Benzene, ethyl benzene, toluene, 1,2,4-TMB, 1,3,5-TMB, xylenes (total), and lead
- **PB 29.** Benzene, ethyl benzene, MTBE, toluene, 1,2,4-TMB, 1,3,5-TMB, xylenes (total), naphthalene, and lead
- **PB 33.** Benzene, ethyl benzene, MTBE, and toluene
- **PB 34.** Benzene and lead
- **PB 35.** Benzene and lead
- **PB 36.** Benzene, ethyl benzene, toluene, 1,2,4-TMB, 1,3,5-TMB, xylenes (total), and naphthalene
- **PB 37.** Benzene and lead
- **PB 38.** Benzene and lead
- **PB 39.** Benzene, ethyl benzene, toluene, 1,2,4-TMB, 1,3,5-TMB, and naphthalene
- **PB 40.** Benzene and lead
- **PB 42.** Benzene

[2] Soil sampling intervals were based on the results of field screening (i.e., staining, odors, and elevated photoionization detector readings). Where potentially impacted materials were not encountered, discrete samples were collected from native soil at a depth of 3.0–3.5 feet bgs in accordance with PADEP's *Closure Requirements for Aboveground Storage Tank Systems* (2017b). Since only subsurface (greater than 2 feet bgs) soil samples were collected from some locations during the Site Assessment, the comparison of the resulting concentrations to MSCs conservatively disregarded the surface/subsurface soil designation reflected in the Non-Res Soil DC MSCs (i.e., results were compared to the Non-Res DC MSCs for surface soil). This approach was used to support Site Characterization decision-making and ensure that adequate characterization was performed.

- **PB 43.** None
- **PB 83.** Benzene
- **PB 84.** Benzene, 1,2,4-TMB, 1,3,5-TMB, and naphthalene
- **PB 85.** Benzene
- **PB 128.** Benzene and lead
- **PB 129.** Benzene, ethyl benzene, toluene, 1,2,4-TMB, 1,3,5-TMB, xylenes (total), and lead
- **PB 204.** Benzene, 1,2-dibromoethane, naphthalene, and lead

Table 2 lists the COCs identified in soil in the vicinity of each on-site tank during Site Assessment sampling. Based on visual observation of the release at PB 83 and the results of Site Assessment sampling for PB 83 and the other on-site tanks, a Site Characterization plan was developed. The objective of the Site Characterization was to delineate the horizontal and vertical extent of the potential releases until sufficient data were available to determine the need for interim or remedial measures.

4 Site Characterization

This section discusses the selection of standards, soil sampling results, and the supplemental Site Characterization.

4.1 Selection of Standard

This selection of standards has been updated from what was originally presented in the April 7, 2022 SCR following discussions with PADEP.

PESRM has chosen to select a combination of standards to attain closure for COCs identified in soil and groundwater in Tank Group 02. Specifically, PESRM has selected the non-residential SHS for all COCs that meet or are below the SHS. For COCs exceeding the SHS MSCs, a SSS via pathway elimination will be chosen as the remediation standard.

A summary of the selected standard for each COC is presented on **Table 3**.

4.2 Site Characterization Soil Sampling Results Summary

The Site Characterization scope included the installation of 32 soil borings and the collection of 79 soil samples. Samples were collected at shallow (0 – 0.5 feet below ground surface [bgs]) and deep soil intervals (e.g., 3.5 – 4, 6 – 6.5, and 14 – 14.5 feet bgs) to vertically characterize the extent of COCs in soil. **Figure 4** shows the location of each of the Site Characterization soil borings. **Table 4** presents a comparison of the maximum detected COC surface soil and subsurface soil concentrations across the Site to the applicable MSCs and reflects both Site Assessment and Site Characterization sampling results. As discussed in the April 7, 2022 SCR, with consideration for surface and subsurface soil, a comparison to applicable MSCs indicates the following:

<u>Surface Soil</u>

- Non-Res Soil DC Exceedances: lead and naphthalene
- Non-Res UA S-GW Exceedances: benzene, ethyl benzene, 1,2,4-TMB, 1,3,5-TMB, xylenes, naphthalene, and lead

<u>Subsurface Soil</u>

- Non-Res Soil DC Exceedance: naphthalene
- Non-Res UA S-GW Exceedances: benzene, 1,2-dibromoethane (DBA), ethyl benzene, MTBE, 1,2,4-TMB, 1,3,5-TMB, toluene, xylenes, naphthalene, and lead

The spatial distribution of these exceedances is shown on **Figure 4**. In summary, benzene, ethyl benzene, 1,2,4-TMB, 1,3,5-TMB, xylenes, naphthalene, and lead are considered COCs in surface soil. Benzene, 1,2-DBA, ethyl benzene, MTBE, 1,2,4-TMB, 1,3,5-TMB, toluene, xylenes, naphthalene, and lead are considered COCs in subsurface soil. Figure sets **5a/5b** through **14a/14b** illustrate the spatial distribution of the specific COCs in surface and subsurface soil, respectively, relative to the applicable MSCs. Tables with the soil analytical results are provided in **Appendix A.**

While not repeated herein, the April 7, 2022 SCR, provides a discussion for each COC as to why the data are sufficient (1) to delineate the horizontal and vertical extent of impacts in soil and (2) to support a reliable determination regarding the need for soil remedial measures with consideration for the selected standard.

4.3 Supplemental Site Characterization

After the submission of the April 7, 2022 SCR, the Department requested that additional analysis and data evaluation be performed to further characterize the nature and extent of COCs in soil and groundwater with consideration for the S-GW exposure pathway. As such, this Section provides for those COCs detected in soil at concentrations exceeding the Non-Res UA S-GW MSCs, conservative fate and transport modeling to:

1. Estimate shallow groundwater COC concentrations that could result from soil contamination leaching to groundwater; and
2. Conservatively estimate the distance to which AST-related groundwater contamination may migrate before attenuating to concentrations equal to or less than the Non-Residential Used Aquifer Groundwater (Non-Res UA) MSCs for groundwater.

The results of this evaluation are used, in combination with existing groundwater data collected by Evergreen for the unconfined unit, to demonstrate that the nature and extent of COC groundwater concentrations above the Non-Res UA MSCs at the Site potentially related to the ASTs has been adequately characterized.

Figure 15 shows the location of the unconfined groundwater monitoring wells for which the most recent analytical results from Evergreen's groundwater data set were evaluated. Tables with the unconfined groundwater analytical results are provided in **Appendix A.**

4.3.1 Fate and Transport (S-GW)

Estimated concentrations in groundwater were calculated by multiplying measured concentrations in soil by the ratio of the Non-Res UA MSC for groundwater to the Non-Res S-GW UA MSC for soil, as shown in the following equation:

$$C_{gw} = C_{soil} \times \frac{MSC_{GW}}{MSC_{S-GW}}$$

Where,

- Cg_W is the estimated groundwater concentration (milligrams per liter [mg/L])
- C_{soil} is the measured soil concentration in the vadose zone (milligrams per kilogram [mg/kg])
- $MSC_{S\text{-}GW}$ is the Non-Res UA S-GW MSC (mg/kg)
- MSC_{GW} is the Non-Res UA MSC (mg/L)

Calculating estimated groundwater concentrations in this way incorporates the same modeling assumptions used by PADEP in derivation of the MSCs. **Table 5** presents the estimated groundwater concentration calculated for each soil result that exceeded the Non-Res UA S-GW MSC. These modeling

results are conservative in that they assume that soil contamination in the vadose zone has reached the water table even at locations where deeper soil samples exhibit concentrations less than the S-GW MSCs.

4.3.2 Fate and Transport (Migration in Groundwater)

The conservative S-GW modeling presented in Section 4.3.1 indicates that soil concentrations of benzene, 1,2-DBA, ethyl benzene, MTBE, 1,2,4-TMB, 1,3,5-TMB, toluene, xylenes, naphthalene, and lead at the following ASTs could potentially result in groundwater concentrations exceeding the Non-Res UA MSCs:

- **Benzene** (@ PB 27, PB 28, PB 29, PB 33, PB 34, PB 35, PB 36, PB 37, PB 38, PB 39, PB 40, PB 42, PB 83, PB 84, PB 85, PB 128, PB 129, and PB 204)
- **1,2-DBA** (@ PB 204)
- **Ethyl Benzene** (@ PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129)
- **MTBE** (@ PB 27, PB 29, and PB 33)
- **Toluene** (@ PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129)
- **1,2,4-TMB** (@ PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129)
- **1,3,5-TMB** (@ PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129)
- **Xylenes** (@ PB 27, PB 28, PB 29, PB 36, and PB 129)
- **Naphthalene** (@ PB 27, PB 29, PB 36, PB 39, PB 84, and PB 204)
- **Lead** (@PB 27, PB 28, PB 29, PB 34, PB 35, PB 37, PB 38, PB 40, PB 128, PB 129, and PB 204)

Simple 1-D groundwater contamination fate and transport modeling calculations were performed for each COC/AST combination. The following relationships were used to estimate the contaminant transport velocity, v_{COC}, in groundwater:

$$v = \frac{K \cdot i}{n_e} \qquad R_{COC} = 1 + \frac{K_d \rho_b}{n_e} \qquad v_{COC} = \frac{v}{R_{COC}}$$

Where,

- v is the conservatively estimated seepage velocity (ft/day)
- K is hydraulic conductivity (ft/day)
- i is the gradient (ft/ft)
- n_e is the effective porosity of the aquifer (unitless)
- R_{COC} is the chemical-specific retardation factor (unitless)
- K_d is the chemical-specific partition coefficient (L/kg)[3]
- ρ_b is the bulk density (kg/L)

[3] For organic chemicals K_d is equal to the product of the chemical-specific organic carbon partition coefficient, K_{oc} (L/kg) and the organic carbon fraction, f_{oc} (unitless).

- v_{COC} is the chemical-specific groundwater velocity (ft/day)

Values of K (40 ft/day), i (0.0007 ft/ft), and n_e (0.39) were based upon information presented in Evergreen's Area of Interest 1 RIR (Stantec 2016a) for the unconfined aquifer in the vicinity of Tank Group 02. The value for f_{oc} was assumed to be 0.002, based upon the default value used by PADEP (2014) for groundwater fate and transport analysis. Chemical-specific values for K_{oc} and K_d as published on Table 5A and Table 5B, respectively, of Chapter 250 were used.

The results of these calculations are presented on **Table 6**.

In order to determine the distance to which AST-related groundwater contamination may migrate before attenuating to concentrations equal to or less than the Non-Res UA MSC, the rate of chemical-specific degradation was estimated assuming first-order decay and the chemical-specific decay rates (λ) presented in Chapter 250, Appendix A, Table 5A for volatile organic compounds. For lead, λ was not estimated. Instead, groundwater contamination migration distances were estimated assuming a 30-year time period (PADEP 2021). With the exception of lead, the time (T) it will take for groundwater contamination to attenuate to the Non-Res UA MSC was estimated using the following relationship:

$$T = -\frac{\ln\left(MSC/C_{gw}\right)}{\lambda}$$

Where,

- T is total transport decay time (days)
- MSC is the chemical-specific Non-Res UA MSC (mg/L)
- C_{gw} is the maximum S-GW modeled groundwater COC concentration at a given AST (mg/L)
- λ is chemical-specific decay rate (day^{-1})

The distance to which AST-related groundwater contamination may migrate before attenuating to concentrations equal to or less than the Non-Res UA MSC was then estimated by multiplying the total transport decay time, T, by the COC specific groundwater velocity, v_{COC}.

The results of these calculations are presented on **Table 6**. Depending on the AST and COC, the distances ranged from less than 1 ft to approximately 300 ft.

The conservative fate and transport analysis further supports a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Benzene

Figure 16a presents the spatial distribution of benzene in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related benzene groundwater concentrations potentially greater than the Non-Res UA MSC of 0.005 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 33, PB 34, PB 35, PB 36, PB 37, PB 38, PB 39, PB 40, PB 42, PB 83, PB 84, PB 85, PB 128, PB 129, and PB 204.

As depicted in the figure, the known pre-existing benzene groundwater contamination in vicinity of the Tank Group is more extensive than the AST-related concentrations and fate and transport distances conservatively modeled. While it is not possible to delineate the actual impact of the benzene in groundwater resulting from soil impacts in the vicinity of ASTs in Tank Group 02, the maximum potential extent of benzene concentrations in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

1,2-DBA

Figure 16b presents the spatial distribution of 1,2-DBA in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related 1,2-DBA groundwater concentrations potentially greater than the Non-Res UA MSC of 0.00005 mg/L are shown in the vicinity of tank PB 204.

As depicted in the figure, the maximum potential extent of 1,2-DBA groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells. The potential extent of 1,2-DBA in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Ethyl Benzene

Figure 16c presents the spatial distribution of ethyl benzene in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related ethyl benzene groundwater concentrations potentially greater than the Non-Res UA MSC of 0.7 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129.

As depicted in the figure, the maximum potential extent of ethyl benzene groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells. The potential extent of ethyl benzene in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

MTBE

Figure 16d presents the spatial distribution of MTBE in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related MTBE groundwater concentrations potentially greater than the Non-Res UA MSC of 0.02 mg/L are shown in the vicinity of tanks PB 27, PB 29, and PB 33.

As depicted in the figure, the known pre-existing MTBE groundwater contamination in vicinity of the Tank Group is more extensive than the AST-related concentrations and fate and transport distances conservatively modeled. While it is not possible to delineate the actual impact of the MTBE in groundwater resulting from soil impacts in the vicinity of ASTs in Tank Group 02, the maximum potential

extent of MTBE in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Toluene

Figure 16e presents the spatial distribution of toluene in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of predicted AST-related toluene groundwater concentrations potentially greater than the Non-Res UA MSC of 1 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129. The estimated transport distance for toluene is less than 10 feet for each discrete release.

As depicted in the figure, the maximum potential extent of toluene groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells. The potential extent of toluene in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

1,2,4-TMB

Figure 16f presents the spatial distribution of 1,2,4-TMB in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related 1,2,4-TMB groundwater concentrations potentially greater than the Non-Res UA MSC of 0.53 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129. The estimated transport distance for 1,2,4-TMB is less than 10 feet for each discrete release.

As depicted in the figure, the maximum potential extent of 1,2,4-TMB groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells, except in the northern direction. The potential extent of 1,2,4-TMB in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

1,3,5-TMB

Figure 16g presents the spatial distribution of 1,3,5-TMB in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related 1,3,5-TMB groundwater concentrations potentially greater than the Non-Res UA MSC of 0.53 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129. The estimated transport distance for 1,3,5-TMB is less than 10 feet for each discrete release.

As depicted in the figure, the maximum potential extent of 1,3,5-TMB groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells. The potential extent of 1,3,5-TMB in groundwater that could be associated with the ASTs in Tank Group 02

has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Xylenes (Total)

Figure 16h presents the spatial distribution of xylenes in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related xylenes groundwater concentrations potentially greater than the Non-Res UA MSC of 10 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 36, and PB 129.

As depicted in the figure, the maximum potential extent of xylenes groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells. The potential extent of xylenes in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Naphthalene

Figure 16i presents the spatial distribution of naphthalene in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related naphthalene groundwater concentrations potentially greater than the Non-Res UA MSC of 0.10 mg/L are shown in the vicinity of tanks PB 27, PB 29, PB 36, PB 39, PB 84, and PB 204.

As depicted in the figure, the maximum potential extent of naphthalene groundwater contamination relating to the ASTs in Tank Group 02 has been delineated by historical sampling in nearby wells, except in the northern direction. The potential extent of naphthalene in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

Lead

Figure 16j presents the spatial distribution of lead in unconfined groundwater based on measured groundwater concentrations from 2014-2021 from available unconfined aquifer monitoring wells. The modeled maximum extents of the predicted AST-related lead groundwater concentrations potentially greater than the Non-Res UA MSC of 0.005 mg/L are shown in the vicinity of tanks PB 27, PB 28, PB 29, PB 34, PB 35, PB 37, PB 38, PB 40, PB 128, PB 129, and PB 204.

As depicted in the figure, the known pre-existing lead groundwater contamination in vicinity of the Tank Group appears sporadic and primarily along the eastern portion of Tank Group 02. As discussed above, the AST-related predicted groundwater concentrations that were conservatively modeled show no distinct lead plume and only limited migration in groundwater. As such, the potential extent of lead in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standard is attained or whether remedial action is warranted.

4.4 Site Characterization Summary

The Site Characterization summary is discussed below.

4.4.1 Soil

As discussed in the April 7, 2022 SCR, with consideration for surface and subsurface soil, a comparison to applicable MSCs indicates the following:

Surface Soil

- Non-Res Soil DC Exceedances: lead and naphthalene
- Non-Res UA S-GW Exceedances: benzene, ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, xylenes, naphthalene, and lead

Subsurface Soil

- Non-Res Soil DC Exceedance: naphthalene
- Non-Res UA S-GW Exceedances: benzene, 1,2-DBA, ethyl benzene, MTBE, 1,2,4-TMB, 1,3,5-TMB, toluene, xylenes, naphthalene, and lead

PESRM has selected the non-residential SHS for all COCs that meet or are below the SHS. For COCs exceeding the SHS MSCs, a SSS via pathway elimination will be chosen as the remediation standard. The nature and extent of these COCs in soil, their concentrations relative to MSCs, and the potential for soil contamination to result in groundwater concentrations greater than the Nonresidential UA GW MSCs have been adequately characterized to support a reliable determination regarding the need for soil remedial measures with consideration for the selected standards as presented on **Table 3**.

4.4.2 Groundwater

With consideration for groundwater, S-GW fate and transport modeling suggest that the following COCs are at concentrations in soil that, through leaching, could potentially result in AST-related groundwater concentrations that exceed the Non-Res UA MSCs.

- **Benzene** (@ PB 27, PB 28, PB 29, PB 33, PB 34, PB 35, PB 36, PB 37, PB 38, PB 39, PB 40, PB 42, PB 83, PB 84, PB 85, PB 128, PB 129, and PB 204)
- **1,2-DBA** (@ PB 204)
- **Ethyl Benzene** (@ PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129)
- **MTBE** (@ PB 27, PB 29, and PB 33)
- **Toluene** (@ PB 27, PB 28, PB 29, PB 33, PB 36, PB 39, and PB 129)
- **1,2,4-TMB** (@ PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129)
- **1,3,5-TMB** (@ PB 27, PB 28, PB 29, PB 36, PB 39, PB 84, and PB 129)
- **Xylenes** (@ PB 27, PB 28, PB 29, PB 36, and PB 129)
- **Naphthalene** (@ PB 27, PB 29, PB 36, PB 39, PB 84, and PB 204)
- **Lead** (@PB 27, PB 28, PB 29, PB 34, PB 35, PB 37, PB 38, PB 40, PB 128, PB 129, and PB 204)

Basic groundwater contamination fate and transport modeling suggests that these chemicals will not have the potential to migrate more than 300 ft in unconfined groundwater before attenuating to concentrations equal to or less than their respective Non-Res UA MSCs. In the case of AST-related lead, the maximum extent of migration of lead concentrations in groundwater greater than the Non-Res UA MSC over a 30-year period is estimated to be no greater than 100 ft.

For the nonresidential groundwater use and nonresidential groundwater vapor intrusion exposure pathways, PESRM has selected to attain the SHS for those COCs that meet the applicable MSCs for those respective pathways and the SSS via pathway elimination for those COCs that do not meet the applicable MSCs.

Based on the S-GW modeling results, the potential extent of these COCs in groundwater that could be associated with the ASTs in Tank Group 02 has been adequately characterized to support a reliable determination as to whether the selected standards (as presented on **Table 3**) are attained or whether remedial action is warranted.

5 Ecological Screening Evaluation

The following describes the ecological screening evaluation that was performed for the Site. This evaluation was conducted in accordance with 25 PA Code § 250.311, as specified in 25 PA Code § 245.310(28). The regulatory framework for conducting an ecological screening evaluation under the Site-Specific Standard is outlined in Section III.I and summarized in the Ecological Screening Flow Chart provided in Figure III-11 of PADEP's Land Recycling Program Technical Guidance Manual (2021). Under the Site-Specific standard, PADEP generally follows the USEPA's Ecological Risk Assessment Guidance for Superfund (USEPA 1997). The USEPA ecological risk assessment process is comprised of eight steps.

The Initial Screening phase of the process consists of Steps 1 and 2, as follows:

- Step 1: Fundamental Components (Screening-level Problem Formulation and Ecological Effects Evaluation).
- Step 2: Preliminary Exposure Estimate and Risk Assessment.

As indicated on Figure III-11 the TGM, after completion of the Initial Screen (Steps 1 and 2), the qualified investigator decides whether there exists substantial risk of ecological harm to species or habitats of concern. If not, then, no further ecological evaluation would be warranted.

Under Step 1 of the Initial Screen, a preliminary evaluation is performed to determine whether there is potential for impact on species or habitats of concern. In order to evaluate this, Terraphase first conducted an assessment to determine whether species or habitats of concern are present at the site. If species or habitats of concern are not identified, the completion of Step 2 and any subsequent steps in the ecological risk assessment process are not warranted. The evaluation of whether species or habitats of concern are present at the site consisted of the following:

- A search of PADEP's PNDI database.
- Site reconnaissance.

The PNDI search was performed for the Site and also a conservative study area that consisted of the Site and areas within a 2,500-foot radius of the site. The results of the PNDI search for the Site indicated no threatened and endangered species and/or special concern species and resources are present. The results of the PNDI search for the study area indicated that further review by the PA Fish and Boat Commission was warranted. Accordingly, Terraphase submitted a request for further review to the PA Fish and Boat Commission. Based on further review by the PA Fish and Boat Commission, no potential impacts to species or habitats of concern were identified within the study area. The results of the PNDI searches and subsequent correspondence with the PA Fish and Boat Commission are provided as **Appendix C**.

Because species or habitats of concern were not identified, the completion of Step 2 and any subsequent steps in the ecological risk assessment process are not warranted. As such, no further ecological screening is required.

6 Conclusion

Terraphase has prepared this Addendum, on behalf of PESRM, to detail the results of additional Site Characterization activities and to provide the further supporting information demonstrating adequate characterization has been performed to support a reliable determination regarding the need for remedial measures with consideration for the selected standard. The supplemental Site Characterization activities described in this Report were performed in accordance with the applicable provisions of Act 32, 25 PA Code Chapter 245 (Subchapter D), and Terraphase's Work Plan (2021).

The specific ASTs addressed in this Report include:

- PB 3V 37 (PADEP No. 014A)
- PB 7316 (PADEP No. 071A)
- PB 14V 304 (PADEP No. 061A)
- PB 89A (PADEP No. 089A)
- PB 26 (PADEP No. 001A)
- PB 27 (PADEP No. 019A)
- PB 28 (PADEP No. 020A)
- PB 29 (PADEP No. 021A)
- PB 33 (PADEP No. 002A)
- PB 34 (PADEP No. 022A)
- PB 35 (PADEP No. 023A)
- PB 36 (PADEP No. 087A)
- PB 37 (PADEP No. 024A)
- PB 38 (PADEP No. 003A)
- PB 39 (PADEP No. 025A)
- PB 40 (PADEP No. 026A)
- PB 42 (PADEP No. 027A)
- PB 43 (PADEP No. 028A)
- PB 83 (PADEP No. 004A)
- PB 84 (PADEP No. 029A)
- PB 85 (PADEP No. 030A)
- PB 128 (PADEP No. 032A)
- PB 129 (PADEP No. 033A)
- PB 204 (PADEP No. 041A)

PESRM has chosen to select a combination of standards to attain closure for COCs identified in soil and groundwater in Tank Group 02. Specifically, PESRM has selected the non-residential SHS for all COCs that meet or are below the SHS. For COCs exceeding the SHS MSCs, a SSS via pathway elimination will be chosen as the remediation standard.

The forthcoming Remedial Action Plan will discuss how proposed remedial action will result in the attainment for the COCs that will be addressed via SHS or the SSS via pathway elimination.

7 References

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Tables

Table 1
Aboveground Storage Tank Details
Philadelphia Energy Systems Refinery and Marketing, Philadelphia, PA

Facility	Tank Group	State Regulation Number	Tank Number	Design Capacity (gal)	Primary Product	Proposed Analyte List[x]	Regulatory Status	Facility ID	Status Modification Date	Tank Type	Double Bottom	Diameter (ft)	Height (ft)	Remaining Liquid (gal)	GPS Survey Complete	Demo Complete	Storage Tanks Reg./Permit App Form Submitted	Release Notification	Incident No.	Int. Remedial/ Corrective Action Required
Point Breeze	2	001A	PB 26	2,142,000	Ethanol	Ethanol	R	51-33620	12/31/2020	IFR	N	90	51.17		Y	Y	1/12/2021			
Point Breeze	2	019A	PB 27	3,410,400	Gasoline Components	Short List 1,2	R	51-33620	1/15/2021	EFR	N	110	48		Y	Y	1/15/2021	7/13/2021	56377	
Point Breeze	2	020A	PB 28	3,414,432	Alkylate	Short List 1-5	R	51-33620	1/25/2021	EFR	Y, Removed	110	49		Y	Y	1/26/2021	7/13/2021	56377	
Point Breeze	2	021A	PB 29	2,935,800	Heavy Reformate	Short List 1-5	R	51-33620	2/9/2021	EFR	N	102	49		Y	Y	2/9/2021	7/13/2021	56377	
Point Breeze	2	002A	PB 33	2,935,800	Gasoline	Short List 1,2	R	51-33620	5/21/2021	EFR	N	102	49		Y	Y	6/18/2021	7/13/2021	56377	
Point Breeze	2	022A	PB 34	3,285,996	Gasoline	Short List 1,2	R	51-33620	3/31/2021	EFR	Y, Removed	110	47		Y	Y	4/21/2021	8/3/2021	56377	
Point Breeze	2	023A	PB 35	3,410,400	Gasoline	Short List 1,2	R	51-33620	3/31/2021	EFR	Y, Removed	110	48		Y	Y	4/21/2021	8/3/2021	56377	
Point Breeze	2	026A	PB 40	5,527,200	Gasoline	Short List 1,2	R	51-33620	3/29/2021	EFR	N	140	48		Y	Y	4/20/2021	8/3/2021	56377	
Point Breeze	2	032A	PB 128	6,447,000	Gasoline Components	Short List 1,2	R	51-33620	3/11/2021	EFR	Y, Removed	140	55.75		Y	Y	3/11/2021	8/3/2021	56377	
Point Breeze	2	033A	PB 129	6,447,000	Heavy Reformate	Short List 1-5	R	51-33620	3/18/2021	EFR	Y, Removed	140	55.2		Y	Y	3/18/2021	8/3/2021	56377	
Point Breeze	2	041A	PB 204	340,200	Recovered Oil	Short List 1-6	R	51-33620	9/1/2021	IFR	N	40	36		Y	Y	9/23/2021	10/27/2021	56377	
Point Breeze	2	087A	PB 36	3,410,400	Gasoline	Short List 1,2	R	51-33620	9/7/2021	IFR	Y, Removed	110	47.5		Y	Y	9/23/2021	10/27/2021	56377	
Point Breeze	2	024A	PB 37	3,200,400	Gasoline Components	Short List 1,2	R	51-33620	6/25/2021	IFR	Y, Removed	110	48		Y	Y	7/2/2021	8/20/2021	56377	
Point Breeze	2	003A	PB 38	3,410,400	Gasoline	Short List 1,2	R	51-33620	9/3/2021	EFR	N	110	48		Y	Y	9/23/2021	8/12/2021	56377	
Point Breeze	2	025A	PB 39	3,410,400	Gasoline	Short List 1,2	R	51-33620	6/16/2021	EFR	N	110	48		Y	Y	6/18/2021	8/12/2021	56377	
Point Breeze	2	027A	PB 42	2,818,200	#2 Fuel Oil	Short List 4	R	51-33620	6/9/2021	Cone Roof	N	100	48		Y	Y	6/18/2021	8/3/2021	56377	
Point Breeze	2	028A	PB 43	3,385,200	15MV1, Distillate	Short List 4	R	51-33620	6/7/2021	Cone Roof	Y, Removed	120	40		Y	Y	6/18/2021			
Point Breeze	2	004A	PB 83	3,288,600	15MV1, Distillate	Short List 4	R	51-33620	6/10/2021	Cone Roof	Y, Removed	100	56		Y	Y	6/18/2021	6/10/2021	56377	Y
Point Breeze	2	029A	PB 84	3,288,600	15MV1, Distillate	Short List 4	R	51-33620	5/26/2021	Cone Roof	Y, Removed	100	56		Y	Y	6/18/2021	8/3/2021	56377	
Point Breeze	2	030A	PB 85	1,806,000	15MV2, Distillate	Short List 4	R	51-33620	4/15/2021	Cone Roof	Y, Removed	80	48		Y	Y	4/22/2021	8/12/2021	56377	
Point Breeze	2	071A	PB 7316	3,990	Acid, Phosphoric	N/A	R	51-33620	7/23/2021	Dome Roof	N	7.75	11.25			Y	8/26/2021			
Point Breeze	2	014A	PB 3V 37	1,764	Methanol	N/A	R	51-33620	7/23/2021	Horiz, Elev	N	5	12			Y	8/26/2021			
Point Breeze	2	061A	PB 14V 304	700	Methanol	N/A	R	51-33620	8/18/2021	UNK	N	UNK	UNK			Y	9/29/2021			
Point Breeze	2	089A	PB 89A	2500	Sodium Hypochlorite	N/A	R	51-33620	7/21/2021	UNK	N	UNK	UNK			Y	8/26/2021			

Abbreviations:
R - Removed

Table 2
COCs Identified in Soil in Proximity to Tank Group 2 ASTs
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

PB 26	PB 27	PB 28	PB 29	PB 33
None	Benzene Ethyl Benzene MTBE Toluene 1,2,4-TMB 1,3,5-TMB Xylenes (total) Naphthalene Lead	Benzene Ethyl Benzene Toluene 1,2,4-TMB 1,3,5-TMB Xylenes (total) Lead	Benzene Ethyl Benzene MTBE Toluene 1,2,4-TMB 1,3,5-TMB Xylenes (total) Naphthalene Lead	Benzene Ethyl Benzene MTBE Toluene
PB 34	**PB 35**	**PB 36**	**PB 37**	**PB 38**
Benzene Lead	Benzene Lead	Benzene Ethyl Benzene Toluene 1,2,4-TMB 1,3,5-TMB Xylenes (total) Naphthalene	Benzene Lead	Benzene Lead
PB 39	**PB 40**	**PB 42**	**PB 43**	**PB 83**
Benzene Ethyl Benzene Toluene 1,2,4-TMB 1,3,5-TMB Naphthalene	Benzene Lead	Benzene	None	Benzene
PB 84	**PB 85**	**PB 128**	**PB 129**	**PB 204**
Benzene 1,2,4-TMB 1,3,5-TMB Naphthalene	Benzene	Benzene Lead	Benzene Ethyl Benzene Toluene 1,2,4-TMB 1,3,5-TMB Xylenes (total) Lead	Benzene 1,2-Dibromoethane Naphthalene Lead

Table 3
Standard Selection
Site Characterization Report Addendum
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

			Soil	Groundwater
Chem Group	Chemical of Concern (COC)	CASRN	Selected Standard	Selected Standard
VOC	Benzene	71-43-2	SSS[PE]	SSS[PE]
VOC	Cumene	98-82-8	SHS	SHS
VOC	1,2-Dibromoethane	106-93-4	SSS[PE]	SSS[PE]
VOC	1,2-Dichloroethane	107-06-2	SHS	SHS
VOC	Ethanol	64-17-5	SHS[ND]	SHS[ND]
VOC	Ethyl Benzene	100-41-4	SSS[PE]	SSS[PE]
VOC	Methyl tert-butyl ether	1634-04-4	SSS[PE]	SSS[PE]
VOC	Toluene	108-88-3	SSS[PE]	SSS[PE]
VOC	1,2,4-Trimethylbenzene	95-63-6	SSS[PE]	SSS[PE]
VOC	1,3,5-Trimethylbenzene	108-67-8	SSS[PE]	SSS[PE]
VOC	Xylenes (total)	1330-20-7	SSS[PE]	SSS[PE]
SVOC	Anthracene	120-12-7	SHS	NA
SVOC	Benzo(a)anthracene	56-55-3	SHS	NA
SVOC	Benzo(a)pyrene	50-32-8	SHS	NA
SVOC	Benzo(b)fluoranthene	205-99-2	SHS	NA
SVOC	Benzo(g,h,i)perylene	191-24-2	SHS	NA
SVOC	Chrysene	218-01-9	SHS	NA
SVOC	Fluorene	86-73-7	SHS	NA
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	SHS	NA
SVOC	Naphthalene	91-20-3	SSS[PE]	SSS[PE]
SVOC	Phenanthrene	85-01-8	SHS	NA
SVOC	Pyrene	129-00-0	SHS	NA
INORG	Lead	7439-92-1	SSS[PE]	SSS[PE]

Notes:
NA - Not applicable as COC was detected in soil at concentrations ≤ to Soil-to-GW (S-GW) Protection MSCs
SHS - Statewide Health Standard is the selected standard for the COC
SSS - Site-Specific Standard is the selected standard for the COC
Basis: ND - COC was not detected in soil
PE - Pathway elimination

Table 4
Soil Screening Summary
Tank Group 02 (Site Assessment, Site Characterization)
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

									PADEP MSCs					
Matrix	**Chem Group**	**Chemical**	**CASRN**	**Analyzed**	**Detected**	**Min Detected** (mg/kg)	**Mean Detected** (mg/kg)	**Max Detected** (mg/kg)	**Non-Res Direct Contact MSC for Surface Soil (0-2 ft)** (mg/kg)	**Ratio of Max Detect to Non-Res Direct Contact MSC for Surface Soil**	**Non-Res Direct Contact MSC for Subsurface Soil (2-15 ft)** (mg/kg)	**Ratio of Max Detect to Non-Res Direct Contact MSC for Subsurface Soil**	**Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW MSC** (mg/kg)	**Ratio of Max Detect to Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW MSC**
Surface Soil	VOC	Benzene	71-43-2	26	15	0.00033	4.3	24	280	0.086			0.5	**48**
Surface Soil	VOC	Cumene	98-82-8	24	21	0.00023	3.4	30	10000	0.003			2500	0.012
Surface Soil	VOC	Ethyl Benzene	100-41-4	25	19	0.00019	25	290	880	0.33			70	**4.1**
Surface Soil	VOC	Methyl tert-butyl ether	1634-04-4	25	8	0.00026	0.44	2	8500	0.00024			2	1
Surface Soil	VOC	Toluene	108-88-3	25	12	0.0015	6.2	65	10000	0.0065			100	0.65
Surface Soil	VOC	1,2,4-Trimethylbenzene	95-63-6	25	19	0.00089	61	680	4700	0.14			300	**2.3**
Surface Soil	VOC	1,3,5-Trimethylbenzene	108-67-8	25	18	0.00021	23	260	4700	0.055			93	**2.8**
Surface Soil	VOC	Xylenes (total)	1330-20-7	13	10	0.0054	220	1600	7900	0.2			1000	**1.6**
Surface Soil	SVOC	Anthracene	120-12-7	6	6	0.002	0.042	0.2	190000	0.0000011			350	0.00057
Surface Soil	SVOC	Benzo(a)anthracene	56-55-3	6	6	0.0036	0.058	0.25	130	0.0019			340	0.00074
Surface Soil	SVOC	Benzo(a)pyrene	50-32-8	6	4	0.0029	0.015	0.029	91	0.00032			46	0.00063
Surface Soil	SVOC	Benzo(b)fluoranthene	205-99-2	6	5	0.004	0.017	0.031	76	0.00041			170	0.00018
Surface Soil	SVOC	Benzo(g,h,i)perylene	191-24-2	6	4	0.0035	0.015	0.027	190000	0.00000014			180	0.00015
Surface Soil	SVOC	Chrysene	218-01-9	6	5	0.0029	0.012	0.018	760	0.000024			230	0.000078
Surface Soil	SVOC	Fluorene	86-73-7	6	5	0.0056	0.17	0.72	130000	0.0000055			3800	0.00019
Surface Soil	SVOC	Naphthalene	91-20-3	32	21	0.0007	6.7	79	66	**1.2**			25	**3.2**
Surface Soil	SVOC	Phenanthrene	85-01-8	6	6	0.011	0.24	1.2	190000	0.0000063			10000	0.00012
Surface Soil	SVOC	Pyrene	129-00-0	6	6	0.0055	0.11	0.52	96000	0.0000054			2200	0.00024
Surface Soil	INORG	Lead	7439-92-1	27	27	4.6	240	2500	1000	**2.5**			450	**5.6**
Subsurface Soil	VOC	Benzene	71-43-2	343	243	0.00018	6.8	180			330	0.55	0.5	**360**
Subsurface Soil	VOC	Cumene	98-82-8	311	266	0.00014	3.7	61			10000	0.0061	2500	0.024
Subsurface Soil	VOC	1,2-Dibromoethane	106-93-4	240	2	0.043	0.062	0.08			4.2	0.019	0.005	**16**
Subsurface Soil	VOC	1,2-Dichloroethane	107-06-2	239	4	0.00025	0.046	0.078			98	0.0008	0.5	0.16
Subsurface Soil	VOC	Ethyl Benzene	100-41-4	321	229	0.00014	23	700			1000	0.7	70	**10**
Subsurface Soil	VOC	Methyl tert-butyl ether	1634-04-4	316	90	0.00024	3.3	120			9800	0.012	2	**60**
Subsurface Soil	VOC	Toluene	108-88-3	322	186	0.00049	34	2000			10000	0.2	100	**20**
Subsurface Soil	VOC	1,2,4-Trimethylbenzene	95-63-6	319	229	0.0003	55	1000			5400	0.19	300	**3.3**
Subsurface Soil	VOC	1,3,5-Trimethylbenzene	108-67-8	319	203	0.00021	21	400			5400	0.074	93	**4.3**
Subsurface Soil	VOC	Xylenes (total)	1330-20-7	244	191	0.00098	130	3300			9100	0.36	1000	**3.3**
Subsurface Soil	SVOC	Anthracene	120-12-7	75	43	0.00088	0.1	2.7			190000	0.000014	350	0.0077
Subsurface Soil	SVOC	Benzo(a)anthracene	56-55-3	75	48	0.00082	0.2	4.7			190000	0.000025	340	0.014
Subsurface Soil	SVOC	Benzo(a)pyrene	50-32-8	75	29	0.0011	0.31	4.2			190000	0.000022	46	0.091
Subsurface Soil	SVOC	Benzo(b)fluoranthene	205-99-2	75	35	0.00081	0.33	4.6			190000	0.000024	170	0.027
Subsurface Soil	SVOC	Benzo(g,h,i)perylene	191-24-2	75	30	0.00069	0.26	3.5			190000	0.000018	180	0.019
Subsurface Soil	SVOC	Chrysene	218-01-9	75	43	0.00061	0.32	9			190000	0.000047	230	0.039
Subsurface Soil	SVOC	Fluorene	86-73-7	75	54	0.0011	0.19	2.4			190000	0.000013	3800	0.00063
Subsurface Soil	SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	13	11	0.0012	0.029	0.096			190000	0.00000051	18000	0.0000053
Subsurface Soil	SVOC	Naphthalene	91-20-3	319	240	0.00053	5.8	170			77	**2.2**	25	**6.8**
Subsurface Soil	SVOC	Phenanthrene	85-01-8	75	60	0.0011	0.43	12			190000	0.000063	10000	0.0012
Subsurface Soil	SVOC	Pyrene	129-00-0	75	55	0.0008	0.3	9.8			190000	0.000052	2200	0.0045
Subsurface Soil	INORG	Lead	7439-92-1	253	253	2.7	170	3900			190000	0.021	450	**8.7**

Notes:
Only constituents detected are shown.
The MSCs for Benzo(g,h,i)perylene are the values provided by the agency for Pyrene.
The MSCs for Phenanthrene are the values provided by the agency for Pyrene.
The concentrations for the Xylene isomers (m/p and o) were summed before comparing to the MSCs for Xylenes (total).
Ratios of concentration to the MSCs greater than 1 are shaded in bold.
Chem Group - chemical group

Table 5
Soil-to-Groundwater Evaluation (Modeled Groundwater Concentrations)
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 129	PB-129-06	N	4.5	5	VOC	1,2,4-Trimethylbenzene	95-63-6	390		300	0.53	0.69
	PB-129-10	N	3.5	4	VOC	1,2,4-Trimethylbenzene	95-63-6	1000		300	0.53	1.8
PB 27	PB-27-01	N	2.5	3	VOC	1,2,4-Trimethylbenzene	95-63-6	400		300	0.53	0.71
	PB-27-02	N	3	3.5	VOC	1,2,4-Trimethylbenzene	95-63-6	530		300	0.53	0.94
	PB-27-03	N	3.5	4	VOC	1,2,4-Trimethylbenzene	95-63-6	470		300	0.53	0.83
	PB-27-05	N	3.5	4	VOC	1,2,4-Trimethylbenzene	95-63-6	480		300	0.53	0.85
PB 28	PB-28-19	N	3	3.5	VOC	1,2,4-Trimethylbenzene	95-63-6	870		300	0.53	1.5
PB 29	PB-29-03	N	4.5	5	VOC	1,2,4-Trimethylbenzene	95-63-6	500		300	0.53	0.88
	PB-29-05	N	4.5	5	VOC	1,2,4-Trimethylbenzene	95-63-6	540		300	0.53	0.95
	PB-29-08	N	1	1.5	VOC	1,2,4-Trimethylbenzene	95-63-6	680		300	0.53	1.2
	PB-29-09	N	4.5	5	VOC	1,2,4-Trimethylbenzene	95-63-6	320		300	0.53	0.57
	PB-29-24	N	4.5	5	VOC	1,2,4-Trimethylbenzene	95-63-6	380		300	0.53	0.67
PB 36	PB-36-03	N	3	3.5	VOC	1,2,4-Trimethylbenzene	95-63-6	670		300	0.53	1.2
	PB-36-07	N	4	4.5	VOC	1,2,4-Trimethylbenzene	95-63-6	640		300	0.53	1.1
PB 39	PB-39-12	N	3	3.5	VOC	1,2,4-Trimethylbenzene	95-63-6	390		300	0.53	0.69
PB 84	PB-84-14	FD	3	3.5	VOC	1,2,4-Trimethylbenzene	95-63-6	530		300	0.53	0.94
PB 204	PB-204-06	N	3	3.5	VOC	1,2-Dibromoethane	106-93-4	0.043	J	0.005	0.00005	0.00043
	PB-204-11	N	4.5	5	VOC	1,2-Dibromoethane	106-93-4	0.080	J	0.005	0.00005	0.00080
PB 129	PB-129-06	N	4.5	5	VOC	1,3,5-Trimethylbenzene	108-67-8	170		93	0.53	0.97
	PB-129-10	N	3.5	4	VOC	1,3,5-Trimethylbenzene	108-67-8	310		93	0.53	1.8
PB 27	PB-27-01	N	2.5	3	VOC	1,3,5-Trimethylbenzene	108-67-8	150		93	0.53	0.85
	PB-27-02	N	3	3.5	VOC	1,3,5-Trimethylbenzene	108-67-8	200		93	0.53	1.1
	PB-27-03	N	3.5	4	VOC	1,3,5-Trimethylbenzene	108-67-8	180		93	0.53	1.0
	PB-27-05	N	3.5	4	VOC	1,3,5-Trimethylbenzene	108-67-8	180		93	0.53	1.0
	PB-27-06	N	4	4.5	VOC	1,3,5-Trimethylbenzene	108-67-8	98		93	0.53	0.56
PB 28	PB-28-19	N	3	3.5	VOC	1,3,5-Trimethylbenzene	108-67-8	400		93	0.53	2.3
PB 29	PB-29-03	N	4.5	5	VOC	1,3,5-Trimethylbenzene	108-67-8	170		93	0.53	0.97
	PB-29-05	N	4.5	5	VOC	1,3,5-Trimethylbenzene	108-67-8	110		93	0.53	0.63
	PB-29-08	N	1	1.5	VOC	1,3,5-Trimethylbenzene	108-67-8	260		93	0.53	1.5
	PB-29-09	N	4.5	5	VOC	1,3,5-Trimethylbenzene	108-67-8	110		93	0.53	0.63
	PB-29-24	N	4.5	5	VOC	1,3,5-Trimethylbenzene	108-67-8	150		93	0.53	0.85
PB 36	PB-36-03	N	3	3.5	VOC	1,3,5-Trimethylbenzene	108-67-8	180		93	0.53	1.0
	PB-36-07	N	4	4.5	VOC	1,3,5-Trimethylbenzene	108-67-8	260		93	0.53	1.5
PB 39	PB-39-12	N	3	3.5	VOC	1,3,5-Trimethylbenzene	108-67-8	98		93	0.53	0.56
PB 84	PB-84-14	FD	3	3.5	VOC	1,3,5-Trimethylbenzene	108-67-8	130		93	0.53	0.74
PB 128	PB-128-04	N	3	3.5	VOC	Benzene	71-43-2	1.3		0.5	0.005	0.013
	PB-128-05	N	4	4.5	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
	PB-128-05	FD	4	4.5	VOC	Benzene	71-43-2	1.2		0.5	0.005	0.012

Table 5
Soil-to-Groundwater Evaluation (Modeled Groundwater Concentrations)
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 129	PB-129-02	N	3	3.5	VOC	Benzene	71-43-2	0.60		0.5	0.005	0.0060
	PB-129-03	N	4.5	5	VOC	Benzene	71-43-2	0.96		0.5	0.005	0.010
PB 204	PB-204-05	N	3	3.5	VOC	Benzene	71-43-2	0.75		0.5	0.005	0.0075
	PB-204-06	N	3	3.5	VOC	Benzene	71-43-2	2.3		0.5	0.005	0.023
	PB-204-12	N	4.5	5	VOC	Benzene	71-43-2	1.8		0.5	0.005	0.018
PB 27	PB-27-01	N	2.5	3	VOC	Benzene	71-43-2	16		0.5	0.005	0.16
	PB-27-02	N	3	3.5	VOC	Benzene	71-43-2	69		0.5	0.005	0.69
	PB-27-02R	N	6	6.5	VOC	Benzene	71-43-2	19		0.5	0.005	0.19
	PB-27-02R	N	14	14.5	VOC	Benzene	71-43-2	6.6		0.5	0.005	0.066
	PB-27-03	N	3.5	4	VOC	Benzene	71-43-2	39		0.5	0.005	0.39
	PB-27-04	N	3.5	4	VOC	Benzene	71-43-2	1.3		0.5	0.005	0.013
	PB-27-04	FD	3.5	4	VOC	Benzene	71-43-2	0.64		0.5	0.005	0.0064
	PB-27-05	N	3.5	4	VOC	Benzene	71-43-2	60		0.5	0.005	0.60
	PB-27-06	N	4	4.5	VOC	Benzene	71-43-2	39		0.5	0.005	0.39
	PB-27-07	N	3	3.5	VOC	Benzene	71-43-2	3.0		0.5	0.005	0.03
	PB-27-08	N	4	4.5	VOC	Benzene	71-43-2	30		0.5	0.005	0.30
	PB-27-09	N	4	4.5	VOC	Benzene	71-43-2	32		0.5	0.005	0.32
	PB-27-10	N	3.5	4	VOC	Benzene	71-43-2	17		0.5	0.005	0.17
	PB-27-11	N	4.5	5	VOC	Benzene	71-43-2	23		0.5	0.005	0.23
	PB-27-15	N	3	3.5	VOC	Benzene	71-43-2	9.8		0.5	0.005	0.098
PB 28	PB-28-05	N	3	3.5	VOC	Benzene	71-43-2	3.2		0.5	0.005	0.032
	PB-28-08	N	3	3.5	VOC	Benzene	71-43-2	1.3		0.5	0.005	0.013
	PB-28-09	N	3	3.5	VOC	Benzene	71-43-2	1.1		0.5	0.005	0.011
	PB-28-10	N	3.5	4	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
	PB-28-19	N	3	3.5	VOC	Benzene	71-43-2	74		0.5	0.005	0.74
	PB-28-19R	N	6	6.5	VOC	Benzene	71-43-2	24		0.5	0.005	0.24
	PB-28-19R	N	14	14.5	VOC	Benzene	71-43-2	51		0.5	0.005	0.51
PB 29	PB-29-01	N	3	3.5	VOC	Benzene	71-43-2	3.5		0.5	0.005	0.035
	PB-29-02	N	4.5	5	VOC	Benzene	71-43-2	8.6		0.5	0.005	0.086
	PB-29-03	N	4.5	5	VOC	Benzene	71-43-2	93		0.5	0.005	0.93
	PB-29-03R	N	6	6.5	VOC	Benzene	71-43-2	110		0.5	0.005	1.1
	PB-29-03R	N	14	14.5	VOC	Benzene	71-43-2	3.0		0.5	0.005	0.030
	PB-29-04	N	4.5	5	VOC	Benzene	71-43-2	1.1		0.5	0.005	0.011
	PB-29-05	N	4.5	5	VOC	Benzene	71-43-2	8.9		0.5	0.005	0.089
	PB-29-06	N	3	3.5	VOC	Benzene	71-43-2	5.5		0.5	0.005	0.055
	PB-29-07	N	3	3.5	VOC	Benzene	71-43-2	12		0.5	0.005	0.12
	PB-29-08	N	1	1.5	VOC	Benzene	71-43-2	22		0.5	0.005	0.22
	PB-29-10	N	1	1.5	VOC	Benzene	71-43-2	24		0.5	0.005	0.24
	PB-29-11	N	1	1.5	VOC	Benzene	71-43-2	1.2		0.5	0.005	0.012
	PB-29-11	FD	1	1.5	VOC	Benzene	71-43-2	3.6		0.5	0.005	0.036

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Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
	PB-29-12	N	3	3.5	VOC	Benzene	71-43-2	6.6		0.5	0.005	0.066
	PB-29-13	N	3	3.5	VOC	Benzene	71-43-2	0.84		0.5	0.005	0.0084
	PB-29-16	N	3.5	4	VOC	Benzene	71-43-2	8.3		0.5	0.005	0.083
	PB-29-19	N	4	4.5	VOC	Benzene	71-43-2	23		0.5	0.005	0.23
	PB-29-20	N	1.5	2	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
	PB-29-21	N	4	4.5	VOC	Benzene	71-43-2	29		0.5	0.005	0.29
	PB-29-22	N	4.5	5	VOC	Benzene	71-43-2	25		0.5	0.005	0.25
	PB-29-23	N	3.5	4	VOC	Benzene	71-43-2	30		0.5	0.005	0.30
	PB-29-24	N	4.5	5	VOC	Benzene	71-43-2	76		0.5	0.005	0.76
	PB-29-25	N	4.5	5	VOC	Benzene	71-43-2	2.0		0.5	0.005	0.020
	PB-29-26	N	4.5	5	VOC	Benzene	71-43-2	11		0.5	0.005	0.11
	PB-29-28	N	6	6.5	VOC	Benzene	71-43-2	7.0		0.5	0.005	0.070
	PB-29-28	N	14	14.5	VOC	Benzene	71-43-2	6.0		0.5	0.005	0.060
PB 33	PB-33-01	N	4.5	5	VOC	Benzene	71-43-2	1.2		0.5	0.005	0.012
	PB-33-02	N	3	3.5	VOC	Benzene	71-43-2	6.6		0.5	0.005	0.066
	PB-33-04	N	1	1.5	VOC	Benzene	71-43-2	12		0.5	0.005	0.12
	PB-33-05	N	2	2.5	VOC	Benzene	71-43-2	46		0.5	0.005	0.46
	PB-33-05	FD	2	2.5	VOC	Benzene	71-43-2	30		0.5	0.005	0.30
	PB-33-05R	N	6	6.5	VOC	Benzene	71-43-2	5.2		0.5	0.005	0.05
	PB-33-05R	N	14	14.5	VOC	Benzene	71-43-2	6.6		0.5	0.005	0.066
	PB-33-09	N	4	4.5	VOC	Benzene	71-43-2	7.9		0.5	0.005	0.079
	PB-33-11	N	4	4.5	VOC	Benzene	71-43-2	12		0.5	0.005	0.12
	PB-33-12	N	2.5	3	VOC	Benzene	71-43-2	2.7		0.5	0.005	0.027
	PB-33-18	N	3.5	4	VOC	Benzene	71-43-2	18		0.5	0.005	0.18
PB 34	PB-34-11	N	4	4.5	VOC	Benzene	71-43-2	4.1		0.5	0.005	0.041
	PB-34-11R	N	6	6.5	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
	PB-34-11R	N	14	14.5	VOC	Benzene	71-43-2	180		0.5	0.005	1.8
	PB-34-12	N	2	2.5	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
PB 35	PB-35-06	N	3	3.5	VOC	Benzene	71-43-2	0.89		0.5	0.005	0.0089
	PB-35-08	N	3.5	4	VOC	Benzene	71-43-2	0.89		0.5	0.005	0.0089
	PB-35-08R	N	6	6.5	VOC	Benzene	71-43-2	2.5		0.5	0.005	0.025
	PB-35-10	N	3	3.5	VOC	Benzene	71-43-2	1.2		0.5	0.005	0.012
	PB-35-11	FD	3	3.5	VOC	Benzene	71-43-2	2.6		0.5	0.005	0.026
	PB-35-11	N	3	3.5	VOC	Benzene	71-43-2	0.73		0.5	0.005	0.0073
	PB-35-12	N	4	4.5	VOC	Benzene	71-43-2	0.71		0.5	0.005	0.0071
	PB-35-13	N	2.5	3	VOC	Benzene	71-43-2	0.89		0.5	0.005	0.0089
	PB-35-14	N	3	3.5	VOC	Benzene	71-43-2	0.54		0.5	0.005	0.0054

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Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 36	PB-36-01	N	4.5	5	VOC	Benzene	71-43-2	0.77		0.5	0.005	0.0077
	PB-36-03	N	3	3.5	VOC	Benzene	71-43-2	35		0.5	0.005	0.35
	PB-36-04	N	3	3.5	VOC	Benzene	71-43-2	1.2		0.5	0.005	0.012
	PB-36-07	N	4	4.5	VOC	Benzene	71-43-2	2.7		0.5	0.005	0.027
	PB-36-09	N	3.5	4	VOC	Benzene	71-43-2	35		0.5	0.005	0.35
	PB-36-10	N	4	4.5	VOC	Benzene	71-43-2	0.52		0.5	0.005	0.0052
PB 37	PB-37-03	N	1	1.5	VOC	Benzene	71-43-2	0.80		0.5	0.005	0.0080
	PB-37-05	N	3	3.5	VOC	Benzene	71-43-2	1.3		0.5	0.005	0.013
	PB-37-05R	N	6	6.5	VOC	Benzene	71-43-2	11		0.5	0.005	0.11
	PB-37-14	N	4.5	5	VOC	Benzene	71-43-2	1.7		0.5	0.005	0.017
PB 38	PB-38-03	N	3	3.5	VOC	Benzene	71-43-2	7.2		0.5	0.005	0.072
	PB-38-04	N	3	3.5	VOC	Benzene	71-43-2	10		0.5	0.005	0.10
	PB-38-08	N	3	3.5	VOC	Benzene	71-43-2	8.4		0.5	0.005	0.084
	PB-38-10	N	3	3.5	VOC	Benzene	71-43-2	1.1		0.5	0.005	0.011
	PB-38-13	N	3	3.5	VOC	Benzene	71-43-2	19		0.5	0.005	0.19
	PB-38-13R	N	6	6.5	VOC	Benzene	71-43-2	3.0		0.5	0.005	0.03
PB 39	PB-39-04	N	2	2.5	VOC	Benzene	71-43-2	0.65		0.5	0.005	0.0065
	PB-39-06	N	4	4.5	VOC	Benzene	71-43-2	0.92		0.5	0.005	0.0092
	PB-39-08	N	3	3.5	VOC	Benzene	71-43-2	0.72		0.5	0.005	0.0072
	PB-39-09	N	4.5	5	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
	PB-39-12	N	3	3.5	VOC	Benzene	71-43-2	73		0.5	0.005	0.73
	PB-39-12R	N	6	6.5	VOC	Benzene	71-43-2	1.7		0.5	0.005	0.017
	PB-39-12R	N	14	14.5	VOC	Benzene	71-43-2	45		0.5	0.005	0.45
PB 40	PB-40-12	N	3	3.5	VOC	Benzene	71-43-2	0.59		0.5	0.005	0.006
PB 42	PB-42-09	N	4	4.5	VOC	Benzene	71-43-2	0.78		0.5	0.005	0.0078
PB 83	PB-83-01	N	4	4.5	VOC	Benzene	71-43-2	5.0		0.5	0.005	0.050
	PB-83-01R	N	6	6.5	VOC	Benzene	71-43-2	1.6		0.5	0.005	0.016
	PB-83-01R	N	14	14.5	VOC	Benzene	71-43-2	0.90		0.5	0.005	0.0090
	PB-83-02	N	3	3.5	VOC	Benzene	71-43-2	0.64		0.5	0.005	0.0064
PB 84	PB-84-04	N	3	3.5	VOC	Benzene	71-43-2	2.1		0.5	0.005	0.021
	PB-84-14	FD	3	3.5	VOC	Benzene	71-43-2	1.4		0.5	0.005	0.014
PB 85	PB-85-06	N	4.5	5	VOC	Benzene	71-43-2	3.1		0.5	0.005	0.031
	PB-85-06R	N	6	6.5	VOC	Benzene	71-43-2	18		0.5	0.005	0.18
	PB-85-09	N	3.5	4	VOC	Benzene	71-43-2	1.7		0.5	0.005	0.017
PB 129	PB-129-06	N	4.5	5	VOC	Ethyl Benzene	100-41-4	230		70	0.7	2.3
	PB-129-10	N	3.5	4	VOC	Ethyl Benzene	100-41-4	170		70	0.7	1.7

Table 5
Soil-to-Groundwater Evaluation (Modeled Groundwater Concentrations)
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 27	PB-27-01	N	2.5	3	VOC	Ethyl Benzene	100-41-4	130		70	0.7	1.3
	PB-27-02	N	3	3.5	VOC	Ethyl Benzene	100-41-4	250		70	0.7	2.5
	PB-27-02R	N	6	6.5	VOC	Ethyl Benzene	100-41-4	100		70	0.7	1.0
	PB-27-03	N	3.5	4	VOC	Ethyl Benzene	100-41-4	200		70	0.7	2.0
	PB-27-05	N	3.5	4	VOC	Ethyl Benzene	100-41-4	250		70	0.7	2.5
	PB-27-06	N	4	4.5	VOC	Ethyl Benzene	100-41-4	110		70	0.7	1.1
	PB-27-08	N	4	4.5	VOC	Ethyl Benzene	100-41-4	97		70	0.7	1.0
	PB-27-09	N	4	4.5	VOC	Ethyl Benzene	100-41-4	140		70	0.7	1.4
PB 28	PB-28-19	N	3	3.5	VOC	Ethyl Benzene	100-41-4	700		70	0.7	7.0
	PB-28-19R	N	6	6.5	VOC	Ethyl Benzene	100-41-4	120		70	0.7	1.2
	PB-28-19R	N	14	14.5	VOC	Ethyl Benzene	100-41-4	95		70	0.7	1.0
PB 29	PB-29-03	N	4.5	5	VOC	Ethyl Benzene	100-41-4	220		70	0.7	2.2
	PB-29-05	N	4.5	5	VOC	Ethyl Benzene	100-41-4	190		70	0.7	1.9
	PB-29-08	N	1	1.5	VOC	Ethyl Benzene	100-41-4	290		70	0.7	2.9
	PB-29-09	N	4.5	5	VOC	Ethyl Benzene	100-41-4	150		70	0.7	1.5
	PB-29-10	N	1	1.5	VOC	Ethyl Benzene	100-41-4	77		70	0.7	0.77
	PB-29-19	N	4	4.5	VOC	Ethyl Benzene	100-41-4	82		70	0.7	0.82
	PB-29-21	N	4	4.5	VOC	Ethyl Benzene	100-41-4	100		70	0.7	1.0
	PB-29-22	N	4.5	5	VOC	Ethyl Benzene	100-41-4	72		70	0.7	0.72
	PB-29-23	N	3.5	4	VOC	Ethyl Benzene	100-41-4	110		70	0.7	1.1
	PB-29-24	N	4.5	5	VOC	Ethyl Benzene	100-41-4	220		70	0.7	2.2
PB 33	PB-33-04	N	1	1.5	VOC	Ethyl Benzene	100-41-4	91		70	0.7	0.91
	PB-33-05	N	2	2.5	VOC	Ethyl Benzene	100-41-4	83		70	0.7	0.83
PB 36	PB-36-03	N	3	3.5	VOC	Ethyl Benzene	100-41-4	160		70	0.7	1.6
	PB-36-07	N	4	4.5	VOC	Ethyl Benzene	100-41-4	260		70	0.7	2.6
PB 39	PB-39-12	N	3	3.5	VOC	Ethyl Benzene	100-41-4	180		70	0.7	1.8
PB 128	PB-128-01	N	3	3.5	INORG	Lead	7439-92-1	1980		450	0.005	0.022
	PB-128-05	N	4	4.5	INORG	Lead	7439-92-1	1070		450	0.005	0.012
	PB-128-05	FD	4	4.5	INORG	Lead	7439-92-1	1470		450	0.005	0.016
	PB-128-05R	N	6	6.5	INORG	Lead	7439-92-1	1780		450	0.005	0.020
	PB-128-08	N	4.5	5	INORG	Lead	7439-92-1	844		450	0.005	0.0094
PB 129	PB-129-01	N	4	4.5	INORG	Lead	7439-92-1	3920		450	0.005	0.044
PB 204	PB-204-01	N	4.5	5	INORG	Lead	7439-92-1	540		450	0.005	0.0060
PB 27	PB-27-02	N	3	3.5	INORG	Lead	7439-92-1	1580		450	0.005	0.018
	PB-27-02R	N	0	0.5	INORG	Lead	7439-92-1	1210		450	0.005	0.013
PB 28	PB-28-05	N	3	3.5	INORG	Lead	7439-92-1	461		450	0.005	0.0051
PB 29	PB-29-02	N	4.5	5	INORG	Lead	7439-92-1	1180		450	0.005	0.013
	PB-29-02R	N	0	0.5	INORG	Lead	7439-92-1	2500		450	0.005	0.028
	PB-29-15	N	3	3.5	INORG	Lead	7439-92-1	2110		450	0.005	0.023

Table 5
Soil-to-Groundwater Evaluation (Modeled Groundwater Concentrations)
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 34	PB-34-03	N	2	2.5	INORG	Lead	7439-92-1	1330		450	0.005	0.015
	PB-34-03R	N	0	0.5	INORG	Lead	7439-92-1	488		450	0.005	0.005
PB 35	PB-35-09	N	3	3.5	INORG	Lead	7439-92-1	1520		450	0.005	0.017
	PB-35-11	FD	3	3.5	INORG	Lead	7439-92-1	1500		450	0.005	0.017
PB 37	PB-37-11	N	3	3.5	INORG	Lead	7439-92-1	2740		450	0.005	0.030
	PB-37-11R	N	6	6.5	INORG	Lead	7439-92-1	854		450	0.005	0.0095
	PB-37-15	N	2.5	3	INORG	Lead	7439-92-1	647		450	0.005	0.0072
	PB-37-17	N	3	3.5	INORG	Lead	7439-92-1	1850		450	0.005	0.021
PB 38	PB-38-10	N	3	3.5	INORG	Lead	7439-92-1	464		450	0.005	0.0052
	PB-38-11	N	3	3.5	INORG	Lead	7439-92-1	780		450	0.005	0.0087
PB 40	PB-40-07	N	3.5	4	INORG	Lead	7439-92-1	463		450	0.005	0.0051
	PB-40-12	N	3	3.5	INORG	Lead	7439-92-1	1070		450	0.005	0.012
PB 27	PB-27-01	N	2.5	3	VOC	Methyl tert-butyl ether	1634-04-4	49		2	0.02	0.49
	PB-27-02	N	3	3.5	VOC	Methyl tert-butyl ether	1634-04-4	120		2	0.02	1.2
	PB-27-02R	N	6	6.5	VOC	Methyl tert-butyl ether	1634-04-4	2.5		2	0.02	0.025
	PB-27-03	N	3.5	4	VOC	Methyl tert-butyl ether	1634-04-4	36		2	0.02	0.36
	PB-27-05	N	3.5	4	VOC	Methyl tert-butyl ether	1634-04-4	10		2	0.02	0.10
	PB-27-06	N	4	4.5	VOC	Methyl tert-butyl ether	1634-04-4	11		2	0.02	0.11
	PB-27-10	N	3.5	4	VOC	Methyl tert-butyl ether	1634-04-4	7.2		2	0.02	0.072
PB 29	PB-29-03	N	4.5	5	VOC	Methyl tert-butyl ether	1634-04-4	22		2	0.02	0.22
	PB-29-03R	N	6	6.5	VOC	Methyl tert-butyl ether	1634-04-4	4.6		2	0.02	0.046
	PB-29-07	N	3	3.5	VOC	Methyl tert-butyl ether	1634-04-4	2.2		2	0.02	0.022
	PB-29-12	N	3	3.5	VOC	Methyl tert-butyl ether	1634-04-4	12		2	0.02	0.12
PB 33	PB-33-11	N	4	4.5	VOC	Methyl tert-butyl ether	1634-04-4	2.6		2	0.02	0.026
PB 204	PB-204-06	N	3	3.5	SVOC	Naphthalene	91-20-3	31		25	0.1	0.12
PB 27	PB-27-01	N	2.5	3	SVOC	Naphthalene	91-20-3	98		25	0.1	0.39
	PB-27-02	N	3	3.5	SVOC	Naphthalene	91-20-3	170		25	0.1	0.68
	PB-27-03	N	3.5	4	SVOC	Naphthalene	91-20-3	59		25	0.1	0.24
	PB-27-05	N	3.5	4	SVOC	Naphthalene	91-20-3	93		25	0.1	0.37
	PB-27-06	N	4	4.5	SVOC	Naphthalene	91-20-3	27		25	0.1	0.11
	PB-27-09	N	4	4.5	SVOC	Naphthalene	91-20-3	53		25	0.1	0.21
	PB-27-11	N	4.5	5	SVOC	Naphthalene	91-20-3	49		25	0.1	0.20
	PB-27-15	N	3	3.5	SVOC	Naphthalene	91-20-3	45		25	0.1	0.18
PB 29	PB-29-02	N	4.5	5	SVOC	Naphthalene	91-20-3	41		25	0.1	0.16
	PB-29-03	N	4.5	5	SVOC	Naphthalene	91-20-3	27		25	0.1	0.11
	PB-29-08	N	1	1.5	SVOC	Naphthalene	91-20-3	79		25	0.1	0.32
PB 36	PB-36-03	N	3	3.5	SVOC	Naphthalene	91-20-3	66		25	0.1	0.26
	PB-36-07	N	4	4.5	SVOC	Naphthalene	91-20-3	87		25	0.1	0.35
PB 39	PB-39-12	N	3	3.5	SVOC	Naphthalene	91-20-3	40		25	0.1	0.16

Table 5
Soil-to-Groundwater Evaluation (Modeled Groundwater Concentrations)
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Tank	Location	Sample Type	Top Depth (ft)	Bottom Depth (ft)	Chem Group	Chemical	CASRN	Conc (mg/kg)	Qual	Non-Res Used Aquifer (TDS ≤ 2500) Soil-to-GW (mg/kg)	Non-Res GW Used Aquifer (TDS ≤ 2500) (mg/L)	Estimated Groundwater Conc (mg/L)
PB 84	PB-84-04	N	3	3.5	SVOC	Naphthalene	91-20-3	74		25	0.1	0.30
PB 129	PB-129-06	N	4.5	5	VOC	Toluene	108-88-3	250		100	1.0	2.5
PB 27	PB-27-02	N	3	3.5	VOC	Toluene	108-88-3	160		100	1.0	1.6
	PB-27-02R	N	6	6.5	VOC	Toluene	108-88-3	170		100	1.0	1.7
	PB-27-03	N	3.5	4	VOC	Toluene	108-88-3	370		100	1.0	3.7
	PB-27-08	N	4	4.5	VOC	Toluene	108-88-3	240		100	1.0	2.4
	PB-27-09	N	4	4.5	VOC	Toluene	108-88-3	110		100	1.0	1.1
PB 28	PB-28-19	N	3	3.5	VOC	Toluene	108-88-3	2000		100	1.0	20
	PB-28-19R	N	6	6.5	VOC	Toluene	108-88-3	510		100	1.0	5.1
PB 29	PB-29-02	N	4.5	5	VOC	Toluene	108-88-3	110		100	1.0	1.1
	PB-29-03	N	4.5	5	VOC	Toluene	108-88-3	540		100	1.0	5.4
	PB-29-03R	N	6	6.5	VOC	Toluene	108-88-3	200		100	1.0	2.0
	PB-29-21	N	4	4.5	VOC	Toluene	108-88-3	150		100	1.0	1.5
PB 33	PB-33-05	N	2	2.5	VOC	Toluene	108-88-3	180		100	1.0	1.8
	PB-33-05	FD	2	2.5	VOC	Toluene	108-88-3	150		100	1.0	1.5
PB 36	PB-36-03	N	3	3.5	VOC	Toluene	108-88-3	180		100	1.0	1.8
PB 39	PB-39-12	N	3	3.5	VOC	Toluene	108-88-3	350		100	1.0	3.5
PB 129	PB-129-06	N	4.5	5	VOC	Xylenes (total)	1330-20-7	1360	J	1000	10	14
	PB-129-10	N	3.5	4	VOC	Xylenes (total)	1330-20-7	1640	J	1000	10	16
PB 27	PB-27-02	N	3	3.5	VOC	Xylenes (total)	1330-20-7	1400	J	1000	10	14
	PB-27-03	N	3.5	4	VOC	Xylenes (total)	1330-20-7	1160	J	1000	10	12
	PB-27-05	N	3.5	4	VOC	Xylenes (total)	1330-20-7	1210	J	1000	10	12
PB 28	PB-28-19	N	3	3.5	VOC	Xylenes (total)	1330-20-7	3290	J	1000	10	33
PB 29	PB-29-03	N	4.5	5	VOC	Xylenes (total)	1330-20-7	1150	J	1000	10	12
	PB-29-08	N	1	1.5	VOC	Xylenes (total)	1330-20-7	1550	J	1000	10	16
PB 36	PB-36-07	N	4	4.5	VOC	Xylenes (total)	1330-20-7	1080	J	1000	10	11

Notes:
Chem Group - chemical group
Estimated concentrations in groundwater are calculated by multiplying measured concentrations in soil by the ratio of the Non-Res UA MSC for groundwater to the Non-Res S-GW UA MSC for soil.
 - the maximum modeled groundwater concentration for the tank/chemical pair that is > than the Non-Res GW Used Aquifer MSC.

Table 6
Groundwater Contamination Fate and Transport Calculations
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Chemical	CASRN	Estimated Max GW Conc (mg/L)	K_{oc} (L/kg)	K_d (L/kg)	R_{oc} (unitless)	V_{COC} (ft/day)	λ (yr^{-1})	λ (day^{-1})	Basis	NonRes UA GW MSC (mg/L)	T (days)	Potential Transport Distance (ft)
PB-129-06	1,2,4-Trimethylbenzene	95-63-6	0.69	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	21	0.085
PB-129-10	1,2,4-Trimethylbenzene	95-63-6	1.8	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	98	0.39
PB-27-01	1,2,4-Trimethylbenzene	95-63-6	0.71	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	23	0.093
PB-27-02	1,2,4-Trimethylbenzene	95-63-6	0.94	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	46	0.18
PB-27-03	1,2,4-Trimethylbenzene	95-63-6	0.83	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	36	0.15
PB-27-05	1,2,4-Trimethylbenzene	95-63-6	0.85	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	38	0.15
PB-28-19	1,2,4-Trimethylbenzene	95-63-6	1.5	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	86	0.35
PB-29-03	1,2,4-Trimethylbenzene	95-63-6	0.88	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	41	0.17
PB-29-05	1,2,4-Trimethylbenzene	95-63-6	0.95	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	48	0.19
PB-29-08	1,2,4-Trimethylbenzene	95-63-6	1.2	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	66	0.27
PB-29-09	1,2,4-Trimethylbenzene	95-63-6	0.57	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	5	0.021
PB-29-24	1,2,4-Trimethylbenzene	95-63-6	0.67	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	19	0.077
PB-36-03	1,2,4-Trimethylbenzene	95-63-6	1.2	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	65	0.26
PB-36-07	1,2,4-Trimethylbenzene	95-63-6	1.1	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	61	0.25
PB-39-12	1,2,4-Trimethylbenzene	95-63-6	0.69	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	21	0.085
PB-84-14	1,2,4-Trimethylbenzene	95-63-6	0.94	2200	2200	17.9	0.004	4.5	0.01	Chapter 250 Table 5A	0.53	46	0.18
PB-204-06	1,2-Dibromoethane	106-93-4	0.00043	54	54	1.4	0.051	2.11	0.006	Chapter 250 Table 5A	0.00005	372	19
PB-204-11	1,2-Dibromoethane	106-93-4	0.00080	54	54	1.4	0.051	2.11	0.006	Chapter 250 Table 5A	0.00005	480	24
PB-129-06	1,3,5-Trimethylbenzene	108-67-8	0.97	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	49	0.58
PB-129-10	1,3,5-Trimethylbenzene	108-67-8	1.8	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	98	1.2
PB-27-01	1,3,5-Trimethylbenzene	108-67-8	0.85	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	39	0.46
PB-27-02	1,3,5-Trimethylbenzene	108-67-8	1.1	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	62	0.73
PB-27-03	1,3,5-Trimethylbenzene	108-67-8	1.0	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	54	0.63
PB-27-05	1,3,5-Trimethylbenzene	108-67-8	1.0	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	54	0.63
PB-27-06	1,3,5-Trimethylbenzene	108-67-8	0.56	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	4	0.05
PB-28-19	1,3,5-Trimethylbenzene	108-67-8	2.3	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	118	1.4
PB-29-03	1,3,5-Trimethylbenzene	108-67-8	0.97	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	49	0.58
PB-29-05	1,3,5-Trimethylbenzene	108-67-8	0.63	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	14	0.16
PB-29-08	1,3,5-Trimethylbenzene	108-67-8	1.5	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	83	1.0
PB-29-09	1,3,5-Trimethylbenzene	108-67-8	0.63	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	14	0.16
PB-29-24	1,3,5-Trimethylbenzene	108-67-8	0.85	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	39	0.46
PB-36-03	1,3,5-Trimethylbenzene	108-67-8	1.0	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	54	0.63
PB-36-07	1,3,5-Trimethylbenzene	108-67-8	1.5	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	83	1.0
PB-39-12	1,3,5-Trimethylbenzene	108-67-8	0.56	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	4	0.050
PB-84-14	1,3,5-Trimethylbenzene	108-67-8	0.74	660	660	6.1	0.012	4.5	0.012	Chapter 250 Table 5A	0.53	27	0.32
PB-128-04	Benzene	71-43-2	0.013	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	996	49
PB-128-05	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-129-02	Benzene	71-43-2	0.006	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	190	9.4
PB-129-03	Benzene	71-43-2	0.010	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	680	34
PB-204-05	Benzene	71-43-2	0.0075	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	423	21
PB-204-06	Benzene	71-43-2	0.023	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1591	79
PB-204-12	Benzene	71-43-2	0.018	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1336	66
PB-27-01	Benzene	71-43-2	0.16	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3614	179
PB-27-02	Benzene	71-43-2	0.69	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	5138	255
PB-27-03	Benzene	71-43-2	0.39	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4543	226
PB-27-04	Benzene	71-43-2	0.013	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	996	49
PB-27-05	Benzene	71-43-2	0.60	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4993	248
PB-27-06	Benzene	71-43-2	0.39	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4543	226
PB-27-07	Benzene	71-43-2	0.030	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1869	93
PB-27-08	Benzene	71-43-2	0.30	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4270	212
PB-27-09	Benzene	71-43-2	0.32	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4337	215
PB-27-10	Benzene	71-43-2	0.17	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3677	183
PB-27-11	Benzene	71-43-2	0.23	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3993	198
PB-27-15	Benzene	71-43-2	0.10	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3103	154
PB-28-05	Benzene	71-43-2	0.032	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1936	96
PB-28-08	Benzene	71-43-2	0.013	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	996	49
PB-28-09	Benzene	71-43-2	0.011	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	822	41
PB-28-10	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-28-19	Benzene	71-43-2	0.74	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	5211	259
PB-29-01	Benzene	71-43-2	0.035	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2029	101
PB-29-02	Benzene	71-43-2	0.086	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2967	147
PB-29-03	Benzene	71-43-2	1.1	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	5625	279
PB-29-04	Benzene	71-43-2	0.011	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	822	41
PB-29-05	Benzene	71-43-2	0.089	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3003	149
PB-29-06	Benzene	71-43-2	0.055	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2501	124
PB-29-07	Benzene	71-43-2	0.12	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3314	165
PB-29-08	Benzene	71-43-2	0.22	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3946	196
PB-29-10	Benzene	71-43-2	0.24	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4037	200
PB-29-11	Benzene	71-43-2	0.036	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2059	102
PB-29-12	Benzene	71-43-2	0.066	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2691	134
PB-29-13	Benzene	71-43-2	0.008	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	541	27
PB-29-16	Benzene	71-43-2	0.083	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2930	145
PB-29-19	Benzene	71-43-2	0.23	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3993	198
PB-29-20	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-29-21	Benzene	71-43-2	0.29	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4234	210
PB-29-22	Benzene	71-43-2	0.25	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4080	203
PB-29-23	Benzene	71-43-2	0.30	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4270	212
PB-29-24	Benzene	71-43-2	0.76	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	5239	260
PB-29-25	Benzene	71-43-2	0.020	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1446	72
PB-29-26	Benzene	71-43-2	0.11	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3224	160
PB-29-28	Benzene	71-43-2	0.070	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2752	137
PB-33-01	Benzene	71-43-2	0.012	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	913	45
PB-33-02	Benzene	71-43-2	0.066	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2691	134
PB-33-04	Benzene	71-43-2	0.12	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3314	165
PB-33-05	Benzene	71-43-2	0.46	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4716	234
PB-33-09	Benzene	71-43-2	0.079	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2878	143
PB-33-11	Benzene	71-43-2	0.12	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3314	165
PB-33-12	Benzene	71-43-2	0.03	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1759	87
PB-33-18	Benzene	71-43-2	0.18	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3737	186

Table 6
Groundwater Contamination Fate and Transport Calculations
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Chemical	CASRN	Estimated Max GW Conc (mg/L)	K_{oc} (L/kg)	K_d (L/kg)	R_{oc} (unitless)	V_{COC} (ft/day)	λ (yr^{-1})	λ (day^{-1})	Basis	NonRes UA GW MSC (mg/L)	T (days)	Potential Transport Distance (ft)
PB-34-11	Benzene	71-43-2	1.80	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	6138	305
PB-34-12	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-35-06	Benzene	71-43-2	0.009	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	601	30
PB-35-08	Benzene	71-43-2	0.025	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1678	83
PB-35-10	Benzene	71-43-2	0.012	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	913	45
PB-35-11	Benzene	71-43-2	0.026	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1719	85
PB-35-12	Benzene	71-43-2	0.0071	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	366	18
PB-35-13	Benzene	71-43-2	0.0089	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	601	30
PB-35-14	Benzene	71-43-2	0.0054	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	80	4.0
PB-36-01	Benzene	71-43-2	0.0077	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	450	22
PB-36-03	Benzene	71-43-2	0.35	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4431	220
PB-36-04	Benzene	71-43-2	0.012	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	913	45
PB-36-07	Benzene	71-43-2	0.027	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1759	87
PB-36-09	Benzene	71-43-2	0.35	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	4431	220
PB-36-10	Benzene	71-43-2	0.0052	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	41	2.0
PB-37-03	Benzene	71-43-2	0.0080	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	490	24
PB-37-05	Benzene	71-43-2	0.11	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3224	160
PB-37-14	Benzene	71-43-2	0.017	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1276	63
PB-38-03	Benzene	71-43-2	0.072	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2782	138
PB-38-04	Benzene	71-43-2	0.10	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3124	155
PB-38-08	Benzene	71-43-2	0.084	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2942	146
PB-38-10	Benzene	71-43-2	0.011	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	822	41
PB-38-13	Benzene	71-43-2	0.19	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3793	188
PB-39-04	Benzene	71-43-2	0.0065	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	274	14
PB-39-06	Benzene	71-43-2	0.0092	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	636	32
PB-39-08	Benzene	71-43-2	0.0072	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	380	19
PB-39-09	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-39-12	Benzene	71-43-2	0.73	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	5197	258
PB-40-12	Benzene	71-43-2	0.0059	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	173	8.6
PB-42-09	Benzene	71-43-2	0.0078	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	464	23
PB-83-01	Benzene	71-43-2	0.050	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	2401	119
PB-83-02	Benzene	71-43-2	0.0064	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	257	13
PB-84-04	Benzene	71-43-2	0.021	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1497	74
PB-84-14	Benzene	71-43-2	0.014	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1074	53
PB-85-06	Benzene	71-43-2	0.18	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	3737	186
PB-85-09	Benzene	71-43-2	0.017	58	58	1.4	0.050	0.35	0.001	Chapter 250 Table 5A	0.005	1276	63
PB-129-06	Ethyl Benzene	100-41-4	2.3	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	391	10
PB-129-10	Ethyl Benzene	100-41-4	1.7	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	292	7.8
PB-27-01	Ethyl Benzene	100-41-4	1.3	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	204	5.4
PB-27-02	Ethyl Benzene	100-41-4	2.5	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	419	11
PB-27-03	Ethyl Benzene	100-41-4	2.0	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	345	9.2
PB-27-05	Ethyl Benzene	100-41-4	2.5	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	419	11
PB-27-06	Ethyl Benzene	100-41-4	1.1	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	149	4.0
PB-27-08	Ethyl Benzene	100-41-4	1.0	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	107	2.9
PB-27-09	Ethyl Benzene	100-41-4	1.4	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	228	6.1
PB-28-19	Ethyl Benzene	100-41-4	7.0	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	757	20
PB-29-03	Ethyl Benzene	100-41-4	2.2	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	377	10
PB-29-05	Ethyl Benzene	100-41-4	1.9	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	328	8.8
PB-29-08	Ethyl Benzene	100-41-4	2.9	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	467	12
PB-29-09	Ethyl Benzene	100-41-4	1.5	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	251	6.7
PB-29-10	Ethyl Benzene	100-41-4	0.77	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	31	0.84
PB-29-19	Ethyl Benzene	100-41-4	0.82	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	52	1.4
PB-29-21	Ethyl Benzene	100-41-4	1.0	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	117	3.1
PB-29-22	Ethyl Benzene	100-41-4	0.72	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	9	0.25
PB-29-23	Ethyl Benzene	100-41-4	1.1	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	149	4.0
PB-29-24	Ethyl Benzene	100-41-4	2.2	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	377	10
PB-33-04	Ethyl Benzene	100-41-4	0.91	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	86	2.3
PB-33-05	Ethyl Benzene	100-41-4	0.83	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	56	1.5
PB-36-03	Ethyl Benzene	100-41-4	1.6	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	272	7.2
PB-36-07	Ethyl Benzene	100-41-4	2.6	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	431	12
PB-39-12	Ethyl Benzene	100-41-4	1.8	220	220	2.7	0.027	1.11	0.003	Chapter 250 Table 5A	0.7	311	8.3
PB-128-01	Lead	7439-92-1	0.022	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-128-05	Lead	7439-92-1	0.020	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-128-08	Lead	7439-92-1	0.0094	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-129-01	Lead	7439-92-1	0.044	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-204-01	Lead	7439-92-1	0.0060	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-27-02	Lead	7439-92-1	0.018	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-28-05	Lead	7439-92-1	0.0051	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-29-02	Lead	7439-92-1	0.028	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-29-15	Lead	7439-92-1	0.023	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-34-03	Lead	7439-92-1	0.015	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-35-09	Lead	7439-92-1	0.017	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-37-11	Lead	7439-92-1	0.030	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-37-15	Lead	7439-92-1	0.0072	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-37-17	Lead	7439-92-1	0.021	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-38-10	Lead	7439-92-1	0.0052	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-38-11	Lead	7439-92-1	0.0087	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-40-07	Lead	7439-92-1	0.0051	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-40-12	Lead	7439-92-1	0.012	--	900	7.9	0.009	--	--	Chapter 250 Table 5B	0.005	10950	99
PB-27-01	Methyl tert-butyl ether	1634-04-4	0.49	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	1692	111
PB-27-02	Methyl tert-butyl ether	1634-04-4	1.2	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	2166	142
PB-27-03	Methyl tert-butyl ether	1634-04-4	0.36	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	1529	100
PB-27-05	Methyl tert-butyl ether	1634-04-4	0.095	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	824	54
PB-27-06	Methyl tert-butyl ether	1634-04-4	0.11	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	902	59
PB-27-10	Methyl tert-butyl ether	1634-04-4	0.072	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	678	45
PB-29-03	Methyl tert-butyl ether	1634-04-4	0.22	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	1268	83
PB-29-07	Methyl tert-butyl ether	1634-04-4	0.022	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	50	3.3
PB-29-12	Methyl tert-butyl ether	1634-04-4	0.12	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	948	62
PB-33-11	Methyl tert-butyl ether	1634-04-4	0.026	12	12	1.1	0.066	0.69	0.002	Chapter 250 Table 5A	0.02	139	9.1

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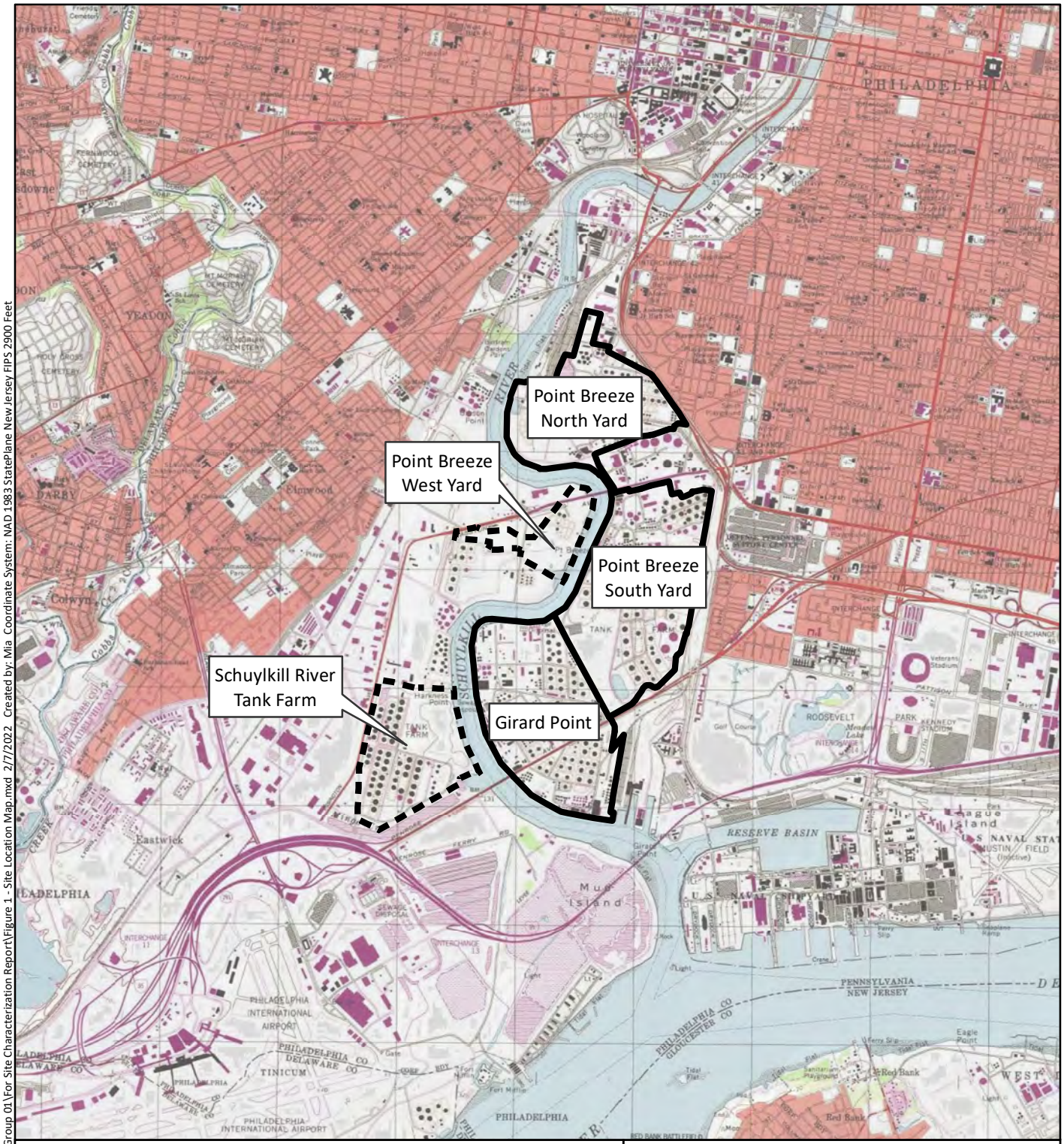
Location	Chemical	CASRN	Estimated Max GW Conc (mg/L)	K_{oc} (L/kg)	K_d (L/kg)	R_{oc} (unitless)	V_{COC} (ft/day)	λ (yr^{-1})	λ (day^{-1})	Basis	NonRes UA GW MSC (mg/L)	T (days)	Potential Transport Distance (ft)
PB-204-06	Naphthalene	91-20-3	0.12	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	80	0.69
PB-27-01	Naphthalene	91-20-3	0.39	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	509	4.4
PB-27-02	Naphthalene	91-20-3	0.68	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	714	6.2
PB-27-03	Naphthalene	91-20-3	0.24	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	320	2.8
PB-27-05	Naphthalene	91-20-3	0.37	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	489	4.2
PB-27-06	Naphthalene	91-20-3	0.11	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	29	0.25
PB-27-09	Naphthalene	91-20-3	0.21	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	280	2.4
PB-27-11	Naphthalene	91-20-3	0.20	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	251	2.2
PB-27-15	Naphthalene	91-20-3	0.18	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	219	1.9
PB-29-02	Naphthalene	91-20-3	0.16	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	184	1.6
PB-29-03	Naphthalene	91-20-3	0.11	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	29	0.25
PB-29-08	Naphthalene	91-20-3	0.32	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	429	3.7
PB-36-03	Naphthalene	91-20-3	0.26	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	362	3.1
PB-36-07	Naphthalene	91-20-3	0.35	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	464	4.0
PB-39-12	Naphthalene	91-20-3	0.16	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	175	1.5
PB-84-04	Naphthalene	91-20-3	0.30	950	950	8.3	0.009	0.98	0.003	Chapter 250 Table 5A	0.1	404	3.5
PB-129-06	Toluene	108-88-3	2.5	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	37	1.3
PB-27-02	Toluene	108-88-3	1.7	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	21	0.77
PB-27-03	Toluene	108-88-3	3.7	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	53	1.9
PB-27-08	Toluene	108-88-3	2.4	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	35	1.3
PB-27-09	Toluene	108-88-3	1.1	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	4	0.14
PB-28-19	Toluene	108-88-3	20	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	121	4.4
PB-29-02	Toluene	108-88-3	1.1	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	4	0.14
PB-29-03	Toluene	108-88-3	5.4	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	68	2.5
PB-29-21	Toluene	108-88-3	1.5	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	16	0.59
PB-33-05	Toluene	108-88-3	1.8	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	24	0.85
PB-36-03	Toluene	108-88-3	1.8	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	24	0.85
PB-39-12	Toluene	108-88-3	3.5	130	130	2.0	0.036	9.01	0.02	Chapter 250 Table 5A	1.0	51	1.8
PB-129-06	Xylenes (total)	1330-20-7	14	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	163	3.2
PB-129-10	Xylenes (total)	1330-20-7	16	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	262	5.1
PB-27-02	Xylenes (total)	1330-20-7	14	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	178	3.5
PB-27-03	Xylenes (total)	1330-20-7	12	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	79	1.5
PB-27-05	Xylenes (total)	1330-20-7	12	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	101	2.0
PB-28-19	Xylenes (total)	1330-20-7	33	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	630	12
PB-29-03	Xylenes (total)	1330-20-7	12	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	74	1.4
PB-29-08	Xylenes (total)	1330-20-7	16	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	232	4.5
PB-36-07	Xylenes (total)	1330-20-7	11	350	350	3.7	0.019	0.69	0.002	Chapter 250 Table 5A	10	41	0.8

Description	Term	Units	Value	Basis
Hydraulic Conductivity	K	ft/day	40	Max K_h along eastern boundary of Tank Group 02 as noted in AOI 1 RIR (Stantec 2016a)
Gradient	i	ft/ft	0.0007	As noted in AOI 1 RIR (Stantec 2016a)
Effective Porosity	n_e	--	0.39	Max porosity from AOI 1 RIR (Stantec 2016a)
Bulk Density	ρ_b	kg/L	1.5	Assumed
Fraction of Organic Carbon	f_{oc}	--	0.002	PADEP Users Guide QD GW Fate and Transport Model (2014)
Seepage Velocity	V_s	ft/day	0.07	Calculated

Note:
-- 1,2,4-TMB is used as a surrogate for decay rate for 1,3,5-TMB.
-- Potential transport distance was estimated by multiplying the total transport decay time, T, by the COC specific groundwater velocity, v_{COC}. In the case of lead, the distance was estimated for 30 years of transport in groundwater.

Figures

16c Unconfined GW Concentrations (Ethyl Benzene)
16d Unconfined GW Concentrations (MTBE)
16e Unconfined GW Concentrations (1,2,4-Trimethylbenzene)
16f Unconfined GW Concentrations (1,3,5-Trimethylbenzene)
16g Unconfined GW Concentrations (Toluene)
16h Unconfined GW Concentrations (Xylenes (total))
16i Unconfined GW Concentrations (Naphthalene)
16j Unconfined GW Concentrations (Lead)



0 2,000 4,000 6,000 Feet

1 inch = 4,000 feet

N

Legend

Subject to AST Closure Plan

Not Subject to AST Closure Plan

Base Map: USGS Philadelphia 1994 7.5 Minute Quadrangle.

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Facility Location

Figure 1

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 01\For Site Characterization Report\Figure 1 - Site Location Map.mxd 2/7/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

Legend

Tank Group

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- Previously Closed
- Subject to AST Closure Plan
- Not Subject to AST Closure Plan

Point Breeze North Yard

Site

Point Breeze South Yard

Point Breeze West Yard

Girard Point

Schuylkill River Tank Farm

N

0 500 1,000 1,500 Feet

1 inch = 1,000 feet

Notes: Aerial imagery source Maxar 10/19/2019

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Site Location

Figure 2

File: N:\GIS\Pr\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\For Site Characterization Report\Figure 2 - Site Location.mxd 2/9/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

PB 201
PB 204
PB 67
PB 30
PB 33
PB 29
PB 28
PB 27
PB 26
PB 85
PB 39
PB 38
PB 37
PB 42
PB 36
PB 43
PB 83
PB 35
PB 44
PB 34
PB 84
PB 40
PB 129
PB 128
PB 182
PB 119
PB 117
PB 7300
PB 7308
PB 7300
PB 7305
PB 89A
PB 7307
PB 15V 101
PB 3V 37
PB 7316
PB 7312
PB 7310
PB 7311
PB 14V 403
PB 140
PB 237
PB 279
PB 298
PB 141

Legend

Tank Group

- 02
- Previously Closed
- Associated Piping

Notes:
Aerial imagery source Maxar 10/19/2019

0 190 380 Feet

1 inch = 190 feet

N

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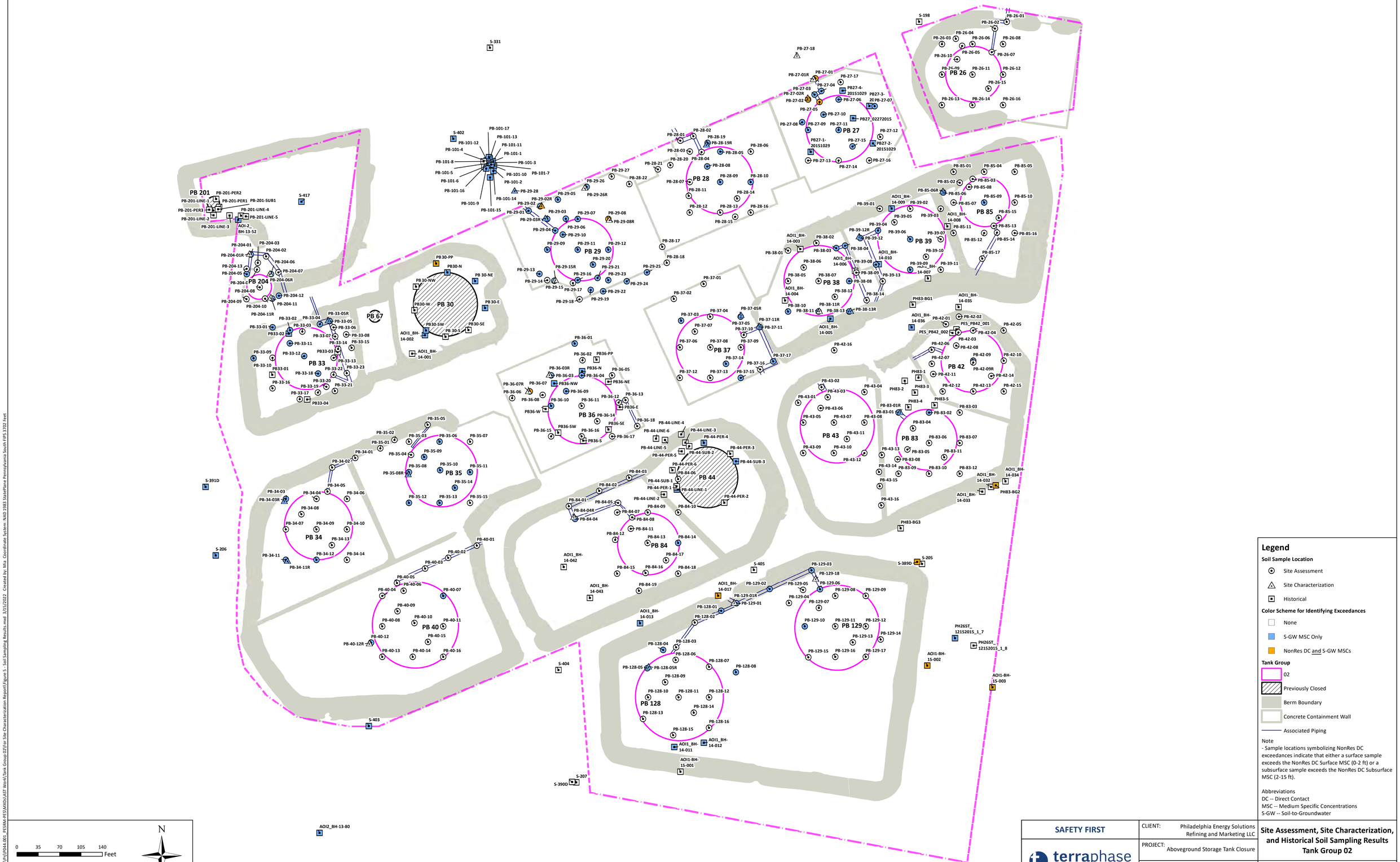
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Site Layout Map
Tank Group 02

Figure 3

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\For Site Characterization Report\Figure 3 - Site Layout Map.mxd 3/21/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

Soil Sample Location

- Site Assessment
- Site Characterization
- Historical

Color Scheme for Identifying Exceedances

- None
- S-GW MSC Only
- NonRes DC and S-GW MSCs

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample locations symbolizing NonRes DC exceedances indicate that either a surface sample exceeds the NonRes DC Surface MSC (0-2 ft) or a subsurface sample exceeds the NonRes DC Subsurface MSC (2-15 ft).

Abbreviations
DC -- Direct Contact
MSC -- Medium Specific Concentrations
S-GW -- Soil-to-Groundwater

0 35 70 105 140 Feet

1 inch = 70 feet

N

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Site Assessment, Site Characterization, and Historical Soil Sampling Results Tank Group 02

Figure 4

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\For Site Characterization Report\Figure 5 - Soil Sampling Results.mxd 3/15/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 40 80 120 160 Feet

1 inch = 85 feet

N

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Benzene)

Figure 5a

File: N:\GIS\Prj\P044.001_PESRM-PFSVMX0s\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Benzene_Surf.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (Benzene)

Figure 5b

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Benzene_Sub.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350
S-330
S-351
S-198
S-402
S-417
PB 201
AOI-2_BH -13-52
PB 204
PB 26
PB 27
PB 28
PB 85
AOI1_BH -14-009
AOI1_BH -14-008
PB-29-08
PB-29-10
PB-29-11
PB 29
PB-29-20
PB-28-18
PB 30-PP
PB 30
PB 67
PB-33-04
PB-33-06
PB 33
PB-33-13
PB-33-19
PB-33-17
AOI1_BH -14-003
AOI1_BH -14-010
AOI1_BH -14-006
PB 39
AOI1_BH -14-007
PB 38
AOI1_BH -14-004
PB-37-03
PB 37
AOI1_BH -14-005
PH83-BG1
AOI1_BH -14-035
AOI1_BH -14-036
PB 42
PH83-2
PB36-PP
PB 36
PB 43
PH83-4
PH83-5
PB 83
PB-44-LINE-6
PB-44-LINE-4
PB-44-LINE-5
PB-44-LINE-3
PB-35-01
PB 35
PB 44
PH83-BG2
S-391D
PB-44-LINE-1
PB-44-LINE-2
PB 34
PB 84
PH83-BG3
AOI1_BH -14-042
S-405
S-389D
S-205
AOI1_BH -14-043
AOI1_BH -14-017
AOI1_BH -14-013
PB 40
PB 129
S-404
PB 128
AOI1_BH -14-012
AOI1_BH -14-011
S-403
S-390D
S-388D
PB 7300
PB 7308
PB 7305
AOI-2_BH -13-79
S-300
AOI2_BH-13-80

Legend

PESRM Soil Sample Location

- No Exceedances

Historical Soil Sample Location

- No Exceedances

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

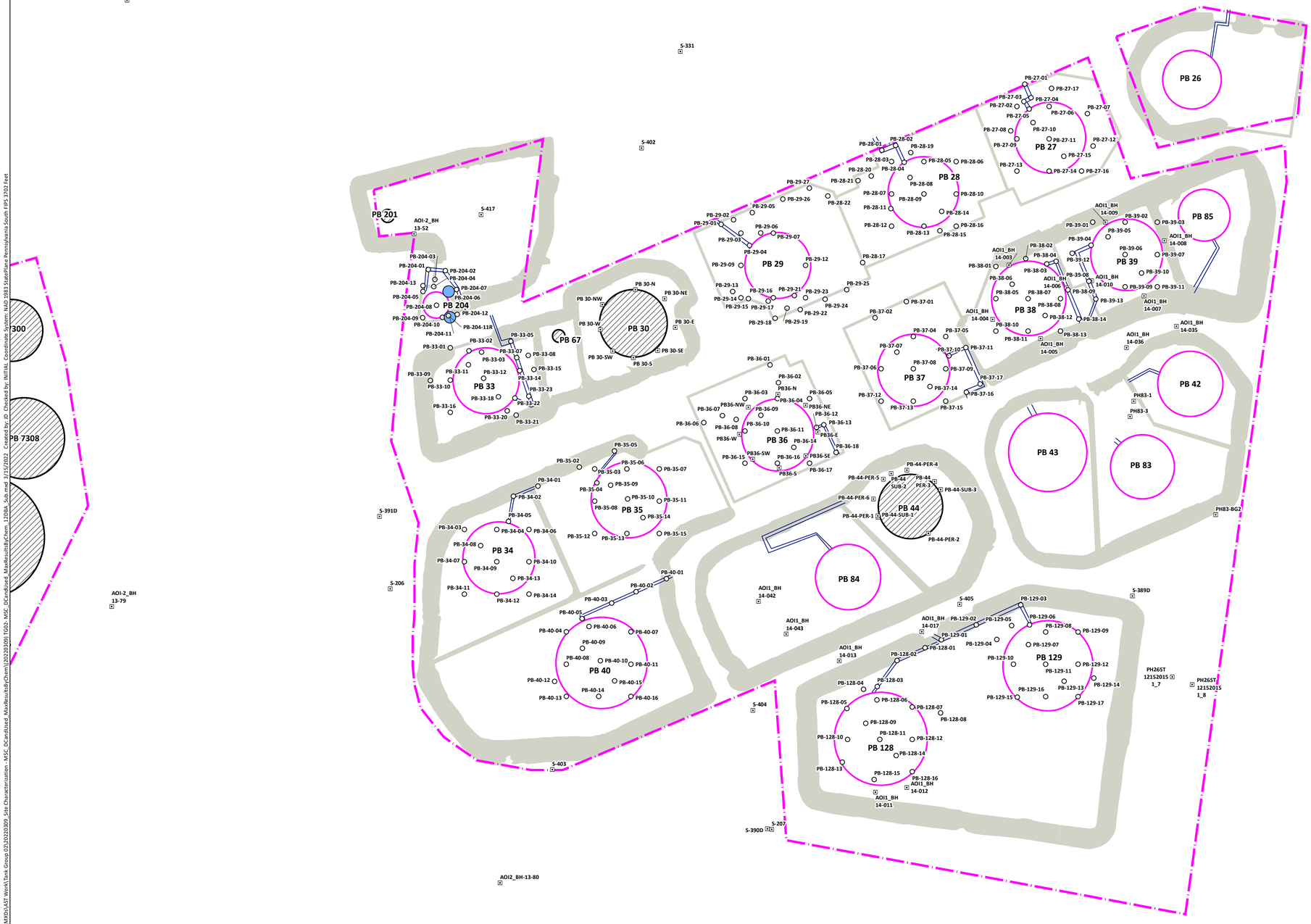
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (1,2-Dibromoethane)

Figure 6a

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization- MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_1208A_Surf.mxd 3/15/2022 Created by: JD Checked by: JNITTAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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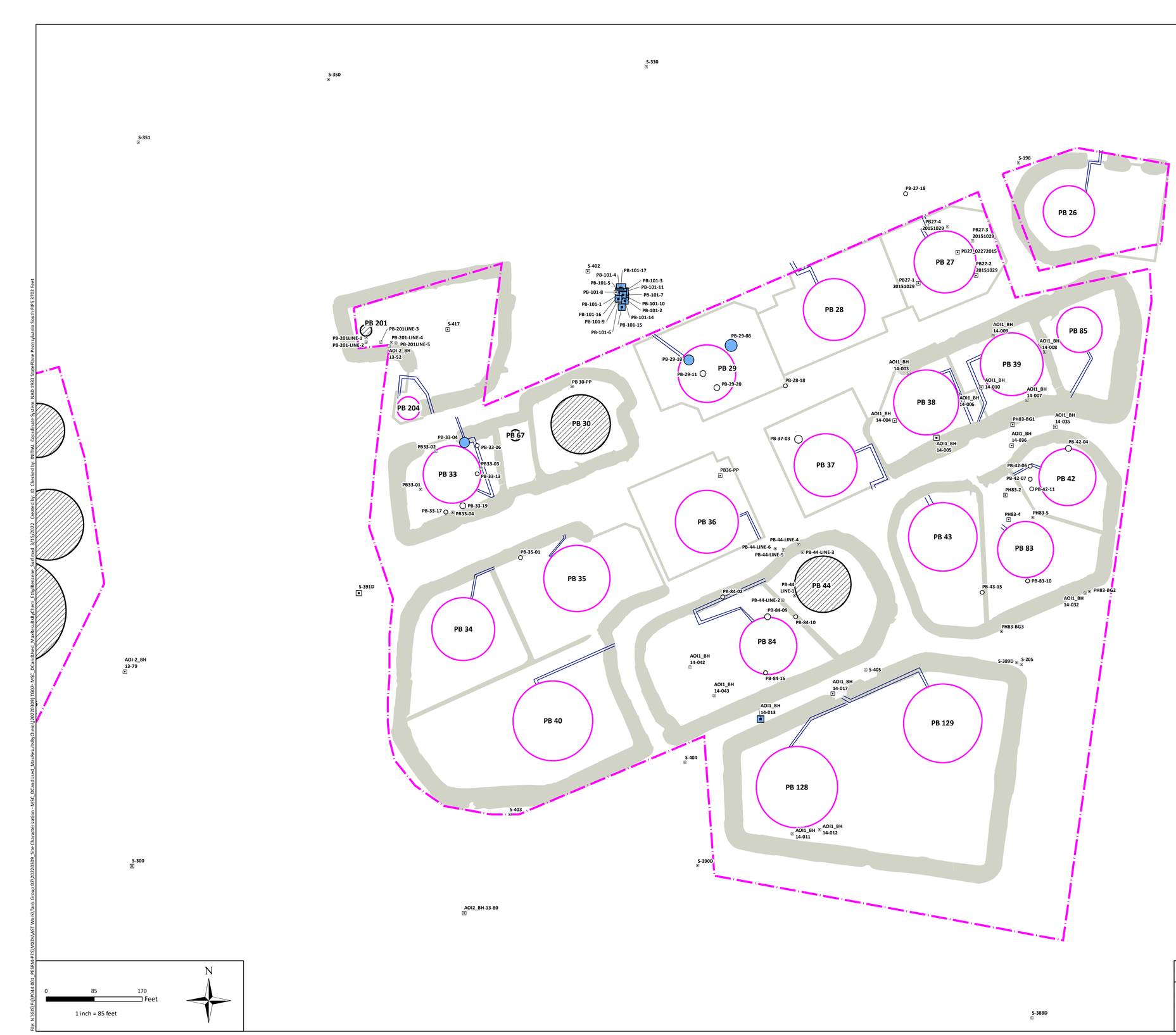
PROJECT:	Aboveground Storage Tank Closure
PROJECT NUMBER:	P044.001.002

Subsurface Soil Sampling Results
Tank Group 02
(1,2-Dibromoethane)

Figure 6b

File: N:\GIS\Proj\P044.001_PESRM-PFES\MXD\5\AST WorkTank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\2022039\TG02- MSC_DCandUsed_MaxResultsByChem_120BA_Sub.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

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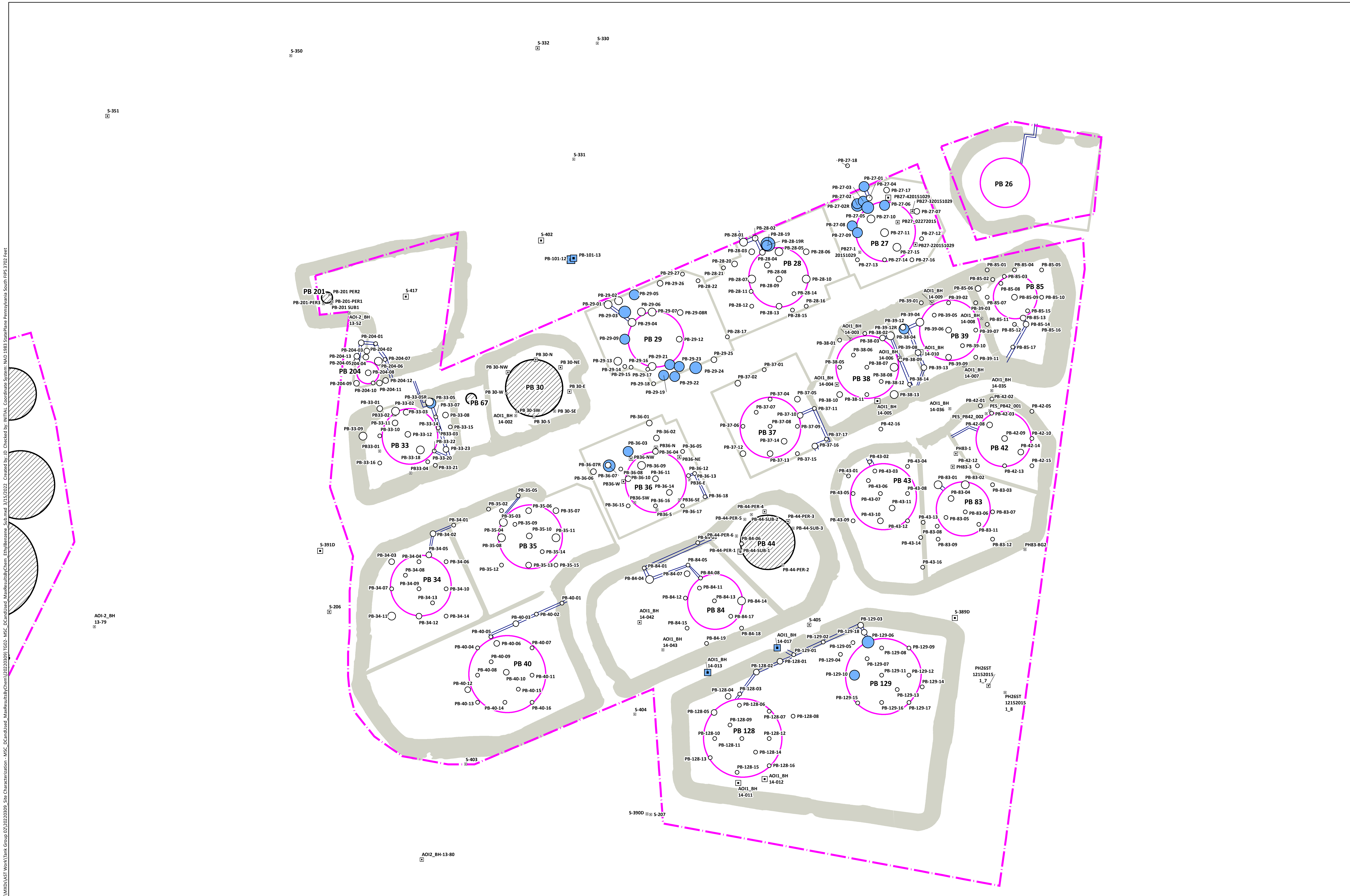
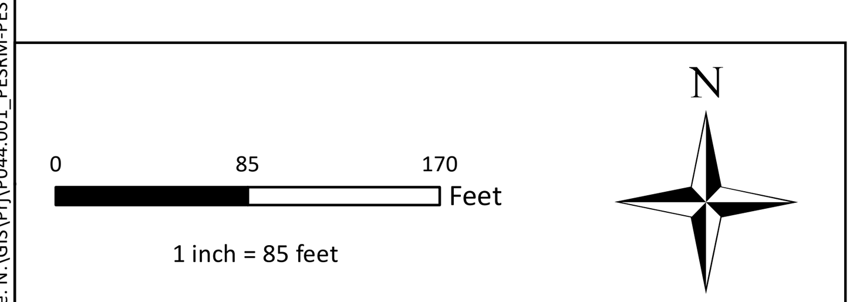
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Ethylbenzene)

Figure 7a





Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (Ethylbenzene)

Figure 7b

S-350
S-330
S-351
S-198
PB-27-18
PB 26
PB27-4-20151029
PB27-3-20151029
PB27_02272015
PB 27
PB27-2-20151029
PB27-1-20151029
S-402
PB 28
PB 201
S-417
AOI-2_BH-13-52
PB-29-08
PB-29-10
PB 29
PB-29-11
PB-29-20
PB-28-18
AOI1_BH-14-009
PB 85
PB 39
AOI1_BH-14-008
AOI1_BH-14-003
AOI1_BH-14-010
AOI1_BH-14-006
AOI1_BH-14-007
PB 204
PB 30-PP
PB 30
PB 38
AOI1_BH-14-004
PH83-BG1
AOI1_BH-14-035
PB 67
PB-33-04
PB-33-06
PB33-02
PB 33
PB33-03
PB-33-13
PB33-01
PB-33-19
PB-33-17
PB33-04
PB-37-03
PB 37
AOI1_BH-14-005
AOI1_BH-14-036
PB-42-04
PB-42-06
PB-42-07
PB 42
PB-42-11
PB36-PP
PH83-2
PB 36
PH83-4
PH83-5
PB 43
PB 83
PB-35-01
PB 35
PB 44
PB-84-02
PB-84-09
PB-84-10
PB-43-15
PB-83-10
PH83-BG2
PB 34
PB 84
PH83-BG3
AOI1_BH-14-042
PB-84-16
S-389D
S-205
S-405
AOI1_BH-14-043
AOI1_BH-14-017
PB 40
AOI1_BH-14-013
PB 129
S-404
PB 128
AOI1_BH-14-012
AOI1_BH-14-011
S-403
S-390D
S-391D
AOI-2_BH-13-79
S-300
AOI2_BH-13-80
S-388D

N

0 85 170 Feet

1 inch = 85 feet

Legend

PESRM Soil Sample Location

No Exceedances

Historical Soil Sample Location

No Exceedances

Tank Group

02

Previously Closed

Berm Boundary

Concrete Containment Wall

Associated Piping

Note
- Sample location size symbolizes relative concentration

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

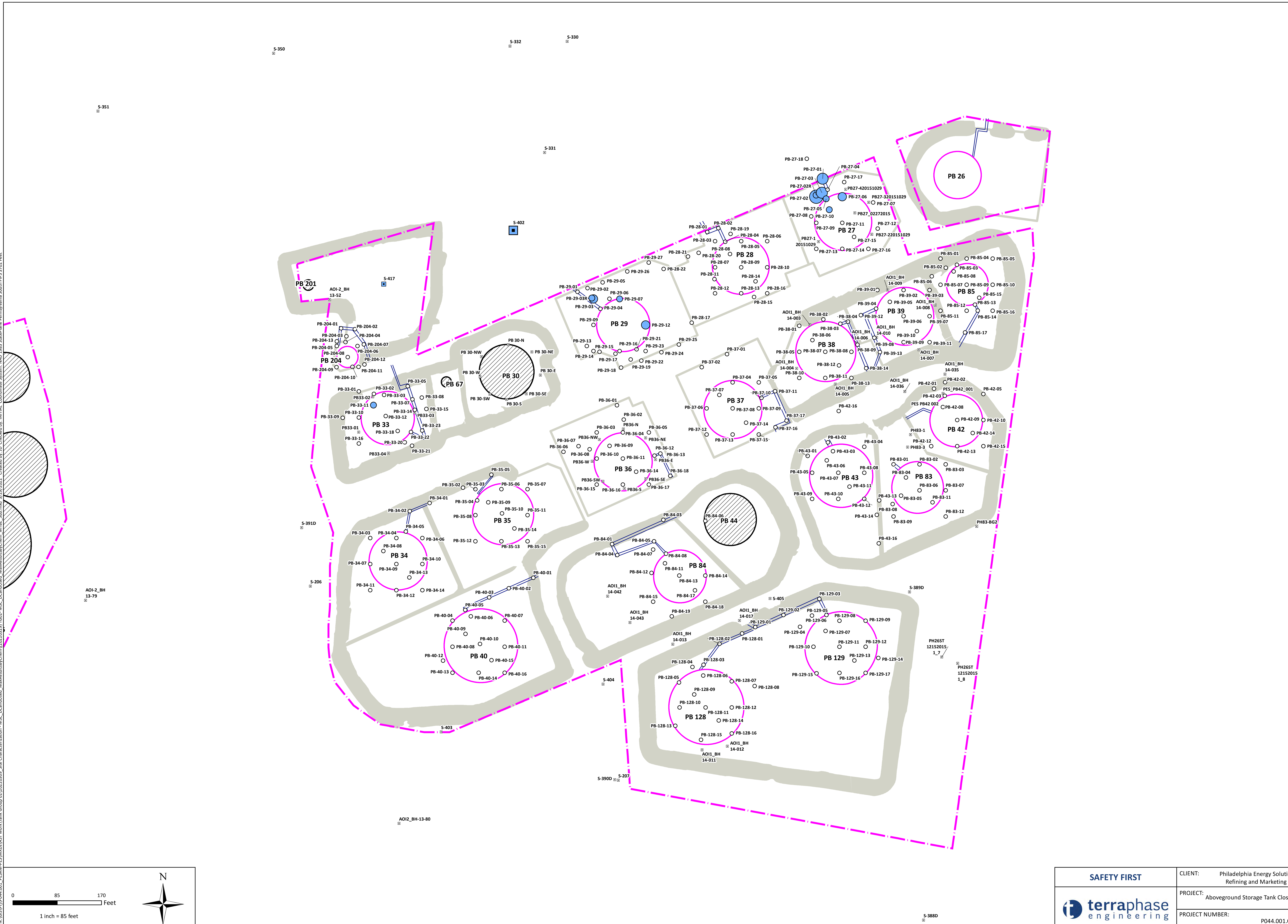
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results
Tank Group 02
(Methyl tert-butyl ether)

Figure 8a

File: N:\GIS\Proj\P044.001_PESRM-PFES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_MTBE_Surf.mxd 3/29/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

SAFETY FIRST	CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC	**Subsurface Soil Sampling Results Tank Group 02 (Methyl tert-butyl ether)**
terraphase engineering	PROJECT: Aboveground Storage Tank Closure	
	PROJECT NUMBER: P044.001.002	**Figure 8b**

S-350

S-351

S-402

PB 201

AOI-2_
BH-13-52

S-417

PB 204

PB 30-PP

PB 30

PB 67

PB-33-04

PB-33-06

PB33-02

PB 33

PB33-03

PB-33-13

PB33-01

PB-33-19

PB-33-17

PB33-04

PB 7300

PB 7308

PB 7305

AOI-2_
BH-13-79

S-300

AOI2_BH-13-80

PB-29-08

PB-29-10

PB-29-11

PB 29

PB-29-20

PB-28-18

PB 28

PB-27-18

PB27-4-20151029

PB27-3-20151029

PB27_02272015

PB 27

PB27-2-20151029

PB27-1-20151029

PB 26

AOI1_
BH-14-009

PB 85

PB 39

AOI1_
BH-14-008

AOI1_
BH-14-003

AOI1_
BH-14-010

AOI1_
BH-14-006

PB 38

AOI1_
BH-14-007

AOI1_
BH-14-004

PB83-BG1

AOI1_
BH-14-035

AOI1_
BH-14-036

PB-37-03

AOI1_
BH-14-005

PB 37

PB-42-04

PB-42-06

PB-42-07

PB 42

PH83-2

PB-42-11

PH83-4

PH83-5

PB 43

PB 83

PB-43-15

PB-83-10

PH83-BG2

PH83-BG3

PB36-PP

PB 36

PB-35-01

PB 35

S-391D

PB 34

PB-84-02

PB-84-09

PB-84-10

PB 44

PB 84

AOI1_
BH-14-042

AOI1_
BH-14-043

PB-84-16

S-405

AOI1_
BH-14-017

AOI1_
BH-14-013

PB 40

PB 129

S-389D

S-404

PB 128

AOI1_
BH-14-012

AOI1_
BH-14-011

S-403

S-390D

S-388D

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

SAFETY FIRST

terraphase engineering

CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (1,2,4-Trimethylbenzene)

Figure 9a

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_124Tri_Surf.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\20220309) TG02- MSC_DCandUsed_MaxResultsByChem_124Fri_Sub.mxd - 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350

S-351

S-402

S-417

PB 201

AOI-2_BH 13-52

PB 204

PB 33

PB 67

PB 30

PB 7308

AOI-2_BH 13-79

S-391D

PB 34

PB 35

PB 36

PB 29

PB 28

PB 27

PB 26

PB 44

PB 40

PB 37

PB 38

PB 39

PB 85

PB 42

PB 83

PB 43

PB 84

PB 128

PB 129

S-404

S-403

S-390D

S-405

S-389D

S-388D

AOI2_BH-13-80

PH265T 12152015 1_7

PH265T 12152015 1_8

PH83-1

PH83-2

PH83-3

PH83-BG2

PES_PB42_001

PB27-1 20151029

PB27-2-20151029

PB27-3-20151029

PB27-4-20151029

PB27_02272015

AOI1_BH 14-003

AOI1_BH 14-004

AOI1_BH 14-005

AOI1_BH 14-006

AOI1_BH 14-007

AOI1_BH 14-008

AOI1_BH 14-009

AOI1_BH 14-010

AOI1_BH 14-011

AOI1_BH 14-012

AOI1_BH 14-013

AOI1_BH 14-017

AOI1_BH 14-035

AOI1_BH 14-036

AOI1_BH 14-042

AOI1_BH 14-043

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (1,2,4-Trimethylbenzene)

Figure 9b

S-350

S-351

PB 201

AOI-2_BH-13-52

S-417

PB 204

PB 67

PB 33

PB33-01

PB33-02

PB33-03

PB33-04

PB-33-04

PB-33-06

PB-33-13

PB-33-17

PB-33-19

PB 30

PB 30-PP

S-402

PB 29

PB-29-08

PB-29-10

PB-29-11

PB-29-20

PB-28-18

PB 28

PB-27-18

PB 27

PB27-4-20151029

PB27-3-20151029

PB27_02272015

PB27-2-20151029

PB27-1-20151029

PB 26

PB 85

AOI1_BH-14-009

AOI1_BH-14-008

PB 39

AOI1_BH-14-003

AOI1_BH-14-010

AOI1_BH-14-006

AOI1_BH-14-007

PB 38

AOI1_BH-14-004

AOI1_BH-14-005

PB-37-03

PB 37

PB83-BG1

AOI1_BH-14-035

AOI1_BH-14-036

PB-42-04

PB-42-06

PB-42-07

PB-42-11

PB 42

PH83-2

PB36-PP

PB 36

PB 43

PH83-4

PH83-5

PB 83

PB-35-01

PB 35

PB 34

PB 44

PB-43-15

PB-83-10

PH83-BG2

PB-84-02

PB-84-09

PB-84-10

PB 84

PH83-BG3

S-389D

AOI1_BH-14-042

PB-84-16

S-405

AOI1_BH-14-043

AOI1_BH-14-017

AOI1_BH-14-013

PB 40

PB 129

S-404

PB 128

AOI1_BH-14-012

AOI1_BH-14-011

S-403

S-390D

S-391D

AOI-2_BH-13-79

S-300

AOI2_BH-13-80

S-388D

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

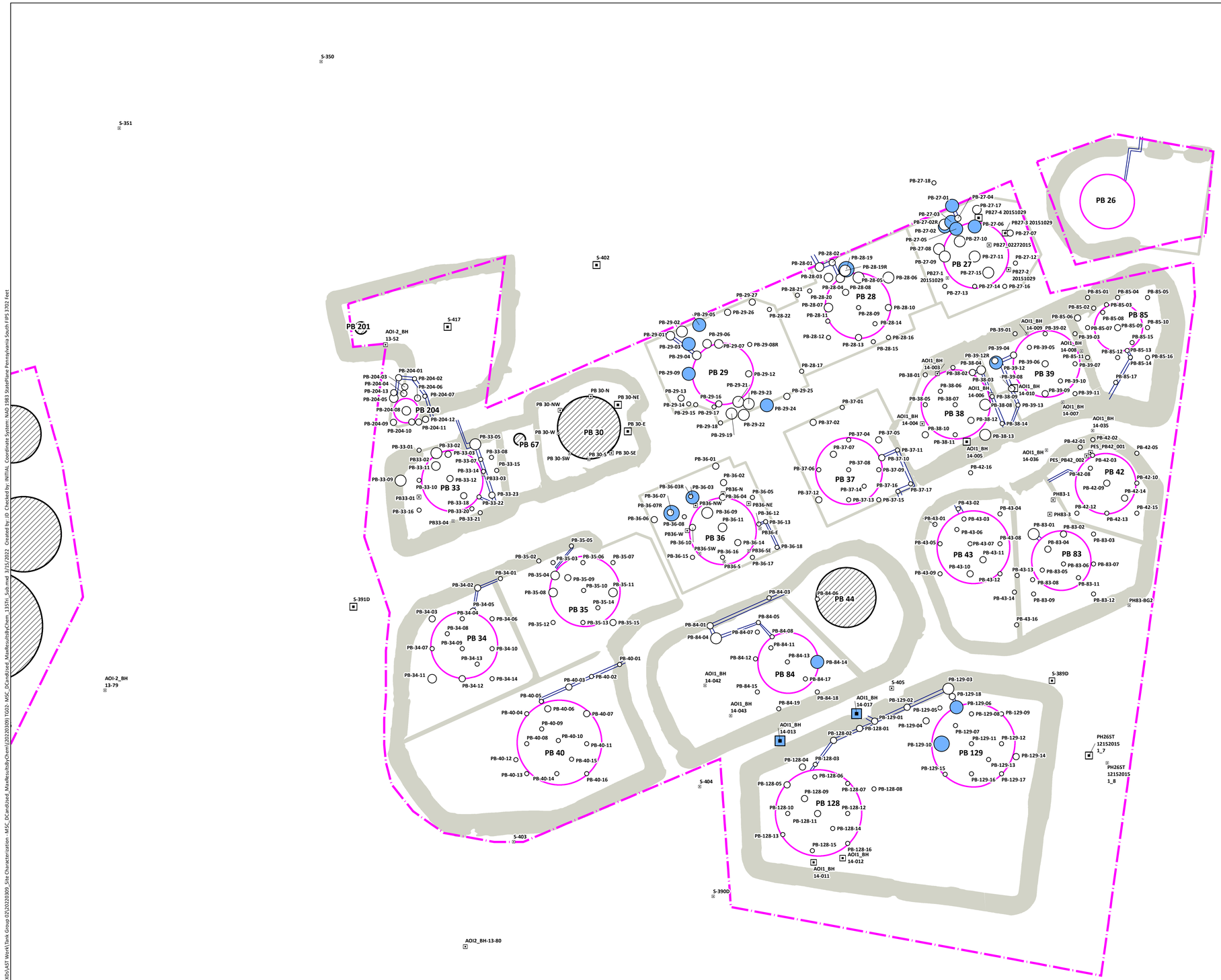
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results
Tank Group 02
(1,3,5-Trimethylbenzene)

Figure 10a

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02 - MSC_DCandUsed_MaxResultsByChem_135Ft_Surf.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (1,3,5-Trimethylbenzene)

Figure 10b

File: N:\GIS\Proj\P044.001_PESRM-PESMA05\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsBzChem\20220309) TG02- MSC_DCandUsed_MaxResultsBzChem_135Ft_Sub.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350
S-330
S-351
S-198
S-402
S-417
S-391D
S-300
S-403
S-404
S-405
S-390D
S-388D
S-205
S-389D
AOI2-BH-13-80
AOI-2_BH 13-79
PB 201
PB-201 LINE-1
PB-201 LINE-2
PB-201 LINE-3
PB-201-LINE-4
PB-201-LINE-5
AOI-2_BH 13-52
PB 204
PB 30
PB 30-PP
PB 67
PB 33
PB33-01
PB33-02
PB-33-03
PB33-03
PB-33-04
PB33-04
PB-33-06
PB-33-19
PB-33-17
PB 34
PB 35
PB-35-01
PB 36
PB36-PP
PB 40
PB 28
PB 29
PB-29-08
PB-29-10
PB-29-11
PB-29-20
PB-29-28
PB-28-18
PB 37
PB-37-03
PB 38
PB 39
PB 85
PB 26
PB 27
PB27-4 20151029
PB27-3-20151029
PB27_02272015
PB27-2 20151029
PB27-1 20151029
PB 43
PB 83
PB-83-10
PB-43-15
PB 42
PB-42-04
PB-42-06
PB-42-07
PB-42-11
PH83-2
PH83-4
PH83-5
PH83-BG1
PH83-BG2
PH83-BG3
PB 44
PB-44 LINE-1
PB-44 LINE-2
PB-44 LINE-3
PB-44 LINE-4
PB-44 LINE-5
PB-44-LINE-6
PB-84-02
PB-84-09
PB-84-10
PB-84-16
PB 84
PB 129
PB 128
AOI1_BH 14-003
AOI1_BH 14-004
AOI1_BH 14-005
AOI1_BH 14-006
AOI1_BH 14-007
AOI1_BH 14-008
AOI1_BH 14-009
AOI1_BH 14-010
AOI1_BH 14-011
AOI1_BH 14-012
AOI1_BH 14-013
AOI1_BH 14-017
AOI1_BH 14-032
AOI1_BH 14-035
AOI1_BH 14-036
AOI1_BH 14-042
AOI1_BH 14-043

Legend

PESRM Soil Sample Location

No Exceedances

Historical Soil Sample Location

No Exceedances

Tank Group

02

Previously Closed

Berm Boundary

Concrete Containment Wall

Associated Piping

Note
- Sample location size symbolizes relative concentration

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

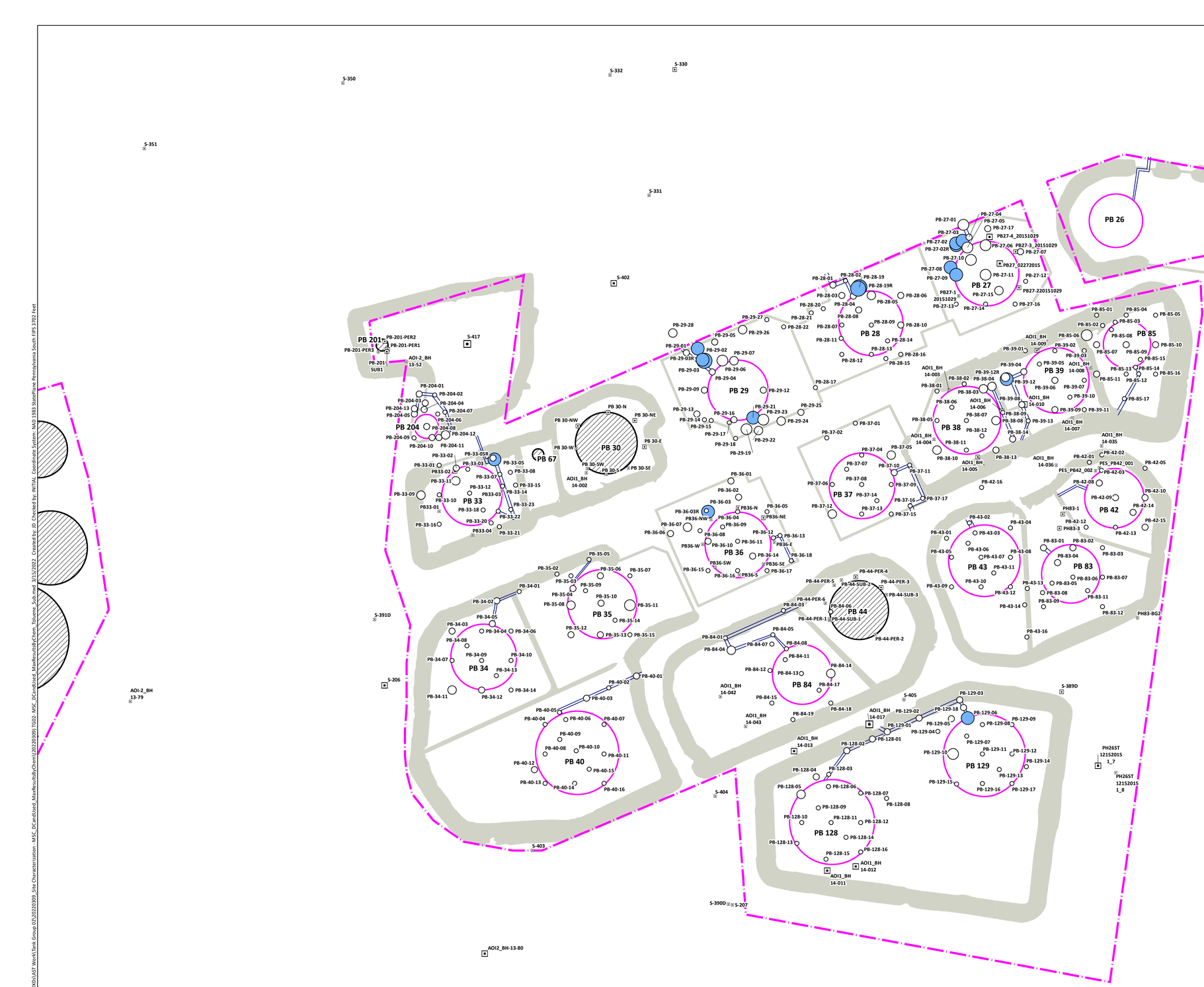
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Toluene)

Figure 11a

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization- MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Toluene_Surf.mxd 3/15/2022 Created by: JD Checked by: IN



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

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CLIENT:	Philadelphia Energy Solutions Refining and Marketing LLC
PROJECT:	Aboveground Storage Tank Closure
PROJECT NUMBER:	P044.001.002

Subsurface Soil Sampling Results
Tank Group 02
(Toluene)

Figure 11b

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Toluene_Sub.mxd 3/15/2022 Created by: JD Checked by: JW/TAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350
S-330
S-351
S-198
PB 26
PB 27
PB27-4-20151029
PB27-3-20151029
PB27_02272015
PB27-1-20151029
PB27-2-20151029
PB 28
PB 201
AOI-2_BH-13-52
S-417
S-402
PB-101-4
PB-101-17
PB-101-8
PB-101-5
PB-101-11
PB-101-1
PB-101-3
PB-101-6
PB-101-10
PB-101-16
PB-101-7
PB-101-9
PB-101-14
PB-101-2
PB-101-15
PB-29-08
PB-29-10
PB 29
PB-29-11
PB-29-20
PB-28-18
PB 30-PP
PB 30
PB 204
PB 67
PB-33-04
PB-33-06
PB33-02
PB 33
PB-33-13
PB33-01
PB-33-19
PB33-NA
PB-33-17
PB36-PP
PB 36
PB 37
PB-37-03
PB 38
AOI1_BH-14-003
AOI1_BH-14-004
AOI1_BH-14-010
AOI1_BH-14-006
AOI1_BH-14-005
AOI1_BH-14-009
PB 39
AOI1_BH-14-008
PB 85
AOI1_BH-14-007
PH83-BG1
AOI1_BH-14-035
AOI1_BH-14-036
PB 42
PH83-2
PH83-4
PH83-5
PB 43
PB 83
AOI1_BH-14-032
PH83-BG2
PH83-BG3
PB-44-LINE-4
PB-44-LINE-6
PB-44-LINE-3
PB-44-LINE-5
PB 44
PB-44-LINE-1
PB-44-LINE-2
PB 84
PB 35
PB-35-01
PB 34
S-391D
AOI1_BH-14-042
AOI1_BH-14-043
S-405
AOI1_BH-14-017
AOI1_BH-14-013
S-389D
S-205
PB 40
PB 129
S-404
PB 128
AOI1_BH-14-012
AOI1_BH-14-011
S-403
S-390D
S-388D
AOI2_BH-13-80
S-300
AOI-2_BH-13-79

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Xylenes (total))

Figure 12a

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Xylenes_Surf.mxd 3/15/2022 Created by: JD Checked by: IN

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (Xylenes (total))

Figure 12b

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Xylenes_Sub.mxd 3/15/2022 Created by: JD Checked by: JNITAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350

S-351

S-198

PB-27-18

PB-27-01R

PB-27-02R

PB27-4
20151029

PB27-3
20151029

PB 26

PB 27

PB27 02272015

PB27-1
20151029

PB27-2
20151029

S-402

PB 28

PB-29-28

PB-29-26R

PB-29-08

PB-29-10

PB 29

PB-29-11

PB-29-20

PB-28-18

PB 85

AOI1_BH
14-009

PB 39

AOI1_BH
14-003

AOI1_BH
14-008

AOI1
BH-14
006

AOI1
BH-14
010

AOI1_BH
14-007

PB 38

AOI1_BH
14-004

AOI1_BH
14-005

PH83-BG1

AOI1_BH
14-035

AOI1_BH
14-036

PB-42-04

PB-42-06

PB-42-07

PB 42

PH83-2

PB-42-11

PH83-4

PH83-5

PB 83

PB-83-10

PB 43

PB-43-15

PH83-BG2

PH83-BG3

PB 201

PB 201
LINE-3

PB-201-LINE-1

PB-201-LINE-4

PB-201
LINE-2

PB-201
LINE-5

AOI
2_BH
13-52

S-417

PB-204-06R

PB 204

PB 30-PP

PB 30

PB 67

PB-33-04

PB-33-06

PB33-02

PB 33

PB-33-13

PB33-01

PB-33-19

PB-33-17

PB33-04

PB 37

PB-37-03

PB36-PP

PB-36-07R

PB 36

PB-44
LINE-6

PB-44-LINE-4

PB-44-LINE-5

PB-44-LINE-3

PB 44

PB-44-LINE-1

PB-44-LINE-2

PB-84-02

PB-84-04R

PB-84-09

PB-84-10

PB 84

PB-84-16

AOI1_BH
14-042

AOI1_BH
14-043

AOI1_BH
14-017

AOI1_BH
14-013

S-405

PB 129

PB 128

AOI1_BH
14-012

AOI1_BH
14-011

PB-35-01

PB 35

PB 34

PB 40

S-391D

S-389D

S-205

S-404

S-403

S-390D

S-388D

AOI1-2_BH
13-79

S-300

AOI2_BH-13-80

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only
- Exceeds NonRes DC and S-GW MSCs

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Notes
- Sample location size symbolizes relative concentration
- Sample locations symbolizing NonRes DC exceedances indicate that either a surface sample exceeds the NonRes DC Surface MSC (0-2 ft) or a subsurface sample exceeds the NonRes DC Subsurface MSC (2-15 ft)

Abbreviations
DC -- Direct Contact
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Naphthalene)

Figure 13a

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\(20220309) TG02- MSC_DCandUsed_MaxResultsByChem_Naphthalene_Surf.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

File: N:\GIS\Prj\P044.001_PESRM-PESWXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DC.mxd\Used_MaxResultsByChem\(20220309) TGO2- MSC_DCmxdUsed_MaxResultsByChem_Naphthalene_Sub.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

S-350
S-351
S-402
S-417
S-391D
S-206
S-403
S-404
S-405
S-207
S-390D
S-389D
S-388D
AOI2_BH-13-80
AOI-2_BH 13-79
PH265T 12152015 1_7
PH265T 12152015 1_8
PH83-BG2

PB 201
PB-201 PER2
PB-201-PER1
PB-201-PER3
PB-201 SUB1
AOI-2_BH 13-52

PB 204
PB-204-01
PB-204-02
PB-204-03
PB-204-06R
PB-204-13
PB-204-05
PB-204-07
PB-204-04
PB-204-06
PB-204-08
PB-204-12
PB-204-09
PB-204-11
PB-204-10

PB 33
PB-33-01
PB-33-02
PB-33-03
PB-33-05
PB-33-11
PB-33-07
PB-33-08
PB-33-09
PB-33-10
PB-33-14
PB-33-15
PB-33-12
PB33-01
PB33-03
PB-33-18
PB-33-23
PB-33-22
PB-33-16
PB-33-20
PB33-04
PB-33-21

PB 67

PB 30
PB 30-N
PB 30-NW
PB 30-NE
PB 30-W
PB 30-E
PB 30-SW
PB 30-SE
PB 30-S

PB 29
PB-29-01
PB-29-28
PB-29-02
PB-29-27
PB-29-05
PB-29-26
PB-29-03
PB-29-06
PB-29-08R
PB-29-04
PB-29-07
PB-29-09
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PB-29-23
PB-29-14
PB-29-21
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PB-29-15
PB-29-17
PB-29-24
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PB-29-22
PB-29-19

PB 28
PB-28-01
PB-28-19
PB-28-02
PB-28-05
PB-28-06
PB-28-21
PB-28-03
PB-28-04
PB-28-20
PB-28-08
PB-28-07
PB-28-10
PB-28-09
PB-28-11
PB-28-14
PB-28-16
PB-28-12
PB-28-13
PB-28-15
PB-28-17

PB 37
PB-37-01
PB-37-02
PB-37-04
PB-37-05
PB-37-07
PB-37-10
PB-37-11
PB-37-06
PB-37-08
PB-37-09
PB-37-14
PB-37-16
PB-37-17
PB-37-12
PB-37-13
PB-37-15

PB 36
PB-36-01
PB-36-02
PB-36-03
PB36-N
PB-36-04
PB-36-05
PB-36-08
PB36-NW
PB36-NE
PB-36-078
PB-36-09
PB-36-06
PB-36-10
PB-36-11
PB-36-12
PB36-E
PB-36-07
PB-36-13
PB36-W
PB-36-14
PB-36-18
PB36-SW
PB36-SE
PB-36-17
PB-36-15
PB-36-16
PB36-S

PB 35
PB-35-05
PB-35-02
PB-35-06
PB-35-07
PB-35-03
PB-34-01
PB-35-04
PB-35-09
PB-35-08
PB-35-10
PB-35-11
PB-34-02
PB-34-05
PB-35-14
PB-35-12
PB-35-15
PB-35-13

PB 34
PB-34-03
PB-34-04
PB-34-06
PB-34-08
PB-34-09
PB-34-07
PB-34-10
PB-34-13
PB-34-11
PB-34-14
PB-34-12

PB 40
PB-40-01
PB-40-02
PB-40-03
PB-40-05
PB-40-04
PB-40-06
PB-40-07
PB-40-09
PB-40-08
PB-40-10
PB-40-11
PB-40-12
PB-40-15
PB-40-13
PB-40-14
PB-40-16

PB 84
PB-84-03
PB-44-PER-6
PB-84-01
PB-84-05
PB-84-04R
PB-84-04
PB-84-07
PB-84-08
PB-84-11
PB-84-12
PB-84-13
PB-84-14
PB-84-15
PB-84-17
PB-84-18
PB-84-19

PB 44
PB-44-PER-5
PB-44 PER-4
PB-44-SUB-2
PB-44-PER-3
PB-44-SUB-3
PB-44-PER-1
PB-84-06
PB-44-SUB-1
PB-44-PER-2

PB 128
PB-128-01
PB-128-02
PB-128-03
PB-128-04
PB-128-06
PB-128-05
PB-128-07
PB-128-08
PB-128-09
PB-128-10
PB-128-11
PB-128-12
PB-128-13
PB-128-14
PB-128-15
PB-128-16

PB 129
PB-129-03
PB-129-06
PB-129-02
PB-129-04
PB-129-05
PB-129-08
PB-129-09
PB-129-01
PB-129-07
PB-129-11
PB-129-12
PB-129-10
PB-129-14
PB-129-13
PB-129-15
PB-129-16
PB-129-17

PB 27
PB-27-18
PB-27-01
PB-27-01R
PB-27-04
PB-27-17
PB27-420151029
PB-27-03
PB-27-028
PB-27-06
PB27-320151029
PB-27-02
PB-27-07
PB-27-05
PB-27-10
PB27-02272015
PB-27-08
PB-27-11
PB-27-12
PB-27-09
PB27-120151029
PB27-220151029
PB-27-15
PB-27-13
PB-27-14
PB-27-16

PB 26

PB 38
PB-38-02
PB-38-04
PB-38-03
PB-38-01
PB-38-06
PB-38-07
PB-38-05
PB-38-09
PB-38-08
PB-38-12
PB-38-11
PB-38-14
PB-38-10
PB-38-13

PB 39
PB-39-01
PB-39-02
PB-39-04
PB-39-05
PB-39-06
PB-39-07
PB-39-08
PB-39-10
PB-39-09
PB-39-11
PB-39-13

PB 85
PB-85-01
PB-85-04
PB-85-05
PB-85-03
PB-85-02
PB-85-06
PB-85-08
PB-85-09
PB-85-10
PB-85-07
PB-85-15
PB-85-13
PB-85-16
PB-85-11
PB-85-12
PB-85-14
PB-85-17

PB 42
PB-42-01
PB-42-02
PES_PB42_001
PB-42-05
PES_PB42_002
PB-42-03
PB-42-08
PB-42-10
PB-42-09
PB-42-14
PB-42-15
PB-42-12
PB-42-13

PB 43
PB-43-02
PB-43-04
PB-43-01
PB-43-03
PB-43-05
PB-43-06
PB-43-08
PB-43-07
PB-43-11
PB-43-09
PB-43-10
PB-43-12
PB-43-14
PB-43-16

PB 83
PB-83-01
PB-83-02
PB-83-04
PB-83-03
PB-83-06
PB-83-07
PB-83-05
PB-83-11
PB-83-08
PB-83-12
PB-83-09

AOI1_BH 14-042
AOI1_BH 14-043
AOI1_BH 14-013
AOI1_BH 14-017
AOI1_BH 14-012
AOI1_BH 14-011
AOI1_BH 14-003
AOI1_BH 14-004
AOI1_BH 14-006
AOI1_BH 14-005
AOI1_BH 14-009
AOI1_BH 14-010
AOI1_BH 14-008
AOI1_BH 14-007
AOI1_BH 14-035
AOI1_BH-14-036

PES_PB42_001
PES_PB42_002
PH83-1
PH83-3

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only
- Exceeds NonRes DC and S-GW MSCs

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only
- Exceeds NonRes DC and S-GW MSCs

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Notes
- Sample location size symbolizes relative concentration
- Sample locations symbolizing NonRes DC exceedances indicate that either a surface sample exceeds the NonRes DC Surface MSC (0-2 ft) or a subsurface sample exceeds the NonRes DC Subsurface MSC (2-15 ft)

Abbreviations
DC -- Direct Contact
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet
1 inch = 85 feet
N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Subsurface Soil Sampling Results Tank Group 02 (Naphthalene)

Figure 13b

S-350
S-330
S-351
S-198
PB-27-18
PB-27-01R
PB-27-02R
PB 26
PB 27
S-402
PB-29-28
PB-29-26R
PB-29-02R
PB 28
PB-29-08
PB-29-10
PB 29
PB-29-11
PB-29-20
PB-29-15R
PB-28-18
PB 201
AOI-2_BH
13-52
S-417
PB-204-01R
PB 204
PB 30-PP
PB 30
PB 67
PB-33-04
PB-33-06
PB 33
PB-33-13
PB-33-19
PB-33-17
AOI1_BH
14-001
AOI1_BH
14-002
PB36-PP
PB 36
PB-37-03
PB 37
PB-37-11R
PB-38-11R
AOI1_BH
14-005
AOI1_BH
14-009
PB 39
PB 85
AOI1_BH
14-003
AOI1_BH
14-006
AOI1_BH
14-010
AOI1_BH
14-008
AOI1_BH
14-007
PB 38
AOI1_BH
14-004
PH83-BG1
AOI1_BH
14-035
AOI1_BH
14-036
PB 42
PH83-2
PH83-4
PH83-5
PB 43
PB 83
PB-44-LINE-4
PB-44-LINE-6
PB-44-LINE-3
PB-44
LINE-5
PB-35-01
PB 35
PB 44
S-391D
PB-34-03R
PB-44-LINE-1
PB-44-LINE-2
AOI1
BH-14
032
AOI1_BH
14-034
AOI1_BH
14-033
PH83
BG2
PB 34
PB 84
PH83-BG3
AOI1_BH
14-042
S-389D
S-205
S-405
AOI1_BH
14-043
AOI1_BH
14-017
PB-129-01R
AOI1_BH
14-013
PB 40
PB 129
PB-40-12R
AOI1-BH
15-002
AOI1-BH
15-003
S-404
PB-128-05R
PB 128
S-403
AOI1_BH
14-012
AOI1_BH
14-011
S-390D
AOI2_BH-13-80
S-388D
AOI1-2_BH
13-79
S-300

Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only
- Exceeds NonRes DC and S-GW MSCs

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only
- Exceeds NonRes DC and S-GW MSCs

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Notes
- Sample location size symbolizes relative concentration
- Sample locations symbolizing NonRes DC exceedances indicate that either a surface sample exceeds the NonRes DC Surface MSC (0-2 ft) or a subsurface sample exceeds the NonRes DC Subsurface MSC (2-15 ft)

Abbreviations
DC -- Direct Contact
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

0 85 170 Feet

1 inch = 85 feet

N

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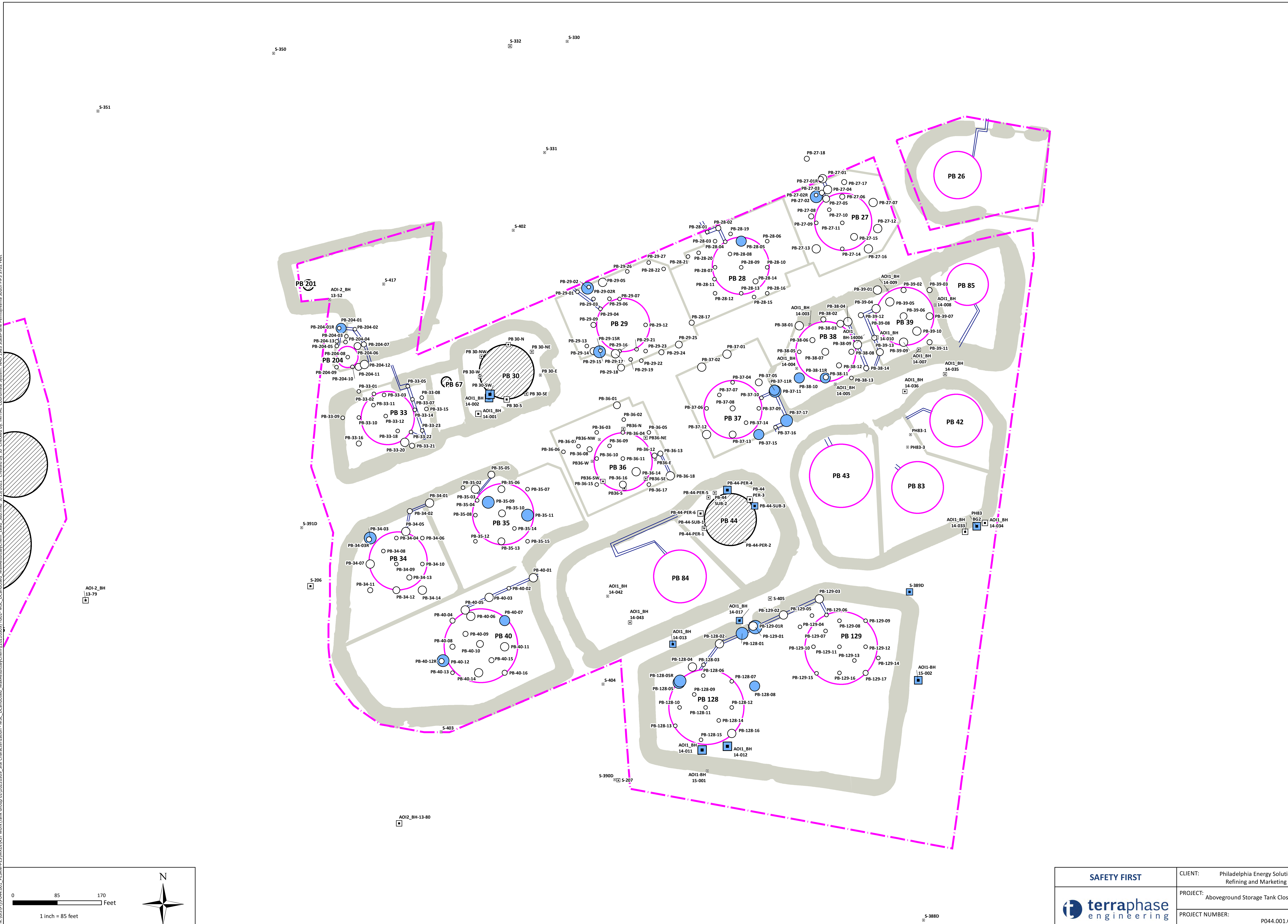
PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Surface Soil Sampling Results Tank Group 02 (Lead)

Figure 14a

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization- MSC_DCandSued_MaxResultsByChem\(20220309) TG02- MSC_DCandSued_MaxResultsByChem_Lead_Surf.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet



Legend

PESRM Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Historical Soil Sample Location

- No Exceedances
- Exceeds S-GW MSC Only

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Note
- Sample location size symbolizes relative concentration

Abbreviations
MSC -- Medium Specific Concentration
S-GW -- Soil-to-Groundwater

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PROJECT:	Aboveground Storage Tank Closure
PROJECT NUMBER:	P044.001.002

Subsurface Soil Sampling Results
Tank Group 02
(Lead)

Figure 14b

File: N:\GIS\Pr\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220309_Site Characterization - MSC_DCandUsed_MaxResultsByChem\20220309\ TG02- MSC_DCandUsed_MaxResultsByChem_Lead_Sub.mxd 3/15/2022 Created by: JD Checked by: INITIAL Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

Evergreen's Active 26th Street Sewer Area System

S-472 S-73 S-294D S-294 S-351 S-467 S-331 S-457_CD S-457 S-76 S-199 S-459_CD S-459 MW-41 RW-400 PZ-400 S-75 S-198 S-195 S-267 S-192 S-191 S-98 S-194 S-193 S-190 S-189 S-271 S-188 S-81 S-470 S-470_CD S-272 S-187 S-273 S-186 S-274 S-185 S-275 S-184 S-276 S-183 S-82 S-182 PZ-402 S-100 S-125 S-181 S-277 RW-402 S-180 S-179 S-84 S-84P RW-403 S-85 S-101 RW-404 S-88A S-87I S-86 S-88 S-89 S-99 S-261 S-116 S-397 S-207 S-390D S-403 S-404 S-126 S-405 S-396 S-389D S-200 S-77P S-295 S-78 S-202 S-401 S-391D S-400 S-206 S-203 S-204 S-79P S-80D S-80 S-215 S-270 S-209 S-52 S-398 S-388D CSX-MW1 CSX-MW5 CSX-IW-5 CSX-DW-5 CSX-MW9 CSX-MW3A

PB 201 PB 204 PB 67 PB 30 PB 29 PB 28 PB 27 PB 26 PB 85 PB 39 PB 38 PB 37 PB 33 PB 36 PB 35 PB 34 PB 44 PB 84 PB 40 PB 128 PB 129 PB 43 PB 83 PB 42 PB 7300 PB 7308

Legend

Tank Group

- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping

Evergreen Groundwater Well Type

- Unconfined Aquifer
- Middle Clay Unit Aquitard
- Lower Aquifer
- Unknown

0 85 170 Feet

1 inch = 85 feet

N

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Groundwater Wells Tank Group 02

Figure 15

File: N:\GIS\Proj\P044.001_PESRM-PFES\MXDs\AST Work\Tank Group 02\20220425_GW Wells In and Around TG02\Figure 1 - TG02 GW Well Locations.mxd 5/19/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

S-472 0.19
S-294 0.047
S-351 U
S-467 0.5
S-331 0.0551
S-457 20
S-76 2.1
S-198 9.55
S-199 13
MW-41 0.169
RW-400* 0.0309
PZ-400 0.0027
S-75 0.039
S-192* 0.00085
S-267 U
S-191* 0.202
S-98 1.39
S-194 0.0382
S-193* 0.17
S-190* 0.138
S-189* 0.154
S-188* 0.0249
S-271 0.12
S-81 0.0633
S-272 0.002
S-187* 0.167
S-273 0.42
S-186* 0.107
S-185* 0.00069
S-275 0.993
S-184* 2.66
S-276 8.8
S-183* 0.831
S-182* 1.95
S-277 4.8
RW-402* U
S-180* 0.00066
S-179 0.00047
S-84P 0.0016
RW-403* 0.0518
CSX-MW1 U
CSX-MW5 0.178
CSX-IW-5 0.00066
S-101 0.0278
S-85 0.0069
RW-404* 0.0087
S-88A 0.0152
S-88 0.0151
S-396 0.66
S-405 5.7
S-200 7.6
S-77P 1.8
S-295 0.0491
S-80 0.384
S-78 0.0062
S-202 0.0121
S-206 0.0078
S-403 0.486
S-207 0.00042
S-116 U
S-261 U
S-99 0.004
S-79P 0.784
S-270 0.371
S-209 1.39
S-52 0.00026

PB 201
PB 204
PB 67
PB 30
PB 33
PB 35
PB 34
PB 40
PB 29
PB 28
PB 27
PB 26
PB 85
PB 39
PB 38
PB 37
PB 36
PB 42
PB 43
PB 83
PB 44
PB 84
PB 129
PB 128
7300
PB 7308

Evergreen's Active 26th Street Sewer Area System

0 85 170 Feet
1 inch = 85 feet
N

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for Groundwater Exceeding the MSC
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

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PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Benzene in Groundwater Tank Group 02

Figure 16a

File: N:\GIS\P\)\P044.001_PESRM-PFES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 1 - TG02 Unconfined GW Wells - Benzene_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

Evergreen's Active 26th Street Sewer Area System

S-351 U
S-294 U
S-472 U
S-467 U
S-331 U
S-77P U
S-457 0.000017
S-76 U
S-199 U
S-200 U
S-198 U
MW-41 U
PZ-400 U
RW-400* U
S-75 U
S-192* U
S-267 U
S-191* U
S-190* U
S-98 U
S-194 U
S-193* U
S-189* U
S-188* U
S-271 U
S-81 U
S-272 U
S-187* U
S-273 U
S-186* U
S-185* U
S-275 U
S-184* U
S-276 U
S-183* U
S-182* U
S-277 U
RW-402* U
S-180* U
S-179 U
S-84P U
RW-403* U
S-85 U
RW-404* U
S-88A U
S-88 U
S-295 0.000037
S-80 U
S-78 U
S-202 U
S-79P U
S-206 U
S-405 U
S-396 U
S-403 U
S-207 U
S-116 U
S-261 U
S-99 U
S-270 U
S-52 U
S-209 U
CSX-MW1 U
CSX-MW5 U
CSX-IW-5 U
S-101 U

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 26
PB 27
PB 28
PB 29
PB 30
PB 85
PB 39
PB 38
PB 37
PB 42
PB 33
PB 36
PB 43
PB 83
PB 35
PB 44
PB 34
PB 84
PB 40
PB 129
PB 128
PB 182

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for GroundwaterExceeding the MSC
- Associated Piping
- Subject to AST Closure Plan

Evergreen Monitoring Well
- No Exceedances

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

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PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

1,2-Dibromoethane in Groundwater Tank Group 02

Figure 16b

File: N:\GIS\Proj\P044.001_PESRM-PFES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 2 - TG02 Unconfined GW Wells - 1DIA_v2.mxd 5/19/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

S-472 1.5
S-294 0.41
S-351 U
S-467 0.033
S-331 0.00108
S-457 1.8
S-76 0.046
S-199 0.64
S-198 1.37
MW-41 0.0053
PZ-400 0.00084
RW-400* 0.00051
S-75 0.002
S-267 U
S-192* U
S-191* 0.16
S-190* 0.0304
S-194 0.008
S-98 0.326
S-193* 0.008
S-189* 0.0412
S-188* 0.0103
S-271 0.008
S-81 0.033
S-272 U
S-187* 0.0838
S-273 0.0581
S-186* 0.0078
S-185* U
S-275 0.183
S-184* 0.241
S-276 0.69
S-183* 0.122
Evergreen's Active 26th Street Sewer Area System
S-182* 0.229
S-277 0.14
RW-402* U
S-180* U
S-179 U
S-84P 0.0028
RW-403* 0.003
S-77P 0.0972
S-200 0.585
S-295 0.0062
PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 34
PB 35
PB 36
PB 37
PB 38
PB 39
PB 40
PB 42
PB 43
PB 44
PB 83
PB 84
PB 85
PB 26
PB 27
PB 28
PB 29
PB 30
PB 129
PB 128
PB 182
S-80 0.0089
S-78 0.0013
S-202 0.0009
S-79P U
S-206 0.00066
S-405 1.8
S-396 0.016
S-85 0.0056
RW-404* 0.0019
S-88A 0.0017
S-88 0.0011
S-403 0.052
S-207 U
S-116 U
S-261 U
S-99 0.0049
S-270 0.0098
S-52 U
S-209 0.0207
CSX-MW1 U
CSX-MW5 0.007
CSX-IW-5 U
S-101 0.0016

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for Groundwater Exceeding the MSC
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

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PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

Ethyl Benzene in Groundwater Tank Group 02

Figure 16c

File: R:\GIS\P\P044.001_PESRM-PESMX05\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 3 - TG02 Unconfined GW Wells - EthylBenzene_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

S-351 U
S-472 0.00079
S-294 0.001
S-467 0.16
S-331 2.22
S-457 4.4
S-76 U
S-199 34
S-77P 5.02
S-200 1.36
S-198 1.46
MW-41 0.0151
RW-400* 0.0799
PZ-400 0.0271
S-75 0.024
S-192* 0.0158
S-267 0.0033
S-191* 0.0415
S-98 0.151
S-194 0.0017
S-193* 0.007
S-190* 0.358
S-189* 0.296
S-188* 0.383
S-271 0.45
S-81 1.64
S-272 0.0107
S-273 0.071
S-187* 0.643
S-186* 1.95
S-185* 0.003
S-275 0.118
S-276 0.26
S-184* 4.22
S-183* 1.64
S-182* 1.26
S-277 4.7
RW-402* U
S-180* 0.0021
S-179 0.0224
S-84P 0.0984
RW-403* 1.36
S-85 0.0619
RW-404* 0.148
S-88A 0.0373
S-88 0.422
S-396 1.6
S-405 0.016
S-80 0.03
S-295 0.0004
S-78 0.011
S-202 0.0366
S-79P 0.31
S-206 0.0339
S-403 0.017
S-207 0.0011
S-116 U
S-261 U
S-99 0.0032
S-270 0.0541
S-52 0.194
S-209 0.063
CSX-MW1 U
CSX-MW5 U
CSX-IW-5 0.0091
S-101 U

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 30
PB 29
PB 27
PB 28
PB 26
PB 85
PB 39
PB 38
PB 37
PB 42
PB 36
PB 43
PB 83
PB 35
PB 44
PB 34
PB 84
PB 40
PB 129
PB 128
PB 182

Evergreen's Active 26th Street Sewer Area System

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for Groundwater Exceeding the MSC
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

File: R:\GIS\Proj\P044.001_PESRM-PESMX05\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 4 - TG02 Unconfined GW Wells - MTBE_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC
PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

Methyl tert-butyl ether in Groundwater Tank Group 02

Figure 16d

Evergreen's Loading Rack Remediation System

S-351 U
S-294 0.0068
S-472 0.0088
S-467 0.021
S-331 0.00406
S-457 1.1
S-76 0.0525
S-199 1.8
S-200 0.108
S-77P 0.0408
MW-41 0.0016
PZ-400 0.0011
RW-400* 0.00057
S-75 0.002
S-198 0.474
S-267 U
S-192* 0.00083
S-191* 0.006
S-190* 0.0245
S-98 0.0347
S-194 0.0014
S-193* 0.0004
S-189* 0.155
S-271 0.035
S-188* 0.0123
S-81 0.0365
S-272 0.00068
S-187* 0.118
S-273 0.01
S-186* 0.0287
S-185* 0.00067
S-275 0.137
S-184* 2.25
S-276 0.071
S-183* 0.497
S-182* 0.0843
S-277 1.4
RW-402* U
S-180* U
S-179 0.00023
S-84P 0.00085
RW-403* 0.0112
S-85 0.0019
RW-404* 0.0039
S-88A 0.0051
S-88 0.0071
S-396 U
S-405 U
S-80 0.0187
S-79P 0.0027
S-78 0.003
S-202 0.0032
S-206 0.0019
S-403 0.066
S-207 0.00038
S-116 U
S-261 U
S-99 0.028
S-270 0.0134
S-52 0.0004
S-209 0.0172
S-295 0.0068
CSX-MW1 U
CSX-MW5 0.0015
CSX-IW-5 U
S-101 0.014

Evergreen's Active 26th Street Sewer Area System

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 34
PB 35
PB 36
PB 37
PB 38
PB 39
PB 40
PB 42
PB 43
PB 44
PB 182
PB 26
PB 27
PB 28
PB 29
PB 30
PB 83
PB 84
PB 85
PB 128
PB 129

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

SAFETY FIRST

terraphase engineering

CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC
PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

Toluene in Groundwater Tank Group 02

Figure 16e

File: N:\GIS\Proj\P044.001_PESRM-PFES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 5 - TG02 Unconfined GW Wells - Toluene_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

Evergreen's Active 26th Street Sewer Area System

S-351 U
S-472 0.75
S-294 0.24
S-467 0.064
S-331 0.0017
S-457 0.77
S-76 0.194
S-199 0.57
S-198 1.36
MW-41 0.0143
RW-400* 0.00026
PZ-400 0.002
S-75 0.0006
S-192* 0.0187
S-267 U
S-191* 0.396
S-98 0.848
S-194 0.0712
S-193* 0.0004
S-190* 0.152
S-189* 0.12
S-188* 0.0212
S-271 U
S-81 0.161
S-272 0.00038
S-187* 0.32
S-273 0.023
S-186* 0.0697
S-185* U
S-275 0.203
S-184* 0.507
S-276 0.34
S-183* 0.131
S-182* 0.134
S-277 0.27
RW-402* U
S-180* U
S-179 0.00065
S-84P 0.0048
RW-403* 0.00061
S-85 0.065
RW-404* 0.00023
S-88A 0.127
S-88 0.00028
S-396 U
S-405 2
S-200 0.831
S-77P 0.0363
S-295 0.0224
S-80 0.0013
S-79P U
S-78 0.00064
S-202 0.0011
S-206 0.00049
S-403 0.06
S-207 0.00028
S-116 U
S-261 U
S-99 0.00083
S-270 0.0263
S-52 U
S-209 0.0043
CSX-MW1 U
CSX-MW5 U
CSX-IW-5 U
S-101 0.0007

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 30
PB 29
PB 28
PB 27
PB 26
PB 85
PB 39
PB 38
PB 37
PB 36
PB 35
PB 34
PB 40
PB 44
PB 84
PB 43
PB 83
PB 42
PB 129
PB 128
PB 182

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

1,2,4-Trimethylbenzene in Groundwater Tank Group 02

Figure 16f

File: N:\GIS\Prj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 6 - TG02 Unconfined GW Wells - 1247MB_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

S-351 U
S-472 0.21
S-294 0.073
S-467 0.029
S-331 U
S-457 0.21
S-76 0.683
S-77P 0.0238
S-200 0.344
S-199 0.19
S-198 0.468
MW-41 0.0271
RW-400* 0.00082
PZ-400 0.0065
S-75 0.007
S-267 U
S-192* 0.0051
S-191* 0.216
S-98 0.234
S-194 0.0287
S-193* U
S-190* 0.0574
S-189* 0.0442
S-271 0.013
S-188* 0.0096
S-81 0.0475
S-272 0.00026
S-187* 0.133
S-273 0.021
S-186* 0.0343
S-275 0.131
S-185* U
S-184* 0.19
S-276 0.17
S-183* 0.175
S-182* 0.152
S-277 0.13
RW-402* U
S-180* U
S-179 U
S-84P 0.0375
RW-403* 0.00024
S-85 0.0729
RW-404* 0.00061
S-88A 0.127
S-88 U
S-396 U
S-405 0.64
S-80 0.0079
S-79P U
S-78 0.00077
S-202 0.0019
S-206 0.00022
S-403 0.021
S-207 U
S-116 U
S-261 U
S-99 0.0015
S-270 0.0049
S-52 U
S-209 0.002
CSX-MW1 U
CSX-MW5 0.0092
CSX-IW-5 U
S-101 0.00089
S-295 0.0096

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 34
PB 35
PB 30
PB 36
PB 29
PB 28
PB 27
PB 26
PB 85
PB 39
PB 38
PB 37
PB 42
PB 43
PB 83
PB 44
PB 84
PB 40
PB 129
PB 128
PB 182

Evergreen's Active 26th Street Sewer Area System

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet

N

SAFETY FIRST

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC
PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

1,3,5-Trimethylbenzene in Groundwater Tank Group 02

Figure 16g

File: N:\GIS\Prj\P044.001_PES\RM-PES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 7 - TG02 Unconfined GW Wells - 1357MB_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

S-351 U
S-472 0.48
S-294 0.41
S-467 0.055
S-331 0.015
S-77P 0.215
S-76 0.399
S-457 5.2
S-200 1.3
S-199 2.6
S-198 3.92
MW-41 0.0072
PZ-400 0.0025
RW-400* 0.0017
S-75 0.001
S-192* 0.0042
S-267 U
S-191* 0.248
S-98 1.35
S-194 0.027
S-190* 0.0497
S-193* 0.0009
S-189* 0.191
S-271 0.05
S-188* 0.0413
S-81 0.224
S-272 0.0022
S-187* 0.819
S-273 0.26
S-186* 0.0373
S-185* 0.0015
S-275 0.37
S-184* 1.56
S-276 2
S-183* 0.386
S-182* 0.43
S-277 1.4
RW-402* U
S-180* 0.00022
S-179 0.0015
S-84P 0.0021
RW-403* 0.0082
S-85 0.0562
RW-404* 0.0026
S-88A 0.118
S-88 0.0044
S-396 0.01
S-405 4.2
S-295 0.0377
S-206 0.0048
S-78 0.002
S-202 0.006
S-403 0.14
S-207 0.00057
S-116 U
S-79P 0.0031
S-261 U
S-99 0.0315
S-270 0.0346
S-52 0.0003
S-209 0.0233
CSX-MW1 U
CSX-MW5 0.0353
CSX-IW-5 U
S-101 0.0163

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
PB 33
PB 30
PB 29
PB 28
PB 27
PB 26
PB 85
PB 39
PB 38
PB 37
PB 42
PB 36
PB 43
PB 83
PB 35
PB 44
PB 34
PB 84
PB 40
PB 129
PB 128
PB 182

Evergreen's Active 26th Street Sewer Area System

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for Groundwater Exceeding the MSC
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet

N

Label Notation:
Location Code
Result (mg/L)

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Xylenes (total) in Groundwater Tank Group 02

Figure 16h

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 8 - TG02 Unconfined GW Wells - Xylenes_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

Evergreen's Active 26th Street Sewer Area System

S-351 U
S-294 2.9
S-472 5.5
S-467 0.086
S-331 0.00247
S-457 4.3
S-76 0.87
S-199 0.56
S-198 9.93
MW-41 0.00533
RW-400* U
PZ-400 U
S-75 0.001
S-192* U
S-267 U
S-191* 0.0242
S-190* 0.0205
S-98 0.107
S-194 0.00851
S-193* U
S-189* U
S-188* 0.00397
S-271 0.005
S-81 0.0396
S-272 U
S-187* 0.0275
S-273 U
S-186* U
S-185* U
S-275 0.222
S-184* 0.0634
S-276 0.029
S-183* 0.0487
S-182* 0.0686
S-277 0.052
RW-402* U
S-180* U
S-179 U
S-84P U
RW-403* U
S-85 U
RW-404* U
S-88A U
S-88 U
S-396 0.0006
S-405 0.27
S-77P 0.0329
S-200 1.38
S-295 0.00047
S-80 0.000796
S-78 U
S-202 0.000324
S-79P U
S-206 U
S-403 0.019
S-207 U
S-116 U
S-261 U
S-99 U
S-270 U
S-209 0.00812
S-52 U
CSX-MW1 U
CSX-MW5 U
CSX-IW-5 U
S-101 U

PB 201, PB 204, PB 67, PB 7300, PB 7308, PB 30, PB 33, PB 34, PB 35, PB 36, PB 40, PB 44, PB 84, PB 128, PB 129, PB 26, PB 27, PB 28, PB 29, PB 38, PB 39, PB 85, PB 37, PB 42, PB 43, PB 83

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Associated Piping
- Subject to AST Closure Plan
- Location with Potential Transport Distance < 10 feet

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.
4. Due to the size of the tank group, a plume for locations with a potential transport distance less than 10 feet is not depicted.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet
N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC
PROJECT: Aboveground Storage Tank Closure
PROJECT NUMBER: P044.001.002

Naphthalene in Groundwater Tank Group 02

Figure 16i

File: N:\GIS\Proj\P044.001_PESRM-PES\MXDs\AST Work\Tank Group 02\20220518_GW Wells in and Around TG02\Figure 9 - TG02 Unconfined GW Wells - Naph_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Evergreen's Loading Rack Remediation System

Evergreen's Active 26th Street Sewer Area System

S-351 U
S-472 0.00043
S-294 0.00015
S-467 0.00045
S-331 0.0031
S-77P U
S-457 0.0052
S-76 0.0863
S-199 0.0057
S-200 0.00081
S-198 U
MW-41 0.013
PZ-400 0.013
RW-400* 0.0017
S-75 0.0023
S-192* 0.0023
S-267 0.0025
S-191* 0.0129
S-98 0.0068
S-194 0.0053
S-193* 0.0003
S-190* 0.012
S-189* 0.0068
S-188* 0.006
S-271 0.0091
S-81 0.0223
S-272 0.0016
S-187* 0.0067
S-273 0.0013
S-186* 0.003
S-185* 0.0019
S-275 0.0169
S-184* 0.0045
S-276 0.0067
S-183* 0.0177
S-182* 0.0128
S-277 0.016
RW-402* 0.0014
S-180* 0.0061
S-179 0.0017
S-84P 0.0041
RW-403* 0.0078
S-85 0.0256
RW-404* 0.0032
S-88A 0.0646
S-88 0.0027
S-396 0.00017
S-405 0.0053
S-79P 0.0031
S-80 0.0066
S-78 0.0024
S-202 0.0024
S-206 0.0014
S-403 0.001
S-207 0.0026
S-116 0.0075
S-261 0.0021
S-99 0.0029
S-270 0.0014
S-52 0.0016
S-209 0.0014
S-295 0.0331
CSX-MW1 0.00062
CSX-MW5 0.0082
CSX-IW-5 U
S-101 U

PB 201
PB 204
PB 67
PB 7300
PB 7308
PB 7305
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PB 26
PB 85
PB 39
PB 38
PB 37
PB 36
PB 35
PB 34
PB 44
PB 84
PB 40
PB 43
PB 83
PB 42
PB 129
PB 128
PB 182

Legend

Tank Group
- 02
- Previously Closed
- Berm Boundary
- Concrete Containment Wall
- Potential Transport Distance for Groundwater Exceeding the MSC
- Associated Piping
- Subject to AST Closure Plan

Evergreen Monitoring Well
- No Exceedances
- Exceeds Groundwater MSC

Notes:
* -- Indicates a recovery well.
1. All concentrations are presented in mg/L.
2. Figure depicts results from 2014 to 2021.
3. Plumes represent the potential transport distance of groundwater containing chemical concentrations greater than the MSC from locations where soil samples collected during AST Site Characterization contained chemical concentrations greater than the soil-to-groundwater MSC.

Label Notation (Exceeds Groundwater MSC):
Location Code
Result (mg/L)

Label Notation (Below Groundwater MSC):
Location Code
Result (mg/L)

Abbreviation:
U -- Not Detected

0 85 170 Feet
1 inch = 85 feet

N

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CLIENT: Philadelphia Energy Solutions Refining and Marketing LLC

PROJECT: Aboveground Storage Tank Closure

PROJECT NUMBER: P044.001.002

Lead in Groundwater Tank Group 02

Figure 16j

File: N:\GIS\Proj\P044.001_PES\Rm-PES\MXDs\AST Work\Tank Group 02\20220518_GW Wells In and Around TG02\Figure 10 - TG02 Unconfined GW Wells - Lead_v2.mxd 5/20/2022 Created by: Mia Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet

Appendix A

Historical Sampling Results

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	AOI1_BH-14-001	AOI1_BH-14-001	AOI1_BH-14-001	AOI1_BH-14-002	AOI1_BH-14-002	AOI1_BH-14-002	AOI1_BH-14-003	AOI1_BH-14-003	AOI1_BH-14-004	AOI1_BH-14-004	AOI1_BH-14-005
Matrix				Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface
Collection Depth (ft bgs)				0 - 2	2 - 4	4 - 6	0 - 2	2 - 4	4 - 6	0 - 2	8 - 10	0 - 2	8 - 10	0 - 2
Sample Date				5/15/2015	5/15/2015	5/15/2015	5/15/2015	5/15/2015	5/15/2015	5/22/2015	5/26/2015	5/27/2015	5/29/2015	5/27/2015
Comments														
Volatile Organic Compounds														
Benzene	280	330	0.5	NA	NA	NA	NA	0.055 (0.0052)	NA	0.11 (0.0055)	0.018 (0.0044)	0.18 (0.0058)	ND (0.24)	0.49 (0.24)
Cumene	10000	10000	2500	NA	NA	NA	NA	NA	NA	ND (0.0055)	0.021 (0.0044)	0.02 (0.0058)	1.2 (0.24)	9.7 (2.4)
Ethyl Benzene	880	1000	70	NA	NA	NA	NA	ND (0.0052)	NA	0.013 (0.0055)	0.057 (0.0044)	0.12 (0.0058)	0.24 J (0.24)	38 (2.4)
Methyl tert-butyl ether	8500	9800	2	NA	NA	NA	NA	NA	NA	0.043 (0.0055)	0.0069 (0.0044)	0.0042 J (0.0058)	ND (0.24)	ND (0.24)
Toluene	10000	10000	100	NA	NA	NA	NA	0.024 (0.0052)	NA	0.11 (0.0055)	0.047 (0.0044)	0.23 (0.0058)	ND (0.24)	1.4 (0.24)
1,2,4-Trimethylbenzene	4700	5400	300	NA	NA	NA	NA	NA	NA	0.062 (0.0055)	0.31 (0.24)	6.1 (0.37)	3.1 (0.24)	256 (23.6)
1,3,5-Trimethylbenzene	4700	5400	93	NA	NA	NA	NA	NA	NA	0.067 (0.0055)	0.26 (0.0044)	1.8 (0.37)	2.3 (0.24)	94.8 (2.4)
Xylenes (total)	7900	9100	1000	NA	NA	NA	NA	0.0083 J (0.016)	NA	0.22 (0.017)	0.39 (0.013)	1.1 (0.017)	2.9 (0.71)	146 (7.1)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	NA	NA	0.015 (0.0081)	0.022 (0.0072)	0.024 (0.0076)	0.087 (0.0077)	0.41 (0.015)
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	NA	NA	0.04 (0.0081)	0.0058 J (0.0072)	0.026 (0.0076)	0.0084 (0.0077)	0.37 (0.015)
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	NA	NA	0.039 (0.0081)	0.0041 J (0.0072)	0.023 (0.0076)	0.0044 J (0.0077)	0.3 (0.015)
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	NA	NA	0.13 (0.0081)	0.0086 (0.0072)	0.074 (0.0076)	0.0089 (0.0077)	0.78 (0.015)
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	NA	NA	0.027 (0.0081)	0.0051 J (0.0072)	0.016 (0.0076)	0.0013 J (0.0077)	0.12 (0.015)
Chrysene	760	190000	230	NA	NA	NA	NA	NA	NA	0.078 (0.0081)	0.0078 (0.0072)	0.049 (0.0076)	0.013 (0.0077)	0.42 (0.015)
Fluorene	130000	190000	3800	NA	NA	NA	NA	NA	NA	0.01 (0.0081)	0.03 (0.0072)	0.015 (0.0076)	0.47 (0.0077)	0.66 (0.015)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	NA	NA	NA	NA	NA	NA	0.52 (0.0081)	0.14 (0.0072)	1.3 (0.0076)	0.28 (0.0077)	32.8 (0.38)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	NA	NA	0.12 (0.0081)	0.055 (0.0072)	0.15 (0.0076)	0.77 (0.0077)	1.7 (0.015)
Pyrene	96000	190000	2200	NA	NA	NA	NA	NA	NA	0.091 (0.0081)	0.022 (0.0072)	0.099 (0.0076)	0.049 (0.0077)	1 (0.015)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	13.4 (0.43)	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	95.3 (1.7)	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	0.28 (0.26)	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	29.8 (0.43)	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	48.2 (0.87)	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	130 J (0.41)	300 J (0.46)	8.1 J (0.42)	497 J (0.48)	2110 J (0.43)	11 J (0.4)	67.3 (0.47)	12 (0.37)	212 (0.42)	9.2 (0.48)	258 (0.33)
Mercury	510	190000	10	NA	NA	NA	NA	0.22 (0.13)	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	16.2 (1.7)	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	0.63 J (0.69)	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	136 (0.87)	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500.

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				AOI1_BH-14-005	AOI1_BH-14-006	AOI1_BH-14-006	AOI1_BH-14-007	AOI1_BH-14-007	AOI1_BH-14-008	AOI1_BH-14-008	AOI1_BH-14-009	AOI1_BH-14-009	AOI1_BH-14-010	AOI1_BH-14-010
Matrix				Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface
Collection Depth (ft bgs)				10 - 12	0 - 2	15 - 17	0 - 2	14 - 16	0 - 2	10 - 12	0 - 2	14 - 16	0 - 2	14 - 16
Sample Date				6/4/2015	5/27/2015	5/28/2015	5/15/2015	5/19/2015	5/20/2015	5/22/2015	5/20/2015	5/22/2015	5/19/2015	5/19/2015
Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500											
Volatile Organic Compounds														
Benzene	280	330	0.5	2.5 (0.21)	0.022 (0.0047)	0.33 (0.29)	ND (0.0052)	ND (0.25)	0.0045 J (0.0046)	ND (0.24)	ND (0.0048)	0.98 (0.22)	0.062 (0.0052)	4.5 (0.24)
Cumene	10000	10000	2500	1.2 (0.21)	0.0031 J (0.0047)	0.31 (0.29)	ND (0.0052)	0.72 (0.25)	ND (0.0046)	0.17 J (0.24)	ND (0.0048)	0.67 (0.22)	0.016 (0.0052)	2.9 (0.24)
Ethyl Benzene	880	1000	70	9.1 (0.21)	0.012 (0.0047)	0.59 (0.29)	ND (0.0052)	0.19 J (0.25)	ND (0.0046)	ND (0.24)	ND (0.0048)	0.13 J (0.22)	0.14 (0.0052)	14.7 (0.24)
Methyl tert-butyl ether	8500	9800	2	ND (0.21)	ND (0.0047)	ND (0.29)	ND (0.0052)	ND (0.25)	ND (0.0046)	ND (0.24)	ND (0.0048)	ND (0.22)	ND (0.0052)	0.22 J (0.24)
Toluene	10000	10000	100	0.71 (0.21)	0.0069 (0.0047)	0.17 J (0.29)	0.0027 J (0.0052)	ND (0.25)	ND (0.0046)	ND (0.24)	ND (0.0048)	0.15 J (0.22)	0.027 (0.0052)	2 (0.24)
1,2,4-Trimethylbenzene	4700	5400	300	50.6 (2.1)	0.016 (0.0047)	0.45 (0.29)	ND (0.0052)	0.26 (0.25)	ND (0.0046)	0.16 J (0.24)	0.0036 J (0.0048)	0.17 J (0.22)	0.19 (0.0052)	55 (2.4)
1,3,5-Trimethylbenzene	4700	5400	93	16.2 (0.21)	0.0036 J (0.0047)	0.15 J (0.29)	ND (0.0052)	ND (0.25)	ND (0.0046)	ND (0.24)	ND (0.0048)	ND (0.22)	0.064 (0.0052)	17.9 (0.24)
Xylenes (total)	7900	9100	1000	80.2 (6.3)	0.035 (0.014)	1.6 (0.87)	ND (0.016)	0.29 J (0.74)	ND (0.014)	0.21 J (0.73)	0.0031 J (0.014)	0.23 J (0.65)	0.23 (0.016)	68.2 (7.1)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	0.048 (0.015)	0.057 (0.0076)	ND (0.0081)	0.23 (0.038)	0.022 (0.016)	0.82 (0.015)	0.038 (0.0079)	0.032 (0.016)	0.01 J (0.015)	0.02 J (0.041)	0.034 (0.0072)
Benzo(a)anthracene	130	190000	340	0.05 (0.015)	0.24 (0.0076)	ND (0.0081)	0.79 (0.038)	0.036 (0.016)	1.6 (0.015)	0.0033 J (0.0079)	0.12 (0.016)	ND (0.015)	0.1 (0.041)	0.026 (0.0072)
Benzo(a)pyrene	91	190000	46	0.058 (0.015)	0.23 (0.0076)	ND (0.0081)	1 (0.038)	0.035 (0.016)	1.5 (0.015)	ND (0.0079)	0.11 (0.016)	ND (0.015)	0.17 (0.041)	0.009 (0.0072)
Benzo(b)fluoranthene	76	190000	170	0.099 (0.015)	0.35 (0.0076)	ND (0.0081)	1.4 (0.038)	0.077 (0.016)	2.3 (0.015)	0.0025 J (0.0079)	0.24 (0.016)	0.0032 J (0.015)	0.39 (0.041)	0.018 (0.0072)
Benzo(g,h,i)perylene	190000	190000	180	0.057 (0.015)	0.12 (0.0076)	ND (0.0081)	0.59 (0.038)	0.02 (0.016)	0.53 (0.015)	ND (0.0079)	0.052 (0.016)	ND (0.015)	0.13 (0.041)	0.0054 J (0.0072)
Chrysene	760	190000	230	0.066 (0.015)	0.24 (0.0076)	ND (0.0081)	0.77 (0.038)	0.041 (0.016)	1.5 (0.015)	0.0021 J (0.0079)	0.12 (0.016)	0.0022 J (0.015)	0.15 (0.041)	0.031 (0.0072)
Fluorene	130000	190000	3800	0.12 (0.015)	0.016 (0.0076)	0.0056 J (0.0081)	0.19 (0.038)	0.22 (0.016)	0.43 (0.015)	0.18 (0.0079)	0.0093 J (0.016)	0.1 (0.015)	0.0053 J (0.041)	0.066 (0.0072)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	8.3 (0.15)	0.073 (0.0076)	0.019 (0.0081)	0.14 (0.038)	0.33 (0.016)	0.085 (0.015)	0.11 (0.0079)	0.0056 J (0.016)	0.19 (0.015)	0.25 (0.041)	2.8 (0.036)
Phenanthrene	190000	190000	10000	0.3 (0.015)	0.23 (0.0076)	0.0067 J (0.0081)	0.88 (0.038)	0.15 (0.016)	3 (0.037)	0.16 (0.0079)	0.13 (0.016)	0.05 (0.015)	0.059 (0.041)	0.16 (0.0072)
Pyrene	96000	190000	2200	0.13 (0.015)	0.35 (0.0076)	ND (0.0081)	1.2 (0.038)	0.062 (0.016)	3.1 (0.037)	0.0076 J (0.0079)	0.21 (0.016)	0.0031 J (0.015)	0.17 (0.041)	0.1 (0.0072)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	8.6 (0.33)	46.8 (0.42)	6.7 (0.49)	113 (0.39)	28.5 (0.36)	70.1 (0.33)	8 (0.35)	29.4 (0.4)	9.1 (0.34)	359 (0.44)	25.7 (0.38)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				NA		NA		NA		NA		NA		NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				AOI1_BH-14-011	AOI1_BH-14-011	AOI1_BH-14-012	AOI1_BH-14-012	AOI1_BH-14-013	AOI1_BH-14-013	AOI1_BH-14-013	AOI1_BH-14-017	AOI1_BH-14-017	AOI1_BH-14-017	AOI1_BH-14-032
Matrix				Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface
Collection Depth (ft bgs)				0 - 2	14 - 16	0 - 2	14 - 16	0 - 2	4 - 6	12 - 14	0 - 2	4 - 6	12 - 14	0 - 2
Sample Date				5/6/2015	5/11/2015	5/8/2015	5/14/2015	5/11/2015	5/11/2015	5/11/2015	5/12/2015	5/12/2015	5/12/2015	5/12/2015
Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500											
Volatile Organic Compounds														
Benzene	280	330	0.5	0.025 (0.0044)	3.4 J (3.5)	0.11 (0.0054)	5.8 (0.36)	ND (0.37)	ND (0.51)	1.4 (0.64)	ND (0.25)	1 (0.3)	ND (0.27)	ND (0.0056)
Cumene	10000	10000	2500	ND (0.0044)	17.6 (3.5)	ND (0.0054)	12.1 (0.36)	17.5 (0.37)	16.7 (0.51)	5.3 (0.64)	0.6 (0.25)	19 (0.3)	2.9 (0.27)	NA
Ethyl Benzene	880	1000	70	ND (0.0044)	8 (3.5)	ND (0.0054)	7.8 (0.36)	72.2 (3.7)	112 (5.1)	10.3 (0.64)	2.9 (0.25)	108 (3)	6.7 (0.27)	ND (0.0056)
Methyl tert-butyl ether	8500	9800	2	ND (0.0044)	ND (3.5)	ND (0.0054)	ND (0.36)	ND (0.37)	ND (0.51)	ND (0.64)	ND (0.25)	ND (0.3)	ND (0.27)	NA
Toluene	10000	10000	100	0.0099 (0.0044)	5.7 (3.5)	0.048 (0.0054)	2.9 (0.36)	0.94 (0.37)	2.4 (0.51)	1.9 (0.64)	1.1 (0.25)	32.7 (3)	0.39 (0.27)	ND (0.0056)
1,2,4-Trimethylbenzene	4700	5400	300	ND (0.0044)	31.3 (3.5)	ND (0.0054)	39.2 (3.6)	903 (36.7)	431 (50.6)	160 (6.4)	53.1 (2.5)	487 (30.2)	287 (26.9)	NA
1,3,5-Trimethylbenzene	4700	5400	93	ND (0.0044)	10.8 (3.5)	ND (0.0054)	14.6 (0.36)	359 (36.7)	246 (5.1)	47.4 (6.4)	16.2 (0.25)	222 (3)	88.4 (2.7)	NA
Xylenes (total)	7900	9100	1000	ND (0.013)	31.9 (10.5)	0.0046 J (0.016)	22.4 (1.1)	457 (11)	619 (15.2)	59.6 (1.9)	34.1 (0.76)	631 (90.5)	183 (8.1)	ND (0.017)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	0.0051 J (0.0083)	2.2 J (2.4)	ND (0.17)	5.8 J (16.7)	0.87 (0.17)	0.43 (0.18)	0.63 (0.16)	0.1 J (0.15)	0.17 (0.09)	0.4 (0.16)	NA
Benzo(a)anthracene	130	190000	340	0.0074 J (0.0083)	0.98 J (2.4)	ND (0.17)	ND (16.7)	0.18 (0.17)	0.12 J (0.18)	1.8 (0.16)	0.046 J (0.15)	0.19 (0.09)	0.46 (0.16)	NA
Benzo(a)pyrene	91	190000	46	0.0056 J (0.0083)	0.75 J (2.4)	ND (0.17)	ND (16.7)	0.17 (0.17)	0.085 J (0.18)	1.9 (0.16)	0.046 J (0.15)	0.31 (0.09)	0.44 (0.16)	NA
Benzo(b)fluoranthene	76	190000	170	0.0081 J (0.0083)	1 J (2.4)	ND (0.17)	ND (16.7)	0.29 (0.17)	0.15 J (0.18)	3 (0.16)	0.077 J (0.15)	0.51 (0.09)	0.85 (0.16)	NA
Benzo(g,h,i)perylene	190000	190000	180	0.0031 J (0.0083)	ND (2.4)	ND (0.17)	ND (16.7)	0.29 (0.17)	0.089 J (0.18)	0.66 (0.16)	0.056 J (0.15)	0.33 (0.09)	0.3 (0.16)	NA
Chrysene	760	190000	230	0.0064 J (0.0083)	2.2 J (2.4)	ND (0.17)	ND (16.7)	0.26 (0.17)	0.17 J (0.18)	1.8 (0.16)	0.05 J (0.15)	0.29 (0.09)	0.82 (0.16)	NA
Fluorene	130000	190000	3800	0.0054 J (0.0083)	5 (2.4)	ND (0.17)	4.7 J (16.7)	1.9 (0.17)	1.1 (0.18)	1.1 (0.16)	0.17 (0.15)	0.77 (0.09)	2 (0.16)	NA
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	0.0026 J (0.0083)	69.2 (2.4)	ND (0.17)	19 (16.7)	27 (0.17)	57.1 (0.92)	12.8 (0.16)	9.6 (0.15)	72.3 (0.9)	**140 (0.82)**	NA
Phenanthrene	190000	190000	10000	0.017 (0.0083)	9.3 (2.4)	ND (0.17)	19.1 (16.7)	2.6 (0.17)	1.6 (0.18)	1.9 (0.16)	0.25 (0.15)	1.1 (0.09)	2.9 (0.16)	NA
Pyrene	96000	190000	2200	0.012 (0.0083)	3.1 (2.4)	ND (0.17)	9.7 J (16.7)	1.5 (0.17)	0.67 (0.18)	3 (0.16)	0.16 (0.15)	0.57 (0.09)	1.9 (0.16)	NA
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.55 (0.43)
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 (1.7)
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 J (0.26)
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1 (0.43)
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16.4 (0.86)
Lead	1000	190000	450	28.2 (0.48)	160000 (52.7)	13.9 (0.56)	3360 (0.39)	524 (0.5)	381 (0.41)	664 (0.52)	133 (0.78)	123 (0.44)	507 (0.5)	3.4 (0.86)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 J (0.11)
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.6 J (1.7)
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.69)
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.6 (0.86)

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				AOI1_BH-14-033	AOI1_BH-14-033	AOI1_BH-14-034	AOI1_BH-14-034	AOI1_BH-14-035	AOI1_BH-14-035	AOI1_BH-14-035	AOI1_BH-14-036	AOI1_BH-14-036	AOI1_BH-14-042	AOI1_BH-14-042
Matrix				Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface
Collection Depth (ft bgs)				0 - 2	2 - 4	0 - 2	2 - 4	0 - 2	12 - 14	14 - 16	0 - 2	6 - 8	0 - 2	6 - 8
Sample Date				5/12/2015	5/12/2015	5/12/2015	5/12/2015	5/14/2015	5/15/2015	5/15/2015	5/14/2015	5/14/2015	5/7/2015	5/7/2015
Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500											
Volatile Organic Compounds														
Benzene	280	330	0.5	NA	NA	NA	NA	0.39 (0.21)	0.074 (0.0042)	0.049 (0.0042)	0.58 (0.27)	0.16 J (0.24)	ND (0.0056)	ND (0.27)
Cumene	10000	10000	2500	NA	NA	NA	NA	0.74 (0.21)	0.0065 (0.0042)	0.0041 J (0.0042)	0.29 (0.27)	0.51 (0.24)	0.043 (0.0056)	2.2 (0.27)
Ethyl Benzene	880	1000	70	NA	NA	NA	NA	0.15 J (0.21)	ND (0.0042)	ND (0.0042)	0.17 J (0.27)	ND (0.24)	0.059 (0.0056)	0.29 (0.27)
Methyl tert-butyl ether	8500	9800	2	NA	NA	NA	NA	ND (0.21)	ND (0.0042)	ND (0.0042)	ND (0.27)	ND (0.24)	ND (0.0056)	ND (0.27)
Toluene	10000	10000	100	NA	NA	NA	NA	0.36 (0.21)	0.016 (0.0042)	0.013 (0.0042)	0.36 (0.27)	ND (0.24)	0.0091 (0.0056)	ND (0.27)
1,2,4-Trimethylbenzene	4700	5400	300	NA	NA	NA	NA	10.6 (0.21)	0.0019 J (0.0042)	0.0041 J (0.0042)	0.95 (0.27)	0.18 J (0.24)	14.1 (0.28)	0.97 (0.27)
1,3,5-Trimethylbenzene	4700	5400	93	NA	NA	NA	NA	0.5 (0.21)	ND (0.0042)	ND (0.0042)	0.23 J (0.27)	ND (0.24)	0.23 (0.0056)	ND (0.27)
Xylenes (total)	7900	9100	1000	NA	NA	NA	NA	0.6 J (0.64)	ND (0.013)	ND (0.013)	0.51 J (0.8)	ND (0.73)	0.33 (0.017)	ND (0.81)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	0.6 (0.069)	0.01 (0.0082)	0.0062 J (0.008)	0.36 (0.081)	0.062 (0.0082)	0.37 (0.16)	0.29 (0.17)
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	ND (0.069)	0.012 (0.0082)	0.0059 J (0.008)	0.2 (0.081)	0.035 (0.0082)	0.09 J (0.16)	0.049 J (0.17)
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	ND (0.069)	0.0092 (0.0082)	0.0041 J (0.008)	0.17 (0.081)	0.03 (0.0082)	0.023 J (0.16)	ND (0.17)
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	ND (0.069)	0.014 (0.0082)	0.0059 J (0.008)	0.32 (0.081)	0.049 (0.0082)	0.055 J (0.16)	ND (0.17)
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	ND (0.069)	0.0034 J (0.0082)	0.0019 J (0.008)	0.11 (0.081)	0.015 (0.0082)	ND (0.16)	ND (0.17)
Chrysene	760	190000	230	NA	NA	NA	NA	ND (0.069)	0.0088 (0.0082)	0.0046 J (0.008)	0.2 (0.081)	0.032 (0.0082)	0.19 (0.16)	0.1 J (0.17)
Fluorene	130000	190000	3800	NA	NA	NA	NA	1.3 (0.069)	0.07 (0.0082)	0.014 (0.008)	2.5 (0.081)	0.2 (0.0082)	1.4 (0.16)	1.2 (0.17)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	NA	NA	NA	NA	3.8 (0.069)	0.089 (0.0082)	0.023 (0.008)	4.9 (0.081)	0.28 (0.0082)	4.2 (0.16)	3.3 (0.17)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	1.6 (0.069)	0.072 (0.0082)	0.026 (0.008)	2 (0.081)	0.16 (0.0082)	3.5 (0.16)	1.9 (0.17)
Pyrene	96000	190000	2200	NA	NA	NA	NA	0.23 (0.069)	0.019 (0.0082)	0.0082 (0.008)	0.63 (0.081)	0.085 (0.0082)	0.29 (0.16)	0.15 J (0.17)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	184 (0.34)	366 (0.37)	371 (0.37)	341 (0.37)	2 (0.68)	29.9 J (0.32)	10.9 J (0.43)	218 (0.37)	62.2 (0.47)	13.4 (0.44)	3.4 (0.52)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location Matrix Collection Depth (ft bgs) Sample Date Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	AOI1_BH-14-043 Soil - Surface 0 - 2 5/8/2015	AOI1_BH-14-043 Soil - Subsurface 6 - 8 5/8/2015	AOI1-BH-15-002 Soil - Surface 0 - 2 11/24/2015	AOI1-BH-15-001 Soil - Subsurface 14 - 15 11/24/2015	AOI1-BH-15-002 Soil - Subsurface 14 - 16 11/24/2015	AOI1-BH-15-003 Soil - Surface 1 - 2 12/10/2015	AOI-2_BH-13-52 Soil - Surface 0 - 2 3/14/2013	AOI-2_BH-13-52 Soil - Subsurface 4 - 6 3/14/2013	PB 30-E Soil - Subsurface 4.5 - 5 1/20/2012	PB 30-N Soil - Subsurface 4.5 - 5 1/20/2012	PB 30-NE Soil - Subsurface 2.5 - 3 1/20/2012
Volatile Organic Compounds														
Benzene	280	330	0.5	ND (0.0058)	0.0065 (0.006)	NA	NA	NA	NA	0.217 (0.1)	ND (0.11)	3.6 (0.12)	0.51 (0.028)	1.1 (0.079)
Cumene	10000	10000	2500	0.005 J (0.0058)	0.16 (0.006)	NA	NA	NA	NA	0.0486 J (0.5)	1.74 (0.54)	6.8 (0.24)	0.72 (0.056)	10 (0.16)
Ethyl Benzene	880	1000	70	ND (0.0058)	0.015 (0.006)	NA	NA	NA	NA	0.0837 J (0.1)	ND (0.11)	4.4 (0.24)	1.9 (0.056)	2.5 (0.16)
Methyl tert-butyl ether	8500	9800	2	ND (0.0058)	ND (0.006)	NA	NA	NA	NA	ND (0.1)	ND (0.11)	ND (0.12)	0.032 J (0.028)	ND (0.079)
Toluene	10000	10000	100	ND (0.0058)	0.0051 J (0.006)	NA	NA	NA	NA	0.125 (0.1)	ND (0.11)	0.59 J (0.24)	0.067 J (0.056)	0.25 J (0.16)
1,2,4-Trimethylbenzene	4700	5400	300	ND (0.0058)	0.47 (0.006)	NA	NA	NA	NA	0.0935 J (0.5)	ND (0.54)	87 (0.59)	14 (0.056)	14 (0.16)
1,3,5-Trimethylbenzene	4700	5400	93	ND (0.0058)	0.039 (0.006)	NA	NA	NA	NA	0.0308 J (0.5)	0.0567 J (0.54)	25 (0.24)	2.5 (0.056)	30 (0.16)
Xylenes (total)	7900	9100	1000	ND (0.017)	0.032 (0.018)	NA	NA	NA	NA	0.31 (0.1)	0.707 (0.11)	47 (0.24)	2.8 (0.056)	2.3 (0.16)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	0.058 J (0.16)	0.031 J (0.17)	NA	NA	NA	NA	0.128 (0.039)	ND (0.038)	ND (0.016)	0.046 (0.00081)	0.11 (0.00085)
Benzo(a)anthracene	130	190000	340	ND (0.16)	ND (0.17)	NA	NA	NA	NA	0.351 (0.039)	0.0158 J (0.038)	0.0046 (0.0004)	0.038 (0.0004)	0.065 (0.00042)
Benzo(a)pyrene	91	190000	46	ND (0.16)	ND (0.17)	NA	NA	NA	NA	0.366 (0.039)	ND (0.038)	0.0029 (0.0004)	0.032 (0.0004)	0.059 (0.00042)
Benzo(b)fluoranthene	76	190000	170	0.035 J (0.16)	ND (0.17)	NA	NA	NA	NA	0.32 (0.039)	ND (0.038)	0.003 (0.00032)	0.027 (0.00032)	0.044 (0.00034)
Benzo(g,h,i)perylene	190000	190000	180	ND (0.16)	ND (0.17)	NA	NA	NA	NA	0.363 (0.039)	ND (0.038)	0.0046 J (0.0024)	0.056 (0.0024)	0.1 (0.0025)
Chrysene	760	190000	230	0.17 (0.16)	ND (0.17)	NA	NA	NA	NA	0.373 (0.039)	0.0133 J (0.038)	0.018 (0.0036)	0.067 (0.0036)	0.14 (0.0038)
Fluorene	130000	190000	3800	0.82 (0.16)	0.36 (0.17)	NA	NA	NA	NA	0.114 (0.039)	0.0586 (0.038)	0.022 (0.004)	0.1 (0.004)	0.45 (0.0042)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	0.13 J (0.16)	0.92 (0.17)	NA	NA	NA	NA	0.0382 J (0.039)	ND (0.038)	9 (0.24)	2.2 (0.056)	0.54 J (0.16)
Phenanthrene	190000	190000	10000	0.4 (0.16)	0.63 (0.17)	NA	NA	NA	NA	0.58 (0.039)	0.077 (0.038)	0.039 (0.0024)	0.16 (0.0024)	0.49 (0.0025)
Pyrene	96000	190000	2200	0.088 J (0.16)	0.036 J (0.17)	NA	NA	NA	NA	0.511 (0.039)	0.0278 J (0.038)	ND (0.096)	ND (0.11)	ND (0.6)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	9.7 (0.34)	19 (0.39)	**6280 (23)**	9.1 (2.1)	1370 (6)	**1550 (6.5)**	455 (2.5)	9.6 (2.4)	10.3 (0.259)	74.4 (0.257)	17.8 (0.277)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	PB 30-NW	PB 30-PP	PB 30-S	PB 30-SE	PB 30-SW	PB 30-W	PB-201-LINE-4	PB-201-LINE-5	PB27_02272015	PB27_02272015	PB27-1-20151029
Matrix				Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Surface	Soil - Surface	Soil - Subsurface	Soil - Surface
Collection Depth (ft bgs)				2.5 - 3	0 - 0.5	4.5 - 5	2.5 - 3	2.5 - 3	4.5 - 5	0 - 0.5	0.5	0.5	2	1.5 - 2
Sample Date				1/20/2012	1/20/2012	1/20/2012	1/20/2012	1/20/2012	1/20/2012	9/4/2007	9/4/2007	2/27/2015	2/27/2015	10/29/2015
Comments														
Volatile Organic Compounds														
Benzene	280	330	0.5	0.2 J (0.089)	0.014 (0.0006)	0.013 (0.0007)	0.047 J (0.033)	0.003 J (0.0005)	ND (0.0006)	0.23 (0.0063)	0.031 (0.0068)	1.23 (0.056)	0.697 (0.06)	0.966 (0.054)
Cumene	10000	10000	2500	2.2 (0.18)	0.002 J (0.001)	0.02 (0.001)	1.1 (0.066)	0.003 J (0.0009)	0.003 J (0.001)	ND (0.0063)	ND (0.0068)	0.0945 J (0.56)	0.127 J (0.6)	0.306 (0.22)
Ethyl Benzene	880	1000	70	4.1 (0.18)	ND (0.001)	0.007 J (0.001)	ND (0.066)	0.002 J (0.0009)	ND (0.001)	ND (0.0063)	ND (0.0068)	0.484 (0.11)	0.518 (0.12)	0.11 (0.11)
Methyl tert-butyl ether	8500	9800	2	0.37 J (0.089)	0.0007 J (0.0006)	0.001 J (0.0007)	ND (0.033)	0.0009 J (0.0005)	0.004 J (0.0006)	NA	NA	1.3 (0.11)	1.56 (0.12)	0.0957 J (0.11)
Toluene	10000	10000	100	0.46 J (0.18)	0.007 (0.001)	0.01 (0.001)	ND (0.066)	0.002 J (0.0009)	ND (0.001)	0.01 (0.0063)	0.0058 J (0.0068)	1.1 (0.11)	1.74 (0.12)	0.0758 J (0.11)
1,2,4-Trimethylbenzene	4700	5400	300	28 (0.18)	0.005 J (0.001)	0.006 J (0.001)	0.14 J (0.066)	0.002 J (0.0009)	ND (0.001)	NA	NA	0.499 (0.22)	0.861 (0.24)	1.34 (0.22)
1,3,5-Trimethylbenzene	4700	5400	93	2.4 (0.18)	ND (0.001)	ND (0.001)	0.11 J (0.066)	0.001 J (0.0009)	ND (0.001)	NA	NA	0.246 (0.22)	0.47 (0.24)	0.875 (0.22)
Xylenes (total)	7900	9100	1000	13 (0.18)	0.013 (0.001)	0.028 (0.001)	0.26 J (0.066)	0.005 (0.0009)	ND (0.001)	NA	NA	1.39 (0.11)	2.14 (0.12)	0.739 (0.11)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	0.05 (0.0081)	0.18 (0.0086)	0.11 (0.0079)	ND (0.03)	0.059 (0.0079)	ND (0.00078)	ND (0.42)	0.64 (0.45)	NA	NA	NA
Benzo(a)anthracene	130	190000	340	0.15 (0.004)	0.63 (0.0043)	0.13 (0.0039)	0.0035 (0.00041)	0.13 (0.0039)	0.0031 (0.00039)	0.53 (0.42)	3.2 (0.45)	NA	NA	NA
Benzo(a)pyrene	91	190000	46	0.23 (0.004)	0.74 (0.0043)	0.14 (0.0039)	0.0026 (0.00041)	0.16 (0.0039)	0.0039 (0.00039)	0.45 (0.42)	3.3 (0.45)	NA	NA	NA
Benzo(b)fluoranthene	76	190000	170	0.17 (0.0032)	0.63 (0.0034)	0.11 (0.0032)	0.0026 (0.00033)	0.13 (0.0031)	0.0028 (0.00031)	0.9 (0.42)	6.7 (0.45)	NA	NA	NA
Benzo(g,h,i)perylene	190000	190000	180	0.4 (0.024)	1.3 (0.026)	0.22 (0.024)	0.0054 J (0.0025)	0.28 (0.024)	0.0057 J (0.0024)	ND (0.42)	0.95 (0.45)	NA	NA	NA
Chrysene	760	190000	230	0.24 (0.036)	0.88 (0.039)	0.34 (0.036)	0.018 (0.0037)	0.26 (0.035)	0.0056 J (0.0035)	0.68 (0.42)	3.6 (0.45)	NA	NA	NA
Fluorene	130000	190000	3800	0.12 J (0.04)	0.11 J (0.043)	0.12 J (0.039)	0.049 (0.0041)	0.071 J (0.039)	ND (0.0039)	ND (0.42)	ND (0.45)	NA	NA	NA
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	ND (0.42)	0.86 (0.45)	NA	NA	NA
Naphthalene	66	77	25	1.5 (0.18)	ND (0.001)	0.006 J (0.001)	0.17 J (0.066)	ND (0.0009)	ND (0.001)	0.0029 J (0.0063)	0.0026 J (0.0068)	0.0863 J (0.56)	0.189 J (0.6)	0.199 J (0.54)
Phenanthrene	190000	190000	10000	0.27 (0.024)	0.75 (0.026)	0.37 (0.024)	ND (0.031)	0.23 (0.024)	0.0029 J (0.0024)	ND (0.42)	3.6 (0.45)	NA	NA	NA
Pyrene	96000	190000	2200	0.15 J (0.04)	1.3 (0.043)	ND (0.89)	ND (0.29)	0.11 J (0.039)	ND (0.0039)	1.1 (0.42)	7.1 (0.45)	NA	NA	NA
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	38.8 (0.259)	**1830 (1.41)**	367 (0.265)	22 (0.263)	3540 (1.3)	23.1 (0.251)	NA	NA	NA	NA	NA
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				NA		NA	NA	NA	NA				NA	

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	PB27-1-20151029	PB27-2-20151029	PB27-2-20151029	PB27-3-20151029	PB27-3-20151029	PB27-4-20151029	PB27-4-20151029	PB33-01	PB33-01	PB33-02	PB33-02
Matrix				Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface
Collection Depth (ft bgs)				3.5 - 4	1 - 1.5	3 - 3.5	1.5 - 2	3 - 3.5	1.5 - 2	3 - 3.5	1	3	1	3.5
Sample Date				10/29/2015	10/29/2015	10/29/2015	10/29/2015	10/29/2015	10/29/2015	10/29/2015	5/3/2019	5/3/2019	5/3/2019	5/3/2019
Comments														
Volatile Organic Compounds														
Benzene	280	330	0.5	0.735 (0.061)	0.0403 J (0.059)	0.562 (0.069)	0.0784 (0.053)	2.76 (0.069)	0.0717 (0.056)	2.42 (0.055)	0.024 J (0.22)	0.027 J (0.24)	0.3 J (0.33)	0.96 (0.24)
Cumene	10000	10000	2500	0.0387 J (0.24)	1.77 (0.24)	6.85 (0.28)	ND (0.21)	8.34 (0.28)	0.0591 J (0.23)	5.19 (0.22)	0.12 J (0.22)	0.76 (0.24)	0.049 J (0.33)	1.3 (0.24)
Ethyl Benzene	880	1000	70	ND (0.12)	0.138 (0.12)	0.307 (0.14)	ND (0.11)	1.54 (0.14)	0.0581 J (0.11)	40.2 (1.1)	0.046 J (0.22)	0.057 J (0.24)	0.089 J (0.33)	2.4 (0.24)
Methyl tert-butyl ether	8500	9800	2	0.41 (0.12)	ND (0.12)	ND (0.14)	ND (0.11)	0.08 J (0.14)	ND (0.11)	ND (0.11)	ND (0.22)	ND (0.24)	0.035 J (0.33)	0.16 J (0.24)
Toluene	10000	10000	100	ND (0.12)	ND (0.12)	0.163 (0.14)	ND (0.11)	0.625 (0.14)	0.0387 J (0.11)	1.92 (0.11)	0.032 J (0.22)	0.015 J (0.24)	0.15 J (0.33)	0.056 J (0.24)
1,2,4-Trimethylbenzene	4700	5400	300	ND (0.24)	0.128 J (0.24)	0.193 J (0.28)	ND (0.21)	2.9 (0.28)	0.0508 J (0.23)	125 (2.2)	0.16 J (0.22)	0.045 J (0.24)	0.084 J (0.33)	0.11 J (0.24)
1,3,5-Trimethylbenzene	4700	5400	93	ND (0.24)	0.0562 J (0.24)	0.0513 J (0.28)	ND (0.21)	5.1 (0.28)	ND (0.23)	45.3 (2.2)	0.05 J (0.22)	0.12 J (0.24)	0.048 J (0.33)	0.45 (0.24)
Xylenes (total)	7900	9100	1000	0.0341 J (0.12)	0.249 (0.12)	0.606 (0.14)	ND (0.11)	1.53 (0.14)	0.0912 J (0.11)	156 (1.1)	0.096 J (0.22)	0.046 J (0.24)	0.62 (0.33)	0.43 (0.24)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	760	190000	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	130000	190000	3800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	0.101 J (0.61)	2.35 (0.59)	2.47 (0.69)	ND (0.53)	1.17 (0.69)	0.0473 J (0.56)	12 (0.55)	0.15 J (0.22)	0.091 J (0.24)	0.048 J (0.33)	0.17 J (0.24)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	96000	190000	2200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				PB33-03	PB33-03	PB33-04	PB33-04	PB36-E	PB36-N	PB36-NE	PB36-NW	PB36-PP	PB36-S	PB36-SE
Matrix	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	Soil - Surface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface
Collection Depth (ft bgs)				1	4	1	2.5 - 0	4.5 - 5	4.5 - 5	2.5 - 3	2.5 - 3	0 - 0.5	4.5 - 5	2.5 - 3
Sample Date				5/3/2019	5/3/2019	5/3/2019	5/3/2019	1/18/2012	1/18/2012	1/18/2012	1/18/2012	1/18/2012	1/18/2012	1/18/2012
Comments														
Volatile Organic Compounds														
Benzene	280	330	0.5	ND (0.25)	0.0004 J (0.005)	ND (0.006)	ND (0.006)	ND (0.0005)	2.2 (0.027)	0.057 J (0.031)	1.6 (0.12)	0.05 (0.0006)	ND (0.031)	ND (0.03)
Cumene	10000	10000	2500	0.035 J (0.25)	0.003 J (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	0.86 (0.053)	0.86 (0.062)	19 (0.24)	0.029 (0.001)	ND (0.062)	ND (0.06)
Ethyl Benzene	880	1000	70	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	4 (0.053)	0.14 J (0.062)	1.1 J (0.24)	0.2 (0.001)	ND (0.062)	ND (0.06)
Methyl tert-butyl ether	8500	9800	2	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	0.008 (0.0005)	0.1 J (0.027)	ND (0.031)	ND (0.12)	ND (0.0006)	ND (0.031)	ND (0.03)
Toluene	10000	10000	100	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	0.092 J (0.053)	0.11 J (0.062)	ND (0.24)	0.022 (0.001)	ND (0.062)	ND (0.06)
1,2,4-Trimethylbenzene	4700	5400	300	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	0.11 J (0.053)	1.7 (0.062)	0.41 J (0.24)	0.21 J (0.065)	ND (0.062)	ND (0.06)
1,3,5-Trimethylbenzene	4700	5400	93	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	0.15 J (0.053)	1.1 (0.062)	0.42 J (0.24)	0.12 (0.001)	ND (0.062)	ND (0.06)
Xylenes (total)	7900	9100	1000	ND (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	5.8 (0.053)	0.29 J (0.062)	0.94 J (0.24)	0.085 (0.001)	ND (0.062)	ND (0.06)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	ND (0.00081)	0.15 (0.00084)	ND (0.066)	ND (0.2)	ND (0.0008)	ND (0.027)	ND (0.04)
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	ND (0.00041)	ND (0.031)	0.011 (0.00041)	0.024 (0.0004)	0.0037 (0.0004)	ND (0.0034)	0.0026 (0.00041)
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	0.00065 J (0.00041)	0.0027 (0.00042)	0.01 (0.00041)	0.0067 (0.0004)	0.0052 (0.0004)	0.00071 J (0.00041)	0.0021 (0.00041)
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	0.00057 J (0.00033)	ND (0.0064)	0.0091 (0.00033)	0.007 (0.00032)	0.0084 (0.00032)	ND (0.00092)	0.0021 (0.00033)
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	ND (0.0024)	0.0031 J (0.0025)	0.019 (0.0025)	0.011 (0.0024)	0.03 (0.0024)	ND (0.0024)	0.0049 J (0.0025)
Chrysene	760	190000	230	NA	NA	NA	NA	ND (0.0037)	0.27 (0.0038)	0.02 (0.0037)	0.18 (0.0036)	0.011 (0.0036)	0.027 (0.0037)	0.011 (0.0037)
Fluorene	130000	190000	3800	NA	NA	NA	NA	ND (0.0041)	0.14 (0.0042)	0.096 (0.0041)	0.26 (0.004)	ND (0.004)	0.033 (0.0041)	0.076 (0.0041)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	0.037 J (0.25)	ND (0.005)	ND (0.006)	ND (0.006)	ND (0.001)	0.098 J (0.053)	0.096 J (0.062)	0.55 J (0.24)	0.01 (0.001)	ND (0.062)	0.062 J (0.06)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	ND (0.0024)	0.6 (0.0025)	ND (0.066)	0.65 (0.0024)	0.0078 (0.0024)	ND (0.025)	0.03 (0.0025)
Pyrene	96000	190000	2200	NA	NA	NA	NA	ND (0.0041)	ND (0.0042)	ND (0.47)	ND (0.42)	ND (0.016)	ND (0.064)	ND (0.32)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	NA	NA	NA	NA	14.7 (0.26)	29.8 (0.282)	37.3 (0.265)	13.5 (0.261)	152 (0.257)	15.4 (0.268)	28.4 (0.273)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					NA		NA	NA	NA	NA	NA		NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location Matrix Collection Depth (ft bgs) Sample Date Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	PB36-SW Soil - Subsurface 2.5 - 3 1/18/2012	PB36-W Soil - Subsurface 4.5 - 5 1/18/2012	PB-44-LINE-1 Soil - Surface 0.5 9/4/2007	PB-44-LINE-2 Soil - Surface 0.5 9/4/2007	PB-44-LINE-3 Soil - Surface 0.5 9/4/2007	PB-44-LINE-4 Soil - Surface 0.5 9/4/2007	PB-44-LINE-5 Soil - Surface 0.5 9/4/2007	PB-44-LINE-6 Soil - Surface 0.5 9/4/2007	PB-44-PER-1 Soil - Subsurface 3 - 3.5 5/29/2007	PB-44-PER-2 Soil - Subsurface 3 - 3.5 5/29/2007	PB-44-PER-3 Soil - Subsurface 3 - 3.5 5/29/2007
Volatile Organic Compounds														
Benzene	280	330	0.5	ND (0.063)	0.057 J (0.032)	ND (0.006)	ND (0.0065)	0.0059 J (0.0062)	0.0049 J (0.0062)	ND (0.0057)	0.014 (0.0059)	ND,D (0.13)	ND,D (0.12)	ND,D (0.3)
Cumene	10000	10000	2500	1.5 (0.13)	0.067 J (0.064)	ND (0.006)	ND (0.0065)	ND (0.0062)	ND (0.0062)	ND (0.0057)	ND (0.0059)	2.6 D (0.13)	0.068 J,D (0.12)	ND,D (0.3)
Ethyl Benzene	880	1000	70	ND (0.13)	0.17 J (0.064)	ND (0.006)	ND (0.0065)	0.0053 J (0.0062)	ND (0.0062)	ND (0.0057)	0.0083 (0.0059)	10 D (0.13)	ND,D (0.12)	0.37 D (0.3)
Methyl tert-butyl ether	8500	9800	2	ND (0.063)	0.42 (0.032)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	10000	10000	100	ND (0.13)	ND (0.064)	0.0037 J (0.006)	ND (0.0065)	0.0064 (0.0062)	0.0027 J (0.0062)	ND (0.0057)	ND (0.0059)	ND,D (0.13)	ND,D (0.12)	0.39 D (0.3)
1,2,4-Trimethylbenzene	4700	5400	300	ND (0.13)	2 (0.064)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	4700	5400	93	ND (0.13)	0.79 (0.064)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	7900	9100	1000	ND (0.13)	0.54 (0.064)	0.0063 (0.006)	0.0028 J (0.0065)	0.01 (0.0062)	0.0031 J (0.0062)	ND (0.0057)	0.041 (0.0059)	16 D (0.13)	ND,D (0.12)	3.2 D (0.3)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	ND (0.063)	ND (0.00082)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	130	190000	340	ND (0.0096)	0.0014 J (0.00041)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	91	190000	46	0.002 (0.00042)	0.0013 J (0.00041)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	76	190000	170	0.0036 (0.00034)	0.0014 (0.00033)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	190000	190000	180	0.0035 J (0.0025)	ND (0.0025)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	760	190000	230	0.071 (0.0038)	ND (0.0037)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	130000	190000	3800	0.19 (0.0042)	ND (0.0041)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	ND (0.13)	0.38 (0.064)	0.0058 J (0.006)	0.0029 J (0.0065)	0.0086 (0.0062)	0.0041 J (0.0062)	0.004 J (0.0057)	0.0083 (0.0059)	5.1 D (0.13)	0.099 J,D (0.12)	0.78 D (0.3)
Phenanthrene	190000	190000	10000	0.19 (0.0025)	0.0053 J (0.0025)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	96000	190000	2200	ND (0.49)	0.0044 J (0.0041)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	90.4 (0.274)	11.4 (0.276)	480 (0.6)	320 (0.65)	340 (0.62)	240 (0.62)	310 (0.57)	430 (0.59)	77 (0.58)	14 (0.64)	430 (0.59)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				PB-44-PER-4	PB-44-PER-5	PB-44-PER-6	PB-44-SUB-1	PB-44-SUB-2	PB-44-SUB-3	PES_PB42_001	PES_PB42_002	ST_12152015_1_7	ST_12152015_1_8	PH83-1
Matrix	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface	Soil - Subsurface
Collection Depth (ft bgs)				3 - 3.5	3 - 3.5	3 - 3.5	5 - 5.5	5 - 5.5	5 - 5.5	3 - 3.5	4 - 4.5	2	2	2.5 - 3
Sample Date				5/29/2007	5/29/2007	5/29/2007	5/29/2007	5/29/2007	5/29/2007	8/24/2015	8/24/2015	12/15/2015	12/15/2015	11/4/2013
Comments														
Volatile Organic Compounds														
Benzene	280	330	0.5	ND,D (0.28)	ND,D (0.13)	ND,D (0.13)	ND,D (0.12)	ND,D (0.16)	ND,D (0.29)	ND (0.07)	0.0374 J (0.087)	0.197 (0.046)	ND (0.00057)	0.0277 J (0.11)
Cumene	10000	10000	2500	0.2 J,D (0.28)	0.29 D (0.13)	0.46 D (0.13)	ND,D (0.12)	ND,D (0.16)	ND,D (0.29)	1.15 (0.28)	1.33 (0.35)	2.99 (0.18)	ND (0.0023)	3.24 (0.56)
Ethyl Benzene	880	1000	70	0.36 D (0.28)	0.08 J,D (0.13)	ND,D (0.13)	ND,D (0.12)	0.091 J,D (0.16)	ND,D (0.29)	0.0616 J (0.14)	0.066 J (0.17)	2.84 (0.092)	ND (0.0011)	0.505 (0.11)
Methyl tert-butyl ether	8500	9800	2	NA	NA	NA	NA	NA	NA	ND (0.14)	ND (0.17)	ND (0.092)	ND (0.0011)	ND (0.11)
Toluene	10000	10000	100	0.23 J,D (0.28)	ND,D (0.13)	ND,D (0.13)	ND,D (0.12)	ND,D (0.16)	ND,D (0.29)	ND (0.14)	ND (0.17)	1.92 (0.092)	ND (0.0011)	0.146 (0.11)
1,2,4-Trimethylbenzene	4700	5400	300	NA	NA	NA	NA	NA	NA	0.294 (0.28)	0.406 (0.35)	33 (0.92)	ND (0.0023)	6.68 (0.56)
1,3,5-Trimethylbenzene	4700	5400	93	NA	NA	NA	NA	NA	NA	0.0748 J (0.28)	0.149 J (0.35)	17.1 (0.18)	ND (0.0023)	2.66 (0.56)
Xylenes (total)	7900	9100	1000	1.7 D (0.28)	0.072 J,D (0.13)	ND,D (0.13)	ND,D (0.12)	0.095 J,D (0.16)	0.96 D (0.29)	NA	NA	47.6 (0.46)	ND (0.0011)	2.66 (0.11)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	760	190000	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	130000	190000	3800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	0.66 D (0.28)	0.15 D (0.13)	ND,D (0.13)	ND,D (0.12)	ND,D (0.16)	0.15 J,D (0.29)	0.608 J (0.7)	ND (0.87)	27.8 (2.3)	ND (0.0057)	0.99 (0.56)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	96000	190000	2200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	1100 (0.6)	51 (0.62)	130 (0.61)	10 (0.53)	26 (0.53)	690 (0.64)	NA	NA	NA	NA	10.7 (0.96)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location Matrix Collection Depth (ft bgs) Sample Date Comments	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	PH83-2 Soil - Surface 1 - 1.5 11/4/2013	PH83-3 Soil - Subsurface 2.5 - 3 11/4/2013	PH83-4 Soil - Surface 1.5 - 2 11/5/2013	PH83-5 Soil - Surface 1.5 - 2 11/5/2013	PH83-BG1 Soil - Surface 0.5 - 1 11/4/2013	PH83-BG2 Soil - Surface 0.5 - 1 11/4/2013	PH83-BG2 Soil - Subsurface 3.5 - 4 11/4/2013	PH83-BG3 Soil - Surface 0.5 - 1 11/4/2013	S-205 Soil - Surface 1.5 - 2 3/10/2005	S-298 Soil - Surface 1 - 2 5/25/2010	S-389D Soil - Surface 0 - 2 12/2/2013
Volatile Organic Compounds														
Benzene	280	330	0.5	0.031 J (0.11)	ND (0.11)	0.477 (0.11)	ND (0.00096)	0.106 J (0.13)	0.00053 J (0.0011)	ND (0.0011)	ND (0.00088)	ND (0.003)	1.2 J (5.3)	0.0026 J (0.0051)
Cumene	10000	10000	2500	0.0686 J (0.57)	1.89 (0.53)	2.51 (0.57)	ND (0.0048)	1.59 (0.64)	ND (0.0055)	ND (0.0053)	ND (0.0044)	ND (0.003)	ND (5.3)	ND (0.0051)
Ethyl Benzene	880	1000	70	0.246 (0.11)	0.538 (0.11)	2.55 (0.11)	ND (0.00096)	0.163 (0.13)	ND (0.0011)	ND (0.0011)	ND (0.00088)	ND (0.003)	ND (5.3)	ND (0.0051)
Methyl tert-butyl ether	8500	9800	2	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.00096)	ND (0.13)	ND (0.0011)	ND (0.0011)	ND (0.00088)	ND (0.003)	ND (5.3)	ND (0.0051)
Toluene	10000	10000	100	0.233 (0.11)	0.257 (0.11)	0.0835 J (0.11)	ND (0.00096)	0.126 J (0.13)	0.00044 J (0.0011)	ND (0.0011)	J.00018 J (0.00088)	ND (0.003)	ND (5.3)	ND (0.0051)
1,2,4-Trimethylbenzene	4700	5400	300	0.226 J (0.57)	8.77 (0.53)	0.0955 J (0.57)	ND (0.0048)	0.223 J (0.64)	0.00045 J (0.0055)	ND (0.0053)	ND (0.0044)	NA	ND (5.3)	ND (0.0051)
1,3,5-Trimethylbenzene	4700	5400	93	0.0574 J (0.57)	3.35 (0.53)	0.577 (0.57)	ND (0.0048)	0.0829 J (0.64)	ND (0.0055)	ND (0.0053)	ND (0.0044)	NA	ND (5.3)	ND (0.0051)
Xylenes (total)	7900	9100	1000	0.678 (0.11)	3.89 (0.11)	0.966 (0.11)	ND (0.00096)	0.31 (0.13)	0.00063 J (0.0011)	ND (0.0011)	J.00031 J (0.00088)	ND (0.003)	ND (5.3)	ND (0.0154)
Semi-Volatile Organic Compounds														
Anthracene	190000	190000	350	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	1.6 (0.19)	0.406 (0.16)
Benzo(a)anthracene	130	190000	340	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	2.5 (0.19)	1.7 (0.16)
Benzo(a)pyrene	91	190000	46	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	1.5 (0.19)	2.33 (0.16)
Benzo(b)fluoranthene	76	190000	170	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	2.1 (0.19)	2.32 (0.16)
Benzo(g,h,i)perylene	190000	190000	180	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	0.66 (0.19)	1.11 (0.16)
Chrysene	760	190000	230	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	2.7 (0.19)	2.21 (0.16)
Fluorene	130000	190000	3800	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	3.3 (0.19)	0.247 (0.16)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	ND (0.57)	1.45 (0.53)	0.246 J (0.57)	ND (0.0048)	0.391 J (0.64)	ND (0.0055)	ND (0.0053)	ND (0.0044)	ND (0.4)	1.4 (0.19)	0.584 (0.16)
Phenanthrene	190000	190000	10000	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	6.9 (1.9)	1.94 (0.16)
Pyrene	96000	190000	2200	NA	NA	NA	NA	NA	NA	NA	NA	ND (0.4)	5.5 (1.9)	3.65 (0.16)
Metals														
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	25.2 (0.95)	10.3 (0.99)	13.2 (0.96)	99.5 (0.95)	170 (0.93)	**6720 (9.6)**	1400 (9.3)	60.3 (0.85)	8.46 (2.38)	96 (0.224)	**2590 (0.41)**
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 (1.2)
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A1
Historical Soil Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location				S-389D	S-403	S-403	S-403	S-405	S-405	S-405	S-417	S-417
Matrix	Non-Res Direct Contact with Surface Soil MSCs	Non-Res Direct Contact with Subsurface Soil MSCs	Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤2500	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface	Soil - Subsurface	Soil - Surface	Soil - Subsurface
Collection Depth (ft bgs)				22 - 24	0 - 2	8 - 10	26 - 28	0 - 2	12 - 14	24 - 26	0 - 2	12 - 14
Sample Date				12/11/2013	11/18/2014	12/10/2014	12/10/2014	11/24/2014	12/9/2014	12/9/2014	11/19/2014	2/19/2015
Comments												
Volatile Organic Compounds												
Benzene	280	330	0.5	0.323 (0.225)	0.015 (0.0052)	0.22 (0.2)	ND (0.22)	0.031 (0.0063)	ND (0.0049)	0.22 (0.2)	0.07 (0.0045)	3.9 (0.22)
Cumene	10000	10000	2500	4.25 (0.225)	ND (0.0052)	ND (0.2)	1.1 (0.22)	ND (0.0063)	ND (0.0049)	0.96 (0.2)	0.035 (0.0045)	2.7 (0.22)
Ethyl Benzene	880	1000	70	7.13 (0.225)	ND (0.0052)	ND (0.2)	ND (0.22)	0.014 (0.0063)	ND (0.0049)	2.1 (0.2)	0.12 (0.0045)	21.7 (2.2)
Methyl tert-butyl ether	8500	9800	2	ND (0.225)	0.0076 (0.0052)	ND (0.2)	ND (0.22)	0.0083 (0.0063)	ND (0.0049)	ND (0.2)	0.017 (0.0045)	2.1 (0.22)
Toluene	10000	10000	100	0.388 (0.225)	ND (0.0052)	ND (0.2)	ND (0.22)	0.0072 (0.0063)	ND (0.0049)	ND (0.2)	ND (0.0045)	34.6 (2.2)
1,2,4-Trimethylbenzene	4700	5400	300	52.1 (4.5)	ND (0.0052)	ND (0.2)	ND (0.22)	0.023 (0.0063)	ND (0.0049)	6.7 (0.2)	0.012 (0.0045)	60.3 (2.2)
1,3,5-Trimethylbenzene	4700	5400	93	12.1 (0.225)	ND (0.0052)	ND (0.2)	ND (0.22)	0.0079 (0.0063)	ND (0.0049)	3 (0.2)	0.0049 (0.0045)	21.5 (2.2)
Xylenes (total)	7900	9100	1000	8.37 (0.676)	ND (0.016)	0.6 J (0.6)	ND (0.65)	0.032 (0.019)	ND (0.015)	1.8 (0.61)	0.12 (0.014)	120 (6.6)
Semi-Volatile Organic Compounds												
Anthracene	190000	190000	350	0.467 (0.152)	0.3 (0.15)	0.042 (0.0078)	0.036 (0.0075)	0.065 (0.039)	ND (0.0087)	0.034 (0.0079)	0.034 (0.0077)	0.083 (0.0077)
Benzo(a)anthracene	130	190000	340	0.437 (0.152)	1.1 (0.15)	0.013 (0.0078)	0.0086 (0.0075)	0.16 (0.039)	ND (0.0087)	0.0097 (0.0079)	0.039 (0.0077)	0.059 (0.0077)
Benzo(a)pyrene	91	190000	46	0.368 (0.152)	1.2 (0.15)	0.0085 (0.0078)	0.0044 J (0.0075)	0.2 (0.039)	0.0016 J (0.0087)	0.0053 J (0.0079)	0.032 (0.0077)	0.038 (0.0077)
Benzo(b)fluoranthene	76	190000	170	0.452 (0.152)	2 (0.15)	0.016 (0.0078)	0.0077 (0.0075)	0.32 (0.039)	0.0028 J (0.0087)	0.011 (0.0079)	0.049 (0.0077)	0.048 (0.0077)
Benzo(g,h,i)perylene	190000	190000	180	0.186 (0.152)	0.42 (0.15)	0.0042 J (0.0078)	ND (0.0075)	0.16 (0.039)	ND (0.0087)	ND (0.0079)	0.019 (0.0077)	0.02 (0.0077)
Chrysene	760	190000	230	0.548 (0.152)	1.4 (0.15)	0.014 (0.0078)	0.013 (0.0075)	0.29 (0.039)	ND (0.0087)	0.016 (0.0079)	0.047 (0.0077)	0.057 (0.0077)
Fluorene	130000	190000	3800	0.408 (0.152)	0.12 J (0.15)	0.15 (0.0078)	0.21 (0.0075)	0.054 (0.039)	ND (0.0087)	0.33 (0.0079)	0.049 (0.0077)	0.13 (0.0077)
Indeno(1,2,3-cd)pyrene	76	190000	18000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	66	77	25	2.86 (0.152)	0.42 (0.15)	0.11 (0.0078)	0.22 (0.0075)	0.76 (0.039)	ND (0.0087)	3.6 (0.039)	0.22 (0.0077)	8 (0.077)
Phenanthrene	190000	190000	10000	1.17 (0.152)	1.3 (0.15)	0.25 (0.0078)	0.3 (0.0075)	0.3 (0.039)	0.0042 J (0.0087)	0.44 (0.0079)	0.16 (0.0077)	0.31 (0.0077)
Pyrene	96000	190000	2200	0.927 (0.152)	2.1 (0.15)	0.044 (0.0078)	0.034 (0.0075)	0.37 (0.039)	ND (0.0087)	0.032 (0.0079)	0.11 (0.0077)	0.15 (0.0077)
Metals												
Arsenic	61	190000	29	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	190000	190000	8200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1600	190000	38	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (total)				NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	100000	190000	43000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1000	190000	450	494 (0.43)	579 (0.43)	11.1 (0.5)	6.5 (0.39)	402 (0.5)	15.1 (0.48)	7.9 (0.41)	46.7 (0.42)	8 (0.41)
Mercury	510	190000	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	64000	190000	650	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	16000	190000	26	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	190000	190000	12000	NA	NA	NA	NA	NA	NA	NA	NA	NA
				NA		NA	NA		NA	NA		NA

Notes:
1 All concentrations are presented in mg/kg (ppm). Detection limts are in parentheses.
2 Only compounds with at least one detection are shown.
3 D is an unknown qualifer.
4 Boldfaced concentrations exceed the Non-Res Direct Contact with Surface Soil MSCs and the Non-Res Direct Contact with Subsurface Soil MSCs.
5 Underlined concentrations exceed the Non-Residential Soil-to-GW MSCs Used Aquifer TDS≤250

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	CSX-IW-5	CSX-IW-5	CSX-MW1	CSX-MW1	CSX-MW1	CSX-MW5	CSX-MW5	MW-41	MW-41	PZ-400	RW-400	RW-400
Sample Date	Used Aquifer	12/5/2019	12/5/2019	5/15/2017	6/20/2018	12/4/2019	5/15/2017	12/4/2019	5/28/2014	12/11/2014	12/8/2014	5/28/2014	12/11/2014
Comments	(TDS ≤ 2500)		FD										
Volatile Organic Compounds													
Benzene	0.005	0.00052	0.00066	NA	ND (0.00025)	ND (0.00045)	**0.15**	**0.178**	**0.0477 (0.0005)**	**0.169 (0.0005)**	0.0027 (0.0005)	**0.0309 (0.0005)**	**0.0127 (0.0005)**
1,2-Dibromoethane	0.00005	ND (0.00001)	ND (0.00001)	ND (0.0000097)	NA	ND (0.00001)	ND (0.0000099)	ND (0.00001)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	ND (0.00075)	ND (0.00075)	NA	ND (0.0005)	ND (0.00075)	0.007	0.0045	0.0037 (0.001)	0.0053 (0.001)	0.00084 J (0.001)	0.00044 J (0.001)	0.00051 J (0.001)
Methyl tert-butyl ether	0.02	0.008	0.0091	NA	ND (0.0005)	ND (0.00075)	ND (0.0005)	ND (0.00075)	0.0048 (0.001)	0.0151 (0.001)	**0.0271 (0.001)**	**0.0799 (0.001)**	0.0162 (0.001)
Toluene	1	ND (0.00075)	ND (0.00075)	NA	ND (0.0005)	ND (0.00075)	0.0015	0.00099 J	0.00065 J (0.001)	0.0016 (0.001)	0.0011 (0.001)	0.00037 J (0.001)	0.00057 J (0.001)
1,2,4-Trimethylbenzene	0.53	ND (0.0015)	ND (0.0015)	NA	ND (0.001)	ND (0.0015)	ND (0.001)	ND (0.0015)	0.0143 (0.002)	0.0125 (0.002)	0.002 (0.002)	0.00021 J (0.002)	0.00026 J (0.002)
1,3,5-Trimethylbenzene	0.53	ND (0.0015)	ND (0.0015)	NA	ND (0.0005)	ND (0.0015)	0.0092	0.003	0.0219 (0.002)	0.0271 (0.002)	0.0065 (0.002)	0.00022 J (0.002)	0.00082 J (0.002)
Xylenes (total)	10	ND (0.00075)	ND (0.00075)	NA	ND (0.0005)	ND (0.00075)	0.0353	0.0175	0.007 (0.001)	0.0072 (0.001)	0.0025 (0.001)	0.00063 J (0.001)	0.0017 (0.001)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.003)	ND (0.003)	NA	ND (0.002)	ND (0.003)	ND (0.002)	ND (0.003)	0.00533 (0.001)	0.00303 (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Metals													
Lead	0.005	NA	NA	NA	0.00062 J	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	RW-402	RW-403	RW-403	RW-404	RW-404	S-101	S-101	S-116	S-116	S-179	S-179	S-180
Sample Date	Used Aquifer	12/10/2014	5/27/2014	12/12/2014	5/23/2014	12/12/2014	6/4/2014	12/11/2014	5/22/2014	12/9/2014	5/22/2014	12/10/2014	5/27/2014
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	ND (0.0005)	**0.0061 (0.0013)**	**0.0518 (0.0005)**	**0.0071 (0.0025)**	**0.0087 (0.0005)**	**0.0278 (0.0005)**	**0.0202 (0.0005)**	ND (0.0005)	ND (0.0005)	ND (0.0005)	0.00047 J (0.0005)	0.00066 (0.0005)
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.000022)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000037)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	ND (0.001)	0.0012 J (0.0025)	0.003 (0.001)	ND (0.005)	0.0019 (0.001)	0.0015 (0.001)	0.0016 (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Methyl tert-butyl ether	0.02	ND (0.001)	**0.437 (0.0025)**	**1.36 (0.02)**	**0.0929 (0.005)**	**0.148 (0.001)**	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	**0.0224 (0.001)**	0.0021 (0.001)
Toluene	1	ND (0.001)	0.0015 J (0.0025)	0.0112 (0.001)	0.0027 J (0.005)	0.0039 (0.001)	0.014 (0.001)	0.0064 (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.00023 J (0.001)	ND (0.001)
1,2,4-Trimethylbenzene	0.53	ND (0.002)	ND (0.005)	0.00061 J (0.002)	ND (0.01)	0.00023 J (0.002)	0.00044 J (0.002)	0.0007 J (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	0.00065 J (0.002)	ND (0.002)
1,3,5-Trimethylbenzene	0.53	ND (0.002)	ND (0.005)	0.00024 J (0.002)	ND (0.01)	0.00061 J (0.002)	0.00089 J (0.002)	0.00079 J (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)
Xylenes (total)	10	ND (0.001)	0.0034 (0.0025)	0.0082 (0.001)	0.0019 J (0.005)	0.0026 (0.001)	0.0163 (0.001)	0.012 (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.0015 (0.001)	0.00022 J (0.001)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
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J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-180	S-182	S-182	S-183	S-183	S-184	S-185	S-186	S-186	S-187	S-187	S-188
Sample Date	Used Aquifer	12/10/2014	5/27/2014	12/15/2014	5/27/2014	12/16/2014	5/27/2014	5/27/2014	5/27/2014	12/10/2014	5/27/2014	12/15/2014	5/23/2014
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	ND (0.0005)	**0.482 (0.0025)**	**1.95 (0.025)**	**0.831 (0.005)**	**0.432 (0.005)**	**2.66 (0.05)**	0.00069 (0.0005)	0.0049 (0.0005)	**0.107 (0.0025)**	**0.167 (0.0025)**	**0.0627 (0.001)**	**0.0249 (0.0005)**
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	ND (0.001)	0.0788 (0.005)	0.229 (0.005)	0.0945 (0.01)	0.122 (0.002)	0.241 (0.01)	ND (0.001)	0.0078 (0.001)	0.006 (0.005)	0.0085 (0.005)	0.0838 (0.002)	0.0103 (0.001)
Methyl tert-butyl ether	0.02	ND (0.001)	**1.26 (0.05)**	**1.18 (0.05)**	**1.64 (0.01)**	**0.546 (0.01)**	**4.22 (0.1)**	0.003 (0.001)	0.008 (0.001)	**1.95 (0.05)**	**0.643 (0.005)**	**0.0963 (0.002)**	**0.128 (0.001)**
Toluene	1	ND (0.001)	0.0129 (0.005)	0.0843 (0.005)	0.497 (0.01)	0.128 (0.002)	**2.25 (0.1)**	0.00067 J (0.001)	0.0019 (0.001)	0.0287 (0.005)	0.0191 (0.005)	0.118 (0.002)	0.0049 (0.001)
1,2,4-Trimethylbenzene	0.53	ND (0.002)	0.0727 (0.01)	0.134 (0.01)	0.112 (0.02)	0.131 (0.004)	0.507 (0.02)	ND (0.002)	0.0697 (0.002)	0.0026 J (0.01)	ND (0.01)	0.32 (0.004)	0.0212 (0.002)
1,3,5-Trimethylbenzene	0.53	ND (0.002)	0.0698 (0.01)	0.152 (0.01)	0.123 (0.02)	0.175 (0.004)	0.19 (0.02)	ND (0.002)	0.0343 (0.002)	0.0038 J (0.01)	ND (0.01)	0.133 (0.004)	0.0096 (0.002)
Xylenes (total)	10	ND (0.001)	0.122 (0.005)	0.43 (0.005)	0.386 (0.01)	0.244 (0.002)	1.56 (0.01)	0.0015 (0.001)	0.0245 (0.001)	0.0373 (0.005)	0.0327 (0.005)	0.819 (0.002)	0.0184 (0.001)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.0001)	0.0221 (0.001)	0.0686 (0.001)	0.0487 (0.001)	0.0218 (0.001)	0.0634 (0.001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	0.0275 (0.001)	ND (0.0001)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

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Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-188	S-189	S-190	S-191	S-191	S-192	S-192	S-193	S-193	S-194	S-194	S-198
Sample Date	Used Aquifer	12/12/2014	5/27/2014	12/12/2014	5/28/2014	12/12/2014	5/23/2014	12/11/2014	11/13/2019	5/12/2021	6/3/2014	12/9/2014	8/17/2018
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**0.0184 (0.0013)**	**0.154 (0.0005)**	**0.138 (0.0005)**	**0.0481 (0.0005)**	**0.202 (0.001)**	0.00085 (0.0005)	0.00049 J (0.0005)	**0.17 (0.001)**	**0.0078 (0.001)**	0.00044 J (0.0005)	**0.0382 (0.0005)**	**9.55 SL (0.1)**
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000025)	ND (0.000028)	ND (0.000029)	ND (0.00002)	ND (0.00002)	ND,SL (0.00001)
Ethyl Benzene	0.7	0.0069 (0.0025)	0.0412 (0.001)	0.0304 (0.001)	0.0294 (0.001)	0.16 (0.002)	ND (0.001)	ND (0.001)	0.008 (0.001)	0.0015 (0.001)	0.00061 J (0.001)	0.008 (0.001)	**1.37 SL (0.1)**
Methyl tert-butyl ether	0.02	**0.383 (0.0025)**	**0.296 (0.02)**	**0.358 (0.01)**	**0.0267 (0.001)**	**0.0415 (0.002)**	0.0076 (0.001)	0.0158 (0.001)	0.007 (0.001)	0.00086 J (0.001)	ND (0.001)	0.0017 (0.001)	**1.46 SL (0.1)**
Toluene	1	0.0123 (0.0025)	0.155 (0.001)	0.0245 (0.001)	0.0041 (0.001)	0.006 (0.002)	0.00083 J (0.001)	0.00034 J (0.001)	0.0004 J (0.001)	ND (0.001)	ND (0.001)	0.0014 (0.001)	0.474 SL (0.1)
1,2,4-Trimethylbenzene	0.53	0.02 (0.005)	0.12 (0.002)	0.152 (0.002)	0.105 (0.002)	0.396 (0.004)	0.0187 (0.002)	0.00072 J (0.002)	0.0004 J (0.005)	ND (0.005)	0.0135 (0.002)	0.0712 (0.002)	**1.36 SL (0.1)**
1,3,5-Trimethylbenzene	0.53	0.0086 (0.005)	0.0442 (0.002)	0.0574 (0.002)	0.0702 (0.002)	0.216 (0.004)	0.0051 (0.002)	0.00045 J (0.002)	ND (0.005)	ND (0.005)	0.0287 (0.002)	0.0077 (0.002)	0.468 SL (0.1)
Xylenes (total)	10	0.0413 (0.0025)	0.191 (0.001)	0.0497 (0.001)	0.0472 (0.001)	0.248 (0.002)	0.0042 (0.001)	0.00076 J (0.001)	0.0009 J (0.003)	ND (0.006)	0.0024 (0.001)	0.027 (0.001)	3.92 SL (0.3)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	0.00397 (0.0001)	ND (0.0001)	0.0205 (0.001)	0.0051 (0.001)	0.0242 (0.001)	ND (0.0001)	ND (0.0001)	ND (0.0005)	ND (0.0005)	ND (0.0001)	0.00851 (0.001)	**9.93 SL (0.125)**
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

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Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-199	S-199	S-200	S-200	S-202	S-202	S-202	S-206	S-206	S-207	S-207	S-209
Sample Date	Used Aquifer	11/13/2019	4/26/2021	7/25/2018	5/19/2021	5/28/2014	12/15/2014	11/19/2019	5/28/2014	12/12/2014	5/28/2014	12/9/2014	5/20/2014
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**13 SL (0.5)**	**11 SL (0.1)**	**7.6 (0.1)**	**6.2 (0.05)**	NA	**0.0121 (0.0005)**	0.002 (0.001)	**0.0078 (0.0005)**	0.003 (0.0005)	0.00042 J (0.0005)	ND (0.0005)	**1.39 (0.005)**
1,2-Dibromoethane	0.00005	ND,SL (0.000028)	ND,SL (0.000082)	ND (0.00001)	ND (0.000028)	ND (0.000028)	ND (0.00002)	NA	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	0.64 SL (0.005)	0.64 SL (0.01)	0.585 (0.01)	0.38 (0.02)	NA	0.0009 J (0.001)	0.0005 J (0.001)	0.00066 J (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.0207 (0.01)
Methyl tert-butyl ether	0.02	**34 SL (0.05)**	**15 SL (0.1)**	**1.36 (0.01)**	**0.24 (0.001)**	NA	**0.0366 (0.001)**	0.011 (0.001)	**0.0203 (0.001)**	**0.0339 (0.001)**	ND (0.001)	0.0011 (0.001)	**0.063 (0.01)**
Toluene	1	**1.2 SL (0.05)**	**1.8 SL (0.01)**	0.108 (0.01)	0.063 (0.001)	NA	0.0032 (0.001)	0.002 (0.001)	0.0019 (0.001)	0.0017 (0.001)	ND (0.001)	0.00038 J (0.001)	0.0168 (0.01)
1,2,4-Trimethylbenzene	0.53	**0.55 SL (0.025)**	**0.57 SL (0.05)**	**0.831 (0.01)**	**0.58 (0.1)**	NA	0.0011 J (0.002)	ND (0.005)	0.00049 J (0.002)	ND (0.002)	0.00028 J (0.002)	ND (0.002)	0.0024 J (0.02)
1,3,5-Trimethylbenzene	0.53	0.17 SL (0.025)	0.19 SL (0.05)	0.344 (0.01)	0.29 (0.1)	NA	0.0019 J (0.002)	0.0008 J (0.005)	0.00022 J (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.02)
Xylenes (total)	10	2.3 SL (0.015)	2.6 SL (0.06)	1.3 (0.03)	0.58 (0.12)	NA	0.0051 (0.001)	0.006 (0.003)	0.0048 (0.001)	0.0039 (0.001)	0.0004 J (0.001)	0.00057 J (0.001)	0.0166 (0.01)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	**0.16 SL (0.005)**	**0.56 SL (0.0051)**	**1.38 (0.005)**	**0.66 (0.0056)**	NA	.000324 J- (0.0001)	ND (0.01)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

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Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-209	S-261	S-261	S-267	S-267	S-270	S-270	S-271	S-271	S-272	S-272	S-273
Sample Date	Used Aquifer	12/17/2014	5/22/2014	12/9/2014	6/3/2014	12/9/2014	5/28/2014	12/12/2014	10/30/2019	5/7/2021	5/23/2014	12/10/2014	10/30/2019
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**0.859 (0.005)**	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	**0.0846 (0.0005)**	**0.371 (0.005)**	**0.11 (0.005)**	**0.12 (0.005)**	0.002 (0.0005)	0.00042 J (0.0005)	**0.045 (0.001)**
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000029)	ND (0.000028)	ND (0.00002)	ND (0.00002)	ND (0.000028)
Ethyl Benzene	0.7	0.0162 (0.0025)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.0073 (0.001)	0.0098 (0.001)	0.008 (0.005)	0.0076 (0.005)	ND (0.001)	ND (0.001)	0.001 (0.001)
Methyl tert-butyl ether	0.02	**0.0581 (0.0025)**	ND (0.001)	ND (0.001)	0.0033 (0.001)	0.00078 J (0.001)	0.0027 (0.001)	**0.0541 (0.001)**	**0.45 (0.005)**	**0.29 (0.005)**	0.0107 (0.001)	0.0085 (0.001)	**0.071 (0.001)**
Toluene	1	0.0172 (0.0025)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.0057 (0.001)	0.0134 (0.001)	0.024 (0.005)	0.035 (0.005)	0.00068 J (0.001)	0.00023 J (0.001)	0.01 (0.001)
1,2,4-Trimethylbenzene	0.53	0.0043 J (0.005)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	0.0222 (0.002)	0.0263 (0.002)	ND (0.025)	ND (0.025)	0.00038 J (0.002)	0.00025 J (0.002)	0.0009 J (0.005)
1,3,5-Trimethylbenzene	0.53	0.002 J (0.005)	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.002)	0.0037 (0.002)	0.0049 (0.002)	0.013 J (0.025)	0.0092 J (0.025)	0.00026 J (0.002)	ND (0.002)	0.003 J (0.005)
Xylenes (total)	10	0.0233 (0.0025)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	0.0261 (0.001)	0.0346 (0.001)	0.05 (0.015)	0.036 (0.03)	0.0022 (0.001)	0.0011 (0.001)	0.015 (0.003)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	0.00812 (0.001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	0.005 (0.0005)	ND (0.00055)	ND (0.0001)	ND (0.0001)	ND (0.0005)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

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Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-273	S-275	S-275	S-276	S-276	S-277	S-277	S-294	S-294	S-295	S-331	S-331
Sample Date	Used Aquifer	5/6/2021	5/27/2014	12/15/2014	11/8/2019	4/27/2021	11/18/2019	4/26/2021	11/8/2019	4/27/2021	8/17/2016	12/15/2014	7/24/2018
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**0.42 (0.01)**	**0.166 (0.0005)**	**0.993 (0.013)**	**8.8 SL (0.1)**	**1.6 SL (0.05)**	**1.3 SL (0.05)**	**4.8 SL (0.05)**	**0.047 (0.005)**	**0.046 (0.005)**	**0.0491 (0.001)**	**0.0551 (0.0025)**	**0.042 (0.001)**
1,2-Dibromoethane	0.00005	ND (0.000028)	ND (0.00002)	ND (0.00002)	ND,SL (0.000028)	ND,SL (0.000029)	ND,SL (0.000028)	ND,SL (0.000029)	ND (0.000028)	ND (0.000029)	000037 J (0.00004)	ND (0.00002)	ND (0.00001)
Ethyl Benzene	0.7	0.058 (0.001)	0.022 (0.001)	0.183 (0.005)	0.69 SL (0.01)	0.27 SL (0.005)	0.13 SL (0.005)	0.14 SL (0.005)	0.41 (0.005)	0.34 (0.005)	0.0062 (0.001)	ND (0.005)	0.00108 (0.001)
Methyl tert-butyl ether	0.02	**0.055 (0.001)**	0.0111 (0.001)	**0.118 (0.005)**	**0.26 SL (0.01)**	**0.14 SL (0.005)**	**0.31 SL (0.005)**	**4.7 SL (0.005)**	0.001 J (0.005)	ND (0.005)	0.0004 J (0.001)	**1.33 (0.02)**	**2.22 (0.05)**
Toluene	1	0.0099 (0.001)	0.0128 (0.001)	0.137 (0.005)	0.071 SL (0.01)	0.018 SL (0.005)	0.16 SL (0.005)	**1.4 SL (0.05)**	0.006 (0.005)	0.0068 (0.005)	0.0068 (0.001)	0.0038 J (0.005)	0.00406 (0.001)
1,2,4-Trimethylbenzene	0.53	0.023 (0.005)	0.0216 (0.002)	0.203 (0.01)	0.34 SL (0.05)	0.2 SL (0.025)	0.1 SL (0.025)	0.27 SL (0.025)	0.24 (0.025)	0.15 (0.025)	0.0224 (0.001)	0.0017 J (0.01)	ND (0.001)
1,3,5-Trimethylbenzene	0.53	0.021 (0.005)	0.0219 (0.002)	0.131 (0.01)	0.17 SL (0.05)	0.086 SL (0.025)	0.048 SL (0.025)	0.13 SL (0.025)	0.073 (0.025)	0.047 (0.025)	0.0096 (0.001)	ND (0.01)	ND (0.001)
Xylenes (total)	10	0.26 (0.006)	0.0312 (0.001)	0.37 (0.005)	2 SL (0.03)	0.71 SL (0.03)	0.65 SL (0.015)	1.4 SL (0.03)	0.41 (0.015)	0.35 (0.03)	0.0377 (0.003)	0.0076 (0.005)	0.015 (0.003)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.00057)	0.0269 (0.001)	**0.222 J- (0.005)**	0.029 SL (0.0006)	0.015 SL (0.0005)	0.017 SL (0.0005)	0.052 SL (0.0005)	**2.9 (0.013)**	**1.3 (0.0055)**	0.00047 (0.00014)	0.00247 (0.0001)	0.00191 (0.00025)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

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Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-351	S-351	S-396	S-396	S-396	S-403	S-403	S-405	S-457	S-457	S-467	S-467
Sample Date	Used Aquifer	5/17/2017	6/25/2018	11/1/2019	5/5/2021	5/5/2021	5/19/2015	2/4/2016	5/19/2015	3/26/2021	10/29/2021	3/24/2021	10/26/2021
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	ND (0.001)	ND (0.001)	**0.66 (0.005)**	ND (0.05)	NA	**0.16 (0.01)**	**0.486 (0.1)**	**5.7 (0.2)**	**18 (0.1)**	**20 (0.5)**	**0.37 (0.01)**	**0.5 (0.01)**
1,2-Dibromoethane	0.00005	ND (0.000029)	ND (0.00001)	ND (0.000029)	ND (0.000029)	NA	ND (0.000029)	ND (0.00004)	ND (0.000029)	ND (0.000029)	00017 J (0.000028)	ND (0.000029)	ND (0.000028)
Ethyl Benzene	0.7	ND (0.001)	ND (0.001)	0.016 (0.005)	ND (0.05)	NA	0.052 (0.001)	0.0258 (0.001)	**1.8 (0.02)**	**1.4 (0.01)**	**1.8 (0.05)**	0.025 (0.001)	0.033 (0.001)
Methyl tert-butyl ether	0.02	ND (0.001)	ND (0.001)	**1.6 (0.005)**	**0.73 (0.05)**	NA	0.017 (0.001)	0.0161 (0.001)	0.016 J (0.02)	**3.7 (0.01)**	**4.4 (0.05)**	**0.078 (0.001)**	**0.16 (0.001)**
Toluene	1	ND (0.001)	ND (0.001)	ND (0.005)	ND (0.05)	NA	0.014 (0.001)	0.066 (0.001)	ND (0.02)	0.77 (0.01)	**1.1 (0.05)**	0.02 (0.001)	0.021 (0.001)
1,2,4-Trimethylbenzene	0.53	ND (0.002)	ND (0.001)	ND (0.025)	ND (0.25)	NA	0.06 (0.002)	0.0479 (0.001)	**2 (0.04)**	**0.55 (0.05)**	**0.77 (0.25)**	0.064 (0.005)	0.039 (0.005)
1,3,5-Trimethylbenzene	0.53	ND (0.002)	ND (0.001)	ND (0.025)	ND (0.25)	NA	0.021 (0.002)	0.0184 (0.001)	**0.64 (0.04)**	0.15 (0.05)	0.21 J (0.25)	0.022 (0.005)	0.029 (0.005)
Xylenes (total)	10	ND (0.001)	ND (0.003)	0.01 J (0.015)	ND (0.3)	NA	0.14 (0.001)	0.0747 (0.003)	4.2 (0.02)	3.5 (0.06)	5.2 (0.3)	0.055 (0.006)	0.051 (0.006)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.0005)	ND (0.00025)	0.0006 (0.0005)	0.00038 J (0.00057)	NA	0.019 (0.0005)	0.0185 (0.0001)	**0.27 (0.005)**	**4.3 (0.5)**	**2.5 (0.058)**	0.085 (0.005)	0.086 (0.00053)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-472	S-472	S-52	S-52	S-75	S-75	S-76	S-77P	S-77P	S-78	S-78	S-78
Sample Date	Used Aquifer	3/24/2021	10/29/2021	5/20/2014	12/9/2014	7/2/2019	11/13/2019	8/2/2018	12/16/2014	7/25/2018	5/27/2014	12/12/2014	11/19/2019
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**0.18 (0.001)**	**0.19 (0.005)**	ND (0.0025)	0.00026 J (0.0005)	**0.006 (0.001)**	**0.039 (0.001)**	**2.1 SL (0.025)**	**1.8 (0.01)**	**0.222 (0.05)**	NA	**0.0062 (0.0005)**	0.003 (0.001)
1,2-Dibromoethane	0.00005	ND (0.000029)	ND (0.000028)	ND (0.00002)	ND (0.00002)	ND (0.000028)	ND (0.000028)	ND,SL (0.00001)	ND (0.00002)	ND (0.00001)	ND (0.00002)	ND (0.00002)	NA
Ethyl Benzene	0.7	**0.97 (0.01)**	**1.5 (0.05)**	ND (0.0025)	ND (0.001)	0.002 (0.001)	0.0006 J (0.001)	0.046 SL (0.025)	0.0972 (0.02)	0.00818 (0.001)	NA	0.0013 (0.001)	0.0006 J (0.001)
Methyl tert-butyl ether	0.02	0.00079 J (0.001)	ND (0.005)	**0.194 (0.005)**	**0.133 (0.001)**	**0.024 (0.001)**	0.004 (0.001)	ND,SL (0.025)	**5.02 (0.2)**	**2.09 (0.05)**	NA	0.011 (0.001)	0.007 (0.001)
Toluene	1	0.0088 (0.001)	0.0072 (0.005)	ND (0.005)	0.0004 J (0.001)	0.002 (0.001)	0.002 (0.001)	0.0525 SL (0.025)	0.0408 (0.02)	0.0235 (0.001)	NA	0.0026 (0.001)	0.003 (0.001)
1,2,4-Trimethylbenzene	0.53	0.49 (0.05)	**0.75 (0.025)**	ND (0.01)	ND (0.002)	0.0006 J (0.005)	ND (0.005)	0.194 SL (0.025)	0.0363 J (0.04)	0.00216 (0.001)	NA	0.00064 J (0.002)	ND (0.005)
1,3,5-Trimethylbenzene	0.53	0.13 (0.005)	0.21 (0.025)	ND (0.01)	ND (0.002)	0.007 (0.005)	0.0006 J (0.005)	**0.683 SL (0.025)**	0.0238 J (0.04)	0.00298 (0.001)	NA	0.00077 J (0.002)	ND (0.005)
Xylenes (total)	10	0.29 (0.006)	0.48 (0.03)	ND (0.005)	0.0003 J (0.001)	0.001 J (0.005)	0.001 J (0.003)	0.399 SL (0.075)	0.215 (0.02)	0.057 (0.003)	NA	0.0016 (0.001)	0.002 J (0.003)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	**3.5 (0.25)**	**5.5 (0.06)**	ND (0.0001)	ND (0.0001)	0.001 (0.0005)	ND (0.0005)	**0.87 SL (0.0025)**	0.0329 (0.0011)	0.00804 (0.00025)	NA	ND (0.0001)	ND (0.01)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-79P	S-79P	S-80	S-81	S-84P	S-84P	S-85	S-85	S-88	S-88	S-88A	S-88A
Sample Date	Used Aquifer	5/28/2014	12/15/2014	5/29/2014	12/16/2014	5/22/2014	12/10/2014	5/23/2014	12/12/2014	5/28/2014	12/12/2014	5/30/2014	12/12/2014
Comments	(TDS ≤ 2500)												
Volatile Organic Compounds													
Benzene	0.005	**0.693 (0.0025)**	**0.784 (0.0025)**	**0.384 (0.0025)**	**0.0633 (0.005)**	0.0016 (0.0005)	0.00042 J (0.0005)	**0.0069 (0.0025)**	0.0036 (0.0005)	**0.0151 (0.0025)**	**0.0118 (0.0005)**	**0.0152 (0.0005)**	**0.0061 (0.0005)**
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	ND (0.005)	ND (0.005)	0.0089 (0.001)	0.033 (0.01)	0.0028 (0.001)	0.0009 J (0.001)	0.0056 (0.005)	0.0023 (0.001)	ND (0.005)	0.0011 (0.001)	0.0017 (0.001)	ND (0.001)
Methyl tert-butyl ether	0.02	**0.168 (0.005)**	**0.31 (0.005)**	**0.03 (0.001)**	**1.64 (0.01)**	0.0014 (0.001)	**0.0984 (0.001)**	**0.0619 (0.005)**	0.0134 (0.001)	**0.186 (0.005)**	**0.422 (0.05)**	**0.0373 (0.001)**	**0.0227 (0.001)**
Toluene	1	0.0027 J (0.005)	0.0026 J (0.005)	0.0187 (0.001)	0.0365 (0.01)	0.00085 J (0.001)	0.00057 J (0.001)	ND (0.005)	0.0019 (0.001)	0.0071 (0.005)	0.0051 (0.001)	0.0037 (0.001)	0.0051 (0.001)
1,2,4-Trimethylbenzene	0.53	ND (0.01)	ND (0.01)	0.0013 J (0.002)	0.161 (0.02)	0.0048 (0.002)	0.00046 J (0.002)	0.065 (0.01)	0.0112 (0.002)	ND (0.01)	0.00028 J (0.002)	0.0099 (0.002)	0.127 (0.002)
1,3,5-Trimethylbenzene	0.53	ND (0.01)	ND (0.01)	0.0079 (0.002)	0.0475 (0.02)	0.0375 (0.002)	0.0074 (0.002)	0.0729 (0.01)	0.0204 (0.002)	ND (0.01)	ND (0.002)	0.0145 (0.002)	0.127 (0.002)
Xylenes (total)	10	ND (0.005)	0.0031 J (0.005)	0.0139 (0.001)	0.224 (0.01)	0.0021 (0.001)	0.00094 J (0.001)	0.0562 (0.005)	0.0284 (0.001)	0.0044 J (0.005)	0.0041 (0.001)	0.0137 (0.001)	0.118 (0.001)
Semi-Volatile Organic Compounds													
Naphthalene	0.1	ND (0.00011)	ND,J (0.0001)	0.000796 (0.0001)	0.0396 (0.001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Metals													
Lead	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Table A2
Historical Groundwater Sampling Results
Tank Group 02
Philadelphia Energy Solutions Refining and Marketing, LLC, Philadelphia, PA

Location	Non-Res GW MSC	S-98	S-98	S-99	S-99
Sample Date	Used Aquifer	6/3/2014	12/15/2014	6/3/2014	12/9/2014
Comments	(TDS ≤ 2500)				
Volatile Organic Compounds					
Benzene	0.005	**0.143 (0.0005)**	**1.39 (0.013)**	0.0019 (0.0005)	0.004 (0.001)
1,2-Dibromoethane	0.00005	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Ethyl Benzene	0.7	0.173 (0.001)	0.326 (0.005)	0.0049 (0.001)	0.0049 (0.002)
Methyl tert-butyl ether	0.02	0.0023 (0.001)	**0.151 (0.005)**	0.0032 (0.001)	0.0026 (0.002)
Toluene	1	0.0034 (0.001)	0.0347 (0.005)	0.0218 (0.001)	0.028 (0.002)
1,2,4-Trimethylbenzene	0.53	**0.59 (0.02)**	**0.848 (0.01)**	0.00083 J (0.002)	0.00072 J (0.004)
1,3,5-Trimethylbenzene	0.53	0.142 (0.002)	0.234 (0.01)	0.0015 J (0.002)	0.0012 J (0.004)
Xylenes (total)	10	0.814 (0.01)	1.35 (0.005)	0.0315 (0.001)	0.0284 (0.002)
Semi-Volatile Organic Compounds					
Naphthalene	0.1	0.0854 (0.001)	**0.107 (0.002)**	ND (0.0001)	ND (0.0001)
Metals					
Lead	0.005	NA	NA	NA	NA

Notes:
1 All concentrations are presented in mg/L. Detection limts are in parentheses.
2 B is an unknown qualifer.
3 Boldfaced and grey shaded concentrations exceed the Non-Res GW MSC Used Aquifer (TDS ≤ 2500).

Abbreviations:
ND -- Not Detected.
NA -- Not Analyzed.
J -- Estimated Concentration.

Appendix B

PNDI

1. PROJECT INFORMATION

Project Name: **PESRM -Tank Group 02**
Date of Review: **4/27/2022 12:19:54 PM**
Project Category: **Hazardous Waste Clean-up, Site Remediation, and Reclamation, Spill (e.g., oil, chemical)**
Project Area: **33.95 acres**
County(s): **Philadelphia**
Township/Municipality(s): **PHILADELPHIA**
ZIP Code:
Quadrangle Name(s): **PHILADELPHIA**
Watersheds HUC 8: **Schuylkill**
Watersheds HUC 12: **City of Philadelphia-Schuylkill River**
Decimal Degrees: **39.918126, -75.193596**
Degrees Minutes Seconds: **39° 55' 5.2528" N, 75° 11' 36.9471" W**

2. SEARCH RESULTS

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

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

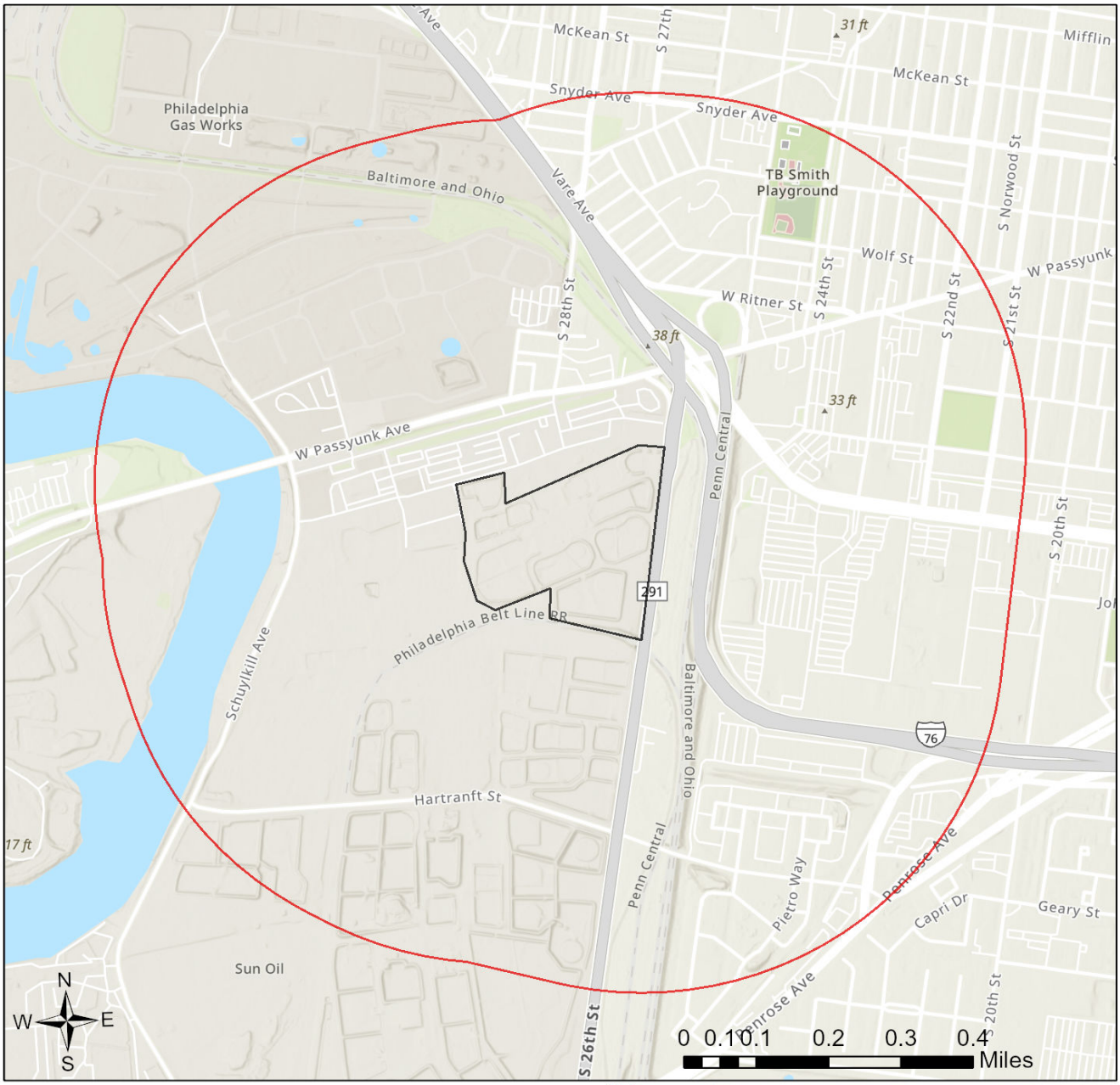
PESRM -Tank Group 02

Buffered Project Boundary

Project Boundary

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland,

PESRM -Tank Group 02



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

RESPONSE TO QUESTION(S) ASKED

Q1: Aquatic habitat (stream, river, lake, pond, etc.) is located on or adjacent to the subject property and project activities (including discharge) may occur within 300 feet of these habitats?
Your answer is: No

3. AGENCY COMMENTS

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

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

PA Game Commission
RESPONSE:
No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources
RESPONSE:
No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

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

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

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email the following information to the agency(s) (see AGENCY CONTACT INFORMATION). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies (but not USFWS).
*If information was requested by USFWS, applicants must email, or mail, project information to IR1_ESPenn@fws.gov to initiate a review. USFWS will not accept uploaded project materials.

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

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

4. DEP INFORMATION

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

5. ADDITIONAL INFORMATION

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

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

6. AGENCY CONTACT INFORMATION

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

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
Email: IR1_ESPenn@fws.gov
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

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

7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(_____)_____Fax:(_____)_____
Email:_____

8. CERTIFICATION

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

_____ _____
applicant/project proponent signature date

Pennsylvania Fish & Boat Commission
established 1866

Division of Environmental Services
Natural Diversity Section
595 E Rolling Ridge Dr.
Bellefonte, PA 16823
814-359-5237

May 17, 2022

IN REPLY REFER TO
SIR# 56128

Terraphase Engineering, Inc.
Nicholas Scala
100 Canal Pointe Blvd
Princeton, New Jersey 08540

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 757963_1
PESRM -Tank Group 02
PHILADELPHIA County: Philadelphia City

Dear Nicholas Scala:

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

An element occurrence of a rare, candidate, threatened, or endangered species under our jurisdiction is known from the vicinity of the proposed project. However, given the nature of the proposed project, the immediate location, or the current status of the nearby element occurrence(s), no adverse impacts are expected to the species of special concern.

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

If you have any questions regarding this review, please contact Kathy Gipe at 814-359-5186 and refer to the SIR # 56128. Thank you for your cooperation and attention to this important matter of species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/dn