
PADEP RESPONSES

**PRIMARY FACILITY IDENTIFICATION NUMBER 778376
AREA OF INTEREST 2**

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

Prepared for:



**Philadelphia Refinery Operations,
A series of Evergreen Resources Group, LLC
2 Righter Parkway
Suite 200
Wilmington, Delaware 19803**

Prepared by:

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LANGAN

**December 28, 2017
2574602**

Response to PADEP Comments
Received October 20, 2017
AOI 2 RIR
PES Refining Complex

Soil

1. No soil characterization was performed in most of the AOI 2 land area. Almost no samples were collected in the northern area of buildings and parking lots, although this included the historic "batch stills and processed solvent mates" (Appendix B). Also, there were almost no samples from the active and historic operating units across the central and southern parts of AOI 2 (WWTP, crude unit, hydrocracker unit, reformer units, hydrogen desulfurization units, FCCU, and alkylation unit). In addition, very few samples were obtained along the network of pipelines throughout the site. Please explain why these potential source areas were not investigated.

Unit areas are generally not accessible within the battery limits for installation of wells or borings due to unit equipment, operations, and subsurface/overhead features. In addition, all drilling, sampling and monitoring equipment would need to be intrinsically safe in those areas. Therefore, borings and wells have been installed around the outskirts of unit/process areas, which are generally within roadways. In general, the major pipeline routes (and other utilities that may act as preferential pathways for migration) are within the roadways. Historically, borings and wells were proposed in areas of known or suspected releases, or to delineate previously identified areas of impact.

2. Exceedances of the benzo(a)pyrene direct contact MSC were identified in shallow soil. EPA issued a new IRIS toxicological review of benzo(a)pyrene in Jan 2017. Evergreen might consider calculating a site-specific numerical value for benzo(a)pyrene or performing a risk assessment using the updated toxicological information.

Langan is currently preparing a Human Health Risk Assessment for the PES Refining Complex. Evergreen is considering calculating a site specific numerical value for benzo(a)pyrene that will consider the new toxicological information from the EPA 2017 review.

Groundwater & NAPL

3. The area of high groundwater elevations in the north appears to be centered on the WWTP. Has Evergreen considered whether this groundwater feature might be related to operations (leakage) at the plant? Should this possibility be investigated?

The RIR fate and transport text contributes the high point to the unpaved area down slope from an asphalt parking lot. It is anticipated the runoff recharges the aquifer in the unpaved area. However, Evergreen may investigate the potential source of high groundwater in the area, and if information warrants, would inform PES they may have a water leak from the wastewater treatment plant (WWTP). Investigation into and

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correction of a potential leak from any PES operating area or unit, such as the WWTP, would be incumbent on PES.

4. Please provide a shallow groundwater elevation map of AOI 2 and vicinity including synoptic data from the Philadelphia Gas Works facility.

The AOI 2 RIR included an unconfined (shallow) groundwater map as Figure 8. Synoptic data from the Philadelphia Gas Works (PGW) site to the north was included in the Figure 8 groundwater contours. The synoptic data was not included in the AOI 2 RIR Table 3b because sufficient detail regarding the data was not available from PGW.

For additional groundwater flow considerations, attached are Figures 5-2, 5-3, and 5-4 from Stantec's forthcoming Remedial Investigation Report (RIR) for AOI 8.

5. The middle distillate LNAPL plume and shallow groundwater contamination in the northwest of AOI 2 has not been fully delineated to the west, adjacent to the Schuylkill River. Determining the horizontal extent of contamination is required by §250.408(e). DEP accepts that this additional delineation will be fully described in a future Act 2 report on groundwater fate-and-transport and surface water compliance.

Evergreen agrees with the comment and will further investigate the middle distillate light non-aqueous phase liquid (LNAPL) plume and shallow groundwater contamination in the northwest portion of AOI 2.

6. Regarding the two new wells installed adjacent to the river in the northwest, please provide the following (prior to the fate-and-transport report):

- Boring logs and well construction details
- Two rounds of gauging data
- Groundwater elevation contour maps for those two gauging events (for either all of AOI 2 or just the northwest area)
- Analytical results from two sampling rounds.

The boring logs, well construction details, and analytical data from the initial groundwater sampling are attached. Evergreen has added these two new monitoring wells to the gauging list. Evergreen is also in the process of conducting a second gauging and groundwater sampling event for these two monitoring wells. No LNAPL within these wells during the initial sampling.

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7. Langan suggested that the “vertical wall” along the river at the northwest edge of AOI 2 impedes groundwater discharge to the river (Sections 5.4, 9.2, Appendix I). Explain why this is thought to be true. What is the purpose of this wall? When was it constructed? The report states that the wall is made of stone and concrete, but a stone wall would probably not inhibit groundwater flow. What prevents groundwater from underflowing the wall? Provide a more complete description of the wall’s construction (what parts are stone, and what parts are concrete?; is the stone mortared?; what is the wall’s thickness, height, and depth below grade?). What is the ground surface elevation difference across the wall? A short cross section including the LNAPL plume and one of the new delineation wells would help show how groundwater relates to this structure.

Evergreen has requested any design or construction information for the vertical wall from PES. No information was identified to date. However, as noted above two monitoring wells were installed downgradient of the vertical wall.

8. Langan considered most LNAPL plumes to be immobile or hydraulically controlled (Section 5.7). Compared to some other recent reports submitted by Evergreen, there is little discussion and supporting information for this statement. There has been no evaluation of LNAPL transmissivity or a lines-of-evidence assessment, for instance. DEP requests further evaluation and discussion of the LNAPL stability conclusions.

An additional assessment will be performed as part of future Facility-wide Act 2 submittals.

9. I recommend that Evergreen demonstrate hydraulic control of the LNAPL plumes at the west end of the Pollack Street sewer, near the river.

The LNAPL plume at the west end of the Pollock Street Sewer has been addressed through remediation efforts and the Pollock Street West End remediation system had been turned off due to a lack of recoverable LNAPL.

The Pollock Street West End Remediation System was originally installed to recover LNAPL and was not designed for hydraulic control/hydraulic influence. The system was started on February 23, 2012. The system was turned off December 19, 2016, due to the lack of recoverable LNAPL.

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On October 6, 2017, the Pollock Street West End Remediation System was started using 6 recovery wells that are proximal to the sewer outfall (RW-104, RW-105, RW-113, RW-125, RW-128 and RW-129) due to a sheen observed along the bulkhead at that time. No sheen was observed at the outfall. Pollock Street West End Remediation System operated until November 30, 2017, when it was turned off due to the absence of recoverable LNAPL.

Additional remediation at the Pollock Street Sewer will be addressed in the site-wide Cleanup Plan.

10. Does LNAPL continue to enter the Pollack Street sewer despite operation of the horizontal well and west end recovery systems? What cumulative and recent quantity of LNAPL was recovered by the skimmer at the outfall (total gallons and/or gallons per year)?

Inspections of the sewer outfall area have observed sheening within the hard boom that is deployed in the area. It is unknown if the sheen is from water flowing through the sewer. On September 29, 2017, PES facility personnel observed a sheen along the bulkhead outside of the outfall.

Historically inspections were completed at select manholes associated with this sewer by Evergreen's environmental consultant. The inspections were recorded in the Marlin data system during Sunoco's ownership of the refinery. The routine inspections are no longer completed due to a lack of observable LNAPL in the sewer.

The Pollock Street Skimmer System was installed in the mid-1990s. In the first quarter of 2005 a new skimmer system was installed to increase the effectiveness of sheen control at the outfall. The skimmer system's discharge is pumped to 12 Sump where the fluids are pumped to the Point Breeze Refinery WWTP for processing. The skimmer system operated until April 20, 2015, when it was turned off due to an absence of recoverable LNAPL. Recovered surface water and LNAPL was not quantified. The skimmer is maintained and tested for operation should it become necessary to activate the equipment. Equipment will be activated if LNAPL is identified in the future.

11. Please show the inactive Pollack Street vertical well system on a map, or list the wells that were part of the system. Did this system collect LNAPL, groundwater, or both? When was it deactivated? What were the recovery totals for LNAPL/groundwater?

The Pollock Street Vertical Remediation System consisted of recovery wells RW-100, RW-101, RW-102, RW-103, RW-104, RW-105, RW-106, RW-107, RW-108, and RW-109. The system was originally constructed with ORS Environmental Equipment SITEPRO

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2000 controllers with a dual pumping system (groundwater and LNAPL pumps). Due to operational issues including fouled float sensors, the dual pumping system was modified to pump total fluids. The recovered groundwater and LNAPL was discharged directly to a benzene NESHAP controlled sewer; therefore, recovered LNAPL volume was not quantified.

When the Pollock Street Vertical Well Remediation System was turned off on April 4, 2013, only RW-101, RW-102 and RW-103 were operated. The system was turned off for main discharge line cleaning and installation of a new pump at horizontal well HW-1. HW-1 maintained adequate drawdown; therefore, the Pollock Street Vertical Remediation System was not turned back on. Recovery wells RW-104, RW-105, and RW-106 were incorporated into the Pollock Street West End Remediation System. The recovery equipment was removed from RW-101, RW-102 and RW-103 on August 2, 2013. The total groundwater and LNAPL recovered by the Pollock Street Vertical Well Remediation System was approximately 66.5 million gallons as of April 2013.

12. Where was the inactive Short Pier recovery system? When was it installed? How many wells did it include? Did it collect LNAPL, groundwater, or both? What were the recovery totals for LNAPL/groundwater?

The Short Pier Remediation System was located to the north of the Pollock Street sewer outfall in the vicinity of monitoring well S-108 along the eastern shore of the Schuylkill River. The system recovered groundwater, LNAPL and soil gas. Operation of the remediation system started on August 20, 2002. A total of 9 wells were used for extraction points for the Short Pier Remediation System [S-145 (formerly MW-A), S-146 (formerly MW-B), S-147 (formerly MW-C), S-148 (formerly MW-D), S-149 (formerly MW-E), S-152 (formerly MW-H), S-154 (formerly MW-J), S-106, and S-107]. The Short Pier Remediation system consisted of a Godwin diesel powered well dewatering pump which extracted total fluids and soil gas. The fluids were discharged directly to a facility sewer and processed by the Point Breeze Refinery WWTP. The soil gas was treated by a biofilter. The system was shut off on December 6, 2002, to avoid freezing. Due to lack of recoverable LNAPL in the area, the system was not restarted. No estimate of the recovered liquids was calculated.

13. Does (or did) the Passyunk Avenue sewer outfall have LNAPL discharge controls, similar to those for the Pollack Street sewer outfall?

Discharge controls, similar to the Pollock Street Sewer Outfall, were not in place for the Passyunk Avenue sewer outfall. The sewer does not have a tide gate or a belt skimmer. There were no installations of hard boom at the Passyunk Avenue sewer

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outfall. Historically, weekly inspections were completed at the outfall and temporary boom was placed at the outfall to address short term conditions. Additional information regarding these inspections and boom placement is not available. Additionally, a baffle was installed inside the Passyunk Avenue sewer to reduce the movement of air surging in the sewer due to tidal influence on the water in the sewer.

Exposure Pathways

14. As discussed previously with Evergreen, further information is needed to document the evaluation of potential vapor intrusion receptors (see 8/28/2017 e-mail). A map should be provided to identify those structures that are not of concern because of positive pressurization, being elevated above the ground, or lacking occupancy. The presence of basements in any buildings should be noted. If trailers are present, they should be listed and mapped. [§250.404(a), §250.408(a)]

Attached are the Potentially Occupied Structure/Building Inventory and Building Survey and Indoor Air and Ambient Sampling Locations Figure prepared by GHD.

15. Several buildings are visible in aerial photographs and maps of the Point Breeze Process Area that are not mentioned in the report. Explain how each of these is being addressed for VI.
- Building located immediately south of Refinery Hall (aka Main Office Annex, 5917)
 - Building located immediately north of the maintenance shop (2448)
 - WWTP Building 2446
 - Area 9-0-1E No. 3 barrel warehouse (Building 5933)
 - Area 9-0-4C Buildings 5624 and 6416
 - Area 9-210C control room (Building 4225)
 - Area 9-0-2D No. 14 service building and main control center (Building 2587)
 - Area 9-864 Building 2450

Attached are the Potentially Occupied Structure/Building Inventory and Building Survey and Indoor Air and Ambient Sampling Locations Figure prepared by GHD. Below are descriptions of VI considerations for the buildings listed above:

- *Building located immediately south of Refinery Hall (aka Main Office Annex, 5917) - Described on GHD's Building Inventory as being a potential VI concern that has had indoor air sampling.*

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- *Building located immediately north of the maintenance shop (2448) - Described on GHD's Building Inventory as being a potential VI concern that has had indoor air sampling.*
- *WWTP Building 2446 - Described on GHD's Building Inventory, but accidentally labeled as 2246. The use is as a centrifuge building and it is elevated.*
- *Area 9-0-1E No. 3 barrel warehouse (Building 5933) - Building 5933 is the Deloch Dock office that sits on top of the Number 3 Barrel Warehouse (called 'warehouse' on GHDs map). The warehouse is not used and always open (no doors, just openings). Neither building poses a VI concern.*
- *Area 9-0-4C Buildings 5624 and 6416 – Building 5624 is a storage building and Building 6416 is a substation. The two are presented within one box around and labeled on the GHD map as "substation electric and storage" on the western portion of AOI 2.*
- *Area 9-210C control room (Building 4225) - This is a storage building ("Old 209 Blockhouse"), which is not occupied. The building is labeled 'filter building' on the GHD map.*
- *Area 9-0-2D No. 14 service building and main control center (Building 2587) - Described on GHD's Building Inventory as a locked building with occupation forbidden.*
- *Area 9-864 Building 2450 - This is a compressor building that is not occupied (houses equipment).*

16. Some reporting levels in the indoor air sample analyses exceeded applicable screening values (Table 7). Please refer to DEP's FAQs on the VI guidance for the application of PQLs to screening.

Langan is preparing a Human Health Risk Assessment for the PES Refining Complex. Reporting limit exceedances of applicable screening values will be addressed in the HHRA as discussed in Section 11.0 "Conclusions and Recommendations", page 55, of the RIR.

17. The report indicates that four buildings in AOI 2 are positively pressurized and will not require additional VI evaluation. If Evergreen will use building pressurization as an engineering control to mitigate VI, then methods for measuring differential pressures in the buildings should be described in the cleanup plan. The post-remedial care plan and environmental covenant should include periodic monitoring of the pressurization.

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Evergreen is not planning to rely on positive pressure for buildings as an engineering control. All positive pressure buildings were or will be evaluated by Evergreen for VI conditions. Please refer to the attachments for comments 14 and 15.

18. In the PNDI review, The Pennsylvania Fish and Boat Commission identified two threatened/endangered species at AOI 2 (Appendix A). Further information was provided by PFBC to DEP on 10/10/2017 (attached). The species of concern are the shortnose sturgeon and the eastern redbelly turtle. PFBC also clarified that their earlier conclusion that "no adverse impacts are expected" did not account for soil, groundwater, and sediment contamination. There is a potentially complete exposure pathway for the two species of concern at AOI 2, and further ecological assessment is required. [§250.402(d)]

Evergreen is in the process of preparing a Complex-Wide biological risk assessment related to potential ecological receptors with the Schuylkill River.

Tables, Figures, and Appendices

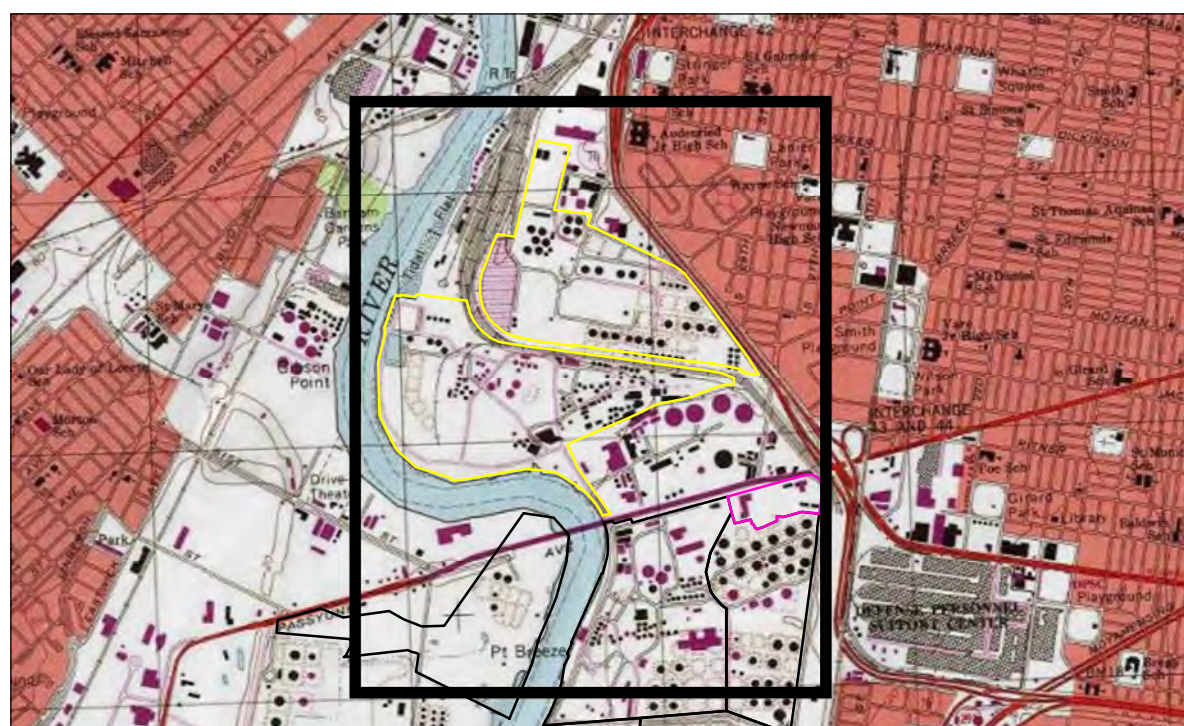
19. In June 2017 EPA published inhalation RSLs for trimethylbenzenes. The RSLs for workers at HQ = 0.1 are 26 ug/m³. The screening values in Table 7 should be updated accordingly.

Table 7 was revised and re-issued to the PADEP on August 2, 2017. The revised Table 7 is attached. None of the indoor air samples exhibited benzene exceedances of the EPA industrial RSL at a target cancer risk of 1E-05 and hazard quotient of 0.1(13 ug/m³). There are twelve indoor air samples that exhibited benzene exceedances of the EPA industrial RSL at a target cancer risk of 1E-06 and hazard quotient of 0.1(1.6 ug/m³).

20. The Passyunk Avenue sewer is mentioned in the report but not shown in the figures or cross section. Please provide a figure showing the Passyunk sewer and the location of the outfall.

The AOI 2 RIR Figure 2 has been updated to include the Passyunk Sewer. The revised Figure 2 is attached.

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Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
North American Vertical Datum of 1988 (NAVD 88)
2. Sources: Stantec and Philadelphia Gas Works (PGW)
3. Labels denote groundwater elevation in feet. Depth to groundwater was measured in each well to the nearest one-hundredth of a foot using an interface probe.
4. Contour Interval = 1 foot
5. Groundwater elevation data was interpolated using block kriging with a linear variogram model in Surfer.
6. Aerial & Topo: Service Layer Credits: © 2017 DigitalGlobe ©CNES (2017) Distribution Airbus DS © 2017 Microsoft Corporation
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- LEGEND**
- MAY/JUNE 2008 WELL GAUGING DATA – WATER-TABLE (UNCONFINED) AQUIFER
 - MAY/JUNE 2008 WATER-TABLE ELEVATION (FEET NAVD 88)
 - APPROXIMATE LOCATION OF PHILADELPHIA WATER DEPARTMENT SEWER
 - APPROXIMATE LOCATION OF RAMBO CREEK PROCESS SEWER
 - LIMITS OF WATER-TABLE WELL CONTROL
 - PHILADELPHIA GAS WORKS (PGW) PASSYUNK FACILITY
 - VERIZON SOUTH DISTRICT WORK CENTER (SDWC) PROPERTY
 - AREA OF INTEREST (AOI) BOUNDARY
 - AOI 8 BOUNDARY
 - BELMONT TERMINAL
 - 2.55' GROUNDWATER ELEVATION (FEET NAVD 88)
 - NM WELL WAS NOT MEASURED

0 275 550 Feet
1:3,300 (At original document size of 24x36)

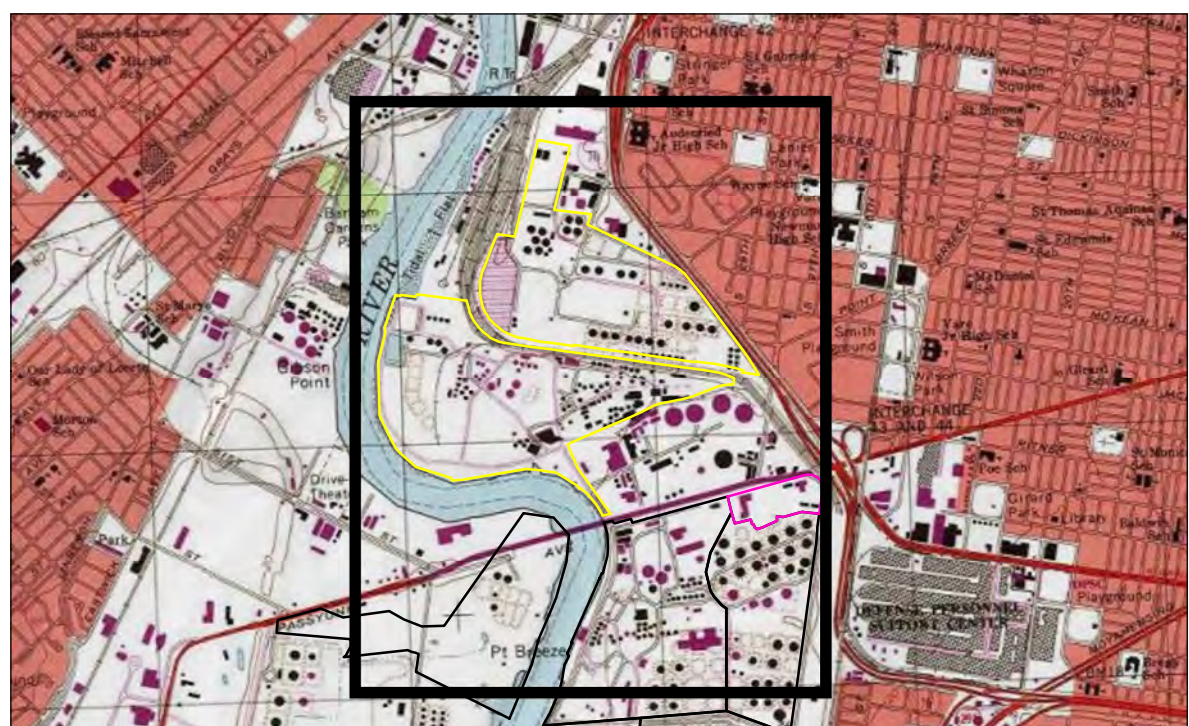
Figure No.
5-2
Title
MAY/JUNE 2008 WATER-TABLE ELEVATION

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

Project Location
City of Philadelphia,
Philadelphia County,
Pennsylvania

213402435
Prepared by GWC on 9/26/2017
Technical Review by ADK on 10/2/2017
Independent Review by JKD on 10/11/2017





Notes

1. Coordinate System: NAD 1983 StatePlane Pennsylvania South FIPS 3702 Feet
North American Vertical Datum of 1988 (NAVD 88)
2. Sources: Stantec and Philadelphia Gas Works (PGW)
3. Labels denote groundwater elevation in feet. Depth to groundwater was measured in each well to the nearest one-hundredth of a foot using an interface probe.
4. Contour Interval = 0.5 feet
5. Groundwater elevation data was interpolated using block kriging with a linear variogram model in Surfer.
6. Aerial & Topo: Service Layer Credits: © 2017 DigitalGlobe ©CNES (2017) Distribution Airbus DS © 2017 Microsoft Corporation
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- LEGEND
- OCTOBER 2016 WELL GAUGING DATA – WATER-TABLE (UNCONFINED) AQUIFER
 - OCTOBER 2016 WATER-TABLE ELEVATION (FEET NAVD 88)
 - APPROXIMATE LOCATION OF PHILADELPHIA WATER DEPARTMENT SEWER
 - APPROXIMATE LOCATION OF RAMBO CREEK PROCESS SEWER
 - LIMITS OF WATER-TABLE WELL CONTROL
 - PHILADELPHIA GAS WORKS (PGW) PASSYUNK FACILITY
 - VERIZON SOUTH DISTRICT WORK CENTER (SDWC) PROPERTY
 - AREA OF INTEREST (AOI) BOUNDARY
 - AOI 8 BOUNDARY
 - BELMONT TERMINAL
 - GROUNDWATER ELEVATION (FEET NAVD 88)
 - WELL WAS NOT MEASURED

0 275 550 Feet
1:3,300 (At original document size of 24x36)



Figure No.
5-4
Title
OCTOBER 2016 WATER-TABLE ELEVATION

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

Project Location
City of Philadelphia,
Philadelphia County,
Pennsylvania

213402435
Prepared by GWC on 9/8/2017
Technical Review by ADK on 10/2/2017
Independent Review by JKD on 10/11/2017



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MONITORING WELL

WELL NO. S-425

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PROJECT:	Philadelphia Refinery	DRILLING METHOD:	Hand Auger
SITE LOCATION:	AOI - 2 Deloach Dock	SAMPLING METHOD:	Soil Cuttings
DRILLING CO:	Total Quality Drilling	SCREEN/RISER DIAMETER:	2"
LOGGED BY:	Luke Mokrycki	BOREHOLE DIAMETER:	2.25"
DATES DRILLED:	5-22-17	LATITUDE:	39.918443
TOTAL DEPTH:	10.50'	LONGITUDE:	-75.200864

Depth (feet)	SAMPLE INTERVAL	PID (ppm)	LITHOLOGY DESCRIPTION	LITHOLOGY DIAGRAM	WELL CONSTRUCTION	COMMENTS
0		0.0ppm	White, tan angular gravels with tightly packed silt			Bentonite surface seal 0-0.5'bgs
		0.0ppm	Dark brown to red gray, silty clay, with black staining			Well gravel 0.5 - 10.50'bgs
		0.0ppm	Dark red brown, sandy, clayey, silt with small gravels; moist			
5		16ppm	Dark brown, silty, sandy, clay with black staining; wet @ 8'bgs			Initial DTW 6.30'bgs
		42ppm	Black stained gravelly sand with some timbers			
			Gray sand			
10		53.1ppm	Red bricks and timbers; refusal @10.5'			



MONITORING WELL

WELL NO. S-426

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PROJECT:	Philadelphia Refinery	DRILLING METHOD:	Hand Auger
SITE LOCATION:	AOI - 2 Deloach Dock	SAMPLING METHOD:	Soil Cuttings
DRILLING CO:	Total Quality Drilling	SCREEN/RISER DIAMETER:	2"
LOGGED BY:	Luke Mokrycki	BOREHOLE DIAMETER:	3"
DATES DRILLED:	5-19-16	LATITUDE:	-75.200963
TOTAL DEPTH:	10'	LONGITUDE:	39.918234

Depth (feet)	SAMPLE INTERVAL	PID (ppm)	LITHOLOGY DESCRIPTION	LITHOLOGY DIAGRAM	WELL CONSTRUCTION	COMMENTS
0		0.0ppm	White, tan gravels with tightly packed silts			Bentonite surface seal 0-0.5'bgs
		0.0ppm	Light to dark gray and reddish, silty, sandy, clay with gravels			Well gravel 0.5 - 10'bgs
5		13ppm	Dark brown, dark gray, silty, gravelly, clay			
		26ppm	Black stained, sandy, gravelly, clay; wet @ 7.5'bgs			Initial DTW 6.80'bgs
10		53.1ppm	Dark brown, silty, clay with timbers; saturated with poor recovery			

PROJECT: **Philadelphia Energy Solutions**
 LOCATION: **AOI-2**
 PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE NO:

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DRILLING / INSTALLATION:
 STARTED **5/19/17** COMPLETED: **5/22/17**
 DRILLING COMPANY: **Total Quality**
 DRILLING EQUIPMENT: **Hand Auger**
 DRILLING METHOD: **Hand Auger**
 SAMPLING EQUIPMENT: **Hand Auger**

NORTHING (ft): EASTING (ft):
 LAT: **39° 55' 6.4"** LONG: **75° 12' 3.1"**
 GROUND ELEV (ft): TOC ELEV (ft):
 INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **10.5**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **10.5**
 WELL CASING DIA. (in): **2** BOREHOLE DIA. (in): **3**
 LOGGED BY: **LM** CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
			GRAVEL WITH SILT ; white and tan; dense; angular		S-425@ 0-2'			0.0		0-0.5' bgs: Bentonite 0-1' bgs: 2" dia. PVC Riser
			SILTY CLAY ; dark brown to reddish gray; hydrocarbon staining		S-425@ 2-4'			0.0		
5			SANDY CLAY AND SILT ; dark reddish brown; moist		S-425@ 4-6'			0.0	5	
			SILTY SAND AND CLAY ; dark brown; wet; hydrocarbon staining; wet @ 8'bgs		S-425@ 6-8'			16		
			GRAVELLY SAND AND CONSTRUCTION DEBRIS ; black; saturated							
			SAND ; gray; saturated		S-425@ 8-10'			42		0.5-10' bgs: Sand 1-10' bgs: 2" dia PVC Screen

PROJECT: **Philadelphia Energy Solutions**
 LOCATION: **AOI-2**
 PROJECT NUMBER:



WELL / PROBEHOLE / BOREHOLE NO:

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DRILLING / INSTALLATION:
 STARTED **5/19/17** COMPLETED: **5/22/17**
 DRILLING COMPANY: **Total Quality**
 DRILLING EQUIPMENT: **Hand Auger**
 DRILLING METHOD: **Hand Auger**
 SAMPLING EQUIPMENT: **Hand Auger**

NORTHING (ft): EASTING (ft):
 LAT: **39° 55' 6.4"** LONG: **75° 12' 3.1"**
 GROUND ELEV (ft): TOC ELEV (ft):
 INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **10.5**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **10.5**
 WELL CASING DIA. (in): **2** BOREHOLE DIA. (in): **3**
 LOGGED BY: **LM** CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
			CONSTRUCTION DEBRIS ; red; saturated							
			Refusal at 10.5 feet. Borehole terminated at 10.5 feet.		S-425@ 10-12'			53.1		
15									15	

PROJECT: **Philadelphia Energy Solutions**
 LOCATION: **AOI-2**
 PROJECT NUMBER:

WELL / PROBEHOLE / BOREHOLE NO:

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DRILLING / INSTALLATION:
 STARTED **5/19/17** COMPLETED: **5/22/17**
 DRILLING COMPANY: **Total Quality**
 DRILLING EQUIPMENT: **Hand Auger**
 DRILLING METHOD: **Hand Auger**
 SAMPLING EQUIPMENT: **Hand Auger**

NORTHING (ft): EASTING (ft):
 LAT: **39° 55' 5.6"** LONG: **75° 12' 3.5"**
 GROUND ELEV (ft): TOC ELEV (ft):
 INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **10.0**
 STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **10.0**
 WELL CASING DIA. (in): **2** BOREHOLE DIA. (in): **3**
 LOGGED BY: **LM** CHECKED BY:

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Measured Recov. (feet)	Blow Count	Headspace PID (units)	Depth (feet)	Borehole Backfill
			GRAVEL WITH SILT ; white and tan; dense		S-426@ 0-2'			0.0		0-0.5' bgs: Bentonite 0-1' bgs: 2" dia. PVC Riser
			SILTY SAND AND CLAY WITH GRAVEL ; light grayish red to dark grayish red		S-426@ 2-4'			0.0		
5			SILTY GRAVEL AND CLAY ; dark brown and dark gray		S-426@ 4-6'			13	5	1-9' bgs: 2" dia PVC Screen 0.5-10' bgs: Sand
			SANDY GRAVEL AND CLAY ; black; wet; hydrocarbon staining; wet @ 7.5bgs		S-426@ 6-8'			26		
			SILTY CLAY WITH CONSTRUCTION DEBRIS ; dark brown; saturated		S-426@ 8-10'			53.1		

Refusal at 10 feet. Borehole terminated at 10 feet.

November 17, 2017

Aquaterra Technologies, Inc. - S/E

Sample Delivery Group: L949980
Samples Received: 11/10/2017
Project Number:
Description: A012 Deloach Dock
Site: DHILA REFINERY(A012)
Report To: Michael Sarcinello
122 South Church Street
West Chester, PA 19382

Entire Report Reviewed By:



Mark W. Beasley
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



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SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



S-425-20171108-WG L949980-01 GW

Collected by
Jason M.

Collected date/time
11/08/17 10:00

Received date/time
11/10/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020	WG1043166	1	11/15/17 15:09	11/15/17 22:10	JPD
Volatile Organic Compounds (GC/MS) by Method 8260C	WG1041803	1	11/16/17 22:01	11/16/17 22:01	JHH
EDB / DBCP by Method 8011	WG1041884	1	11/12/17 11:18	11/14/17 12:42	HMH
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1042314	1.33	11/14/17 17:28	11/15/17 13:06	KM

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

S-426-20171108-WG L949980-02 GW

Collected by
Jason M.

Collected date/time
11/08/17 10:15

Received date/time
11/10/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020	WG1043166	1	11/15/17 15:09	11/15/17 22:15	JPD
Volatile Organic Compounds (GC/MS) by Method 8260C	WG1041803	1	11/16/17 22:21	11/16/17 22:21	JHH
EDB / DBCP by Method 8011	WG1041884	1	11/12/17 11:18	11/14/17 08:37	HMH
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1042314	1	11/14/17 17:28	11/15/17 13:31	KM

S-427-20171108-WG L949980-03 GW

Collected by
Jason M.

Collected date/time
11/08/17 10:30

Received date/time
11/10/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICPMS) by Method 6020	WG1043166	1	11/15/17 15:09	11/15/17 22:21	JPD
Volatile Organic Compounds (GC/MS) by Method 8260C	WG1041803	1	11/13/17 03:10	11/13/17 03:10	BMB
EDB / DBCP by Method 8011	WG1041884	1	11/12/17 11:18	11/14/17 09:00	HMH
Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM	WG1042314	1	11/14/17 17:28	11/15/17 13:56	KM

TRIP BLANK L949980-04 GW

Collected by
Jason M.

Collected date/time
11/08/17 00:00

Received date/time
11/10/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC/MS) by Method 8260C	WG1041803	1	11/12/17 22:35	11/12/17 22:35	BMB

ACCOUNT:

Aquaterra Technologies, Inc. - S/E

PROJECT:

SDG:

L949980

DATE/TIME:

11/17/17 13:53

PAGE:

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All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Mark W. Beasley
Technical Service Representative

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Lead,Dissolved	ND		2.00	1	11/15/2017 22:10	WG1043166

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc

Volatile Organic Compounds (GC/MS) by Method 8260C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	11/16/2017 22:01	WG1041803
1,2-Dichloroethane	ND		1.00	1	11/16/2017 22:01	WG1041803
Ethylbenzene	ND		1.00	1	11/16/2017 22:01	WG1041803
Isopropylbenzene	3.33		1.00	1	11/16/2017 22:01	WG1041803
Methyl tert-butyl ether	ND		1.00	1	11/16/2017 22:01	WG1041803
Toluene	ND		1.00	1	11/16/2017 22:01	WG1041803
1,2,4-Trimethylbenzene	ND		1.00	1	11/16/2017 22:01	WG1041803
1,3,5-Trimethylbenzene	ND		1.00	1	11/16/2017 22:01	WG1041803
Xylenes, Total	ND		3.00	1	11/16/2017 22:01	WG1041803
(S) Toluene-d8	106		80.0-120		11/16/2017 22:01	WG1041803
(S) Dibromofluoromethane	107		76.0-123		11/16/2017 22:01	WG1041803
(S) 4-Bromofluorobenzene	115		80.0-120		11/16/2017 22:01	WG1041803

EDB / DBCP by Method 8011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0100	1	11/14/2017 12:42	WG1041884

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Anthracene	0.924		0.0665	1.33	11/15/2017 13:06	WG1042314
Benzo(a)anthracene	0.411		0.0665	1.33	11/15/2017 13:06	WG1042314
Benzo(a)pyrene	0.168		0.0665	1.33	11/15/2017 13:06	WG1042314
Benzo(b)fluoranthene	0.194		0.0665	1.33	11/15/2017 13:06	WG1042314
Benzo(g,h,i)perylene	0.115		0.0665	1.33	11/15/2017 13:06	WG1042314
Chrysene	0.515		0.0665	1.33	11/15/2017 13:06	WG1042314
Fluorene	1.21		0.0665	1.33	11/15/2017 13:06	WG1042314
Naphthalene	1.12		0.333	1.33	11/15/2017 13:06	WG1042314
Phenanthrene	0.450		0.0665	1.33	11/15/2017 13:06	WG1042314
Pyrene	0.983		0.0665	1.33	11/15/2017 13:06	WG1042314
(S) Nitrobenzene-d5	47.4		31.0-160		11/15/2017 13:06	WG1042314
(S) 2-Fluorobiphenyl	111		48.0-148		11/15/2017 13:06	WG1042314
(S) p-Terphenyl-d14	88.3		37.0-146		11/15/2017 13:06	WG1042314



Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Lead,Dissolved	ND		2.00	1	11/15/2017 22:15	WG1043166

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc

Volatile Organic Compounds (GC/MS) by Method 8260C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	11/16/2017 22:21	WG1041803
1,2-Dichloroethane	ND		1.00	1	11/16/2017 22:21	WG1041803
Ethylbenzene	ND		1.00	1	11/16/2017 22:21	WG1041803
Isopropylbenzene	4.02		1.00	1	11/16/2017 22:21	WG1041803
Methyl tert-butyl ether	ND		1.00	1	11/16/2017 22:21	WG1041803
Toluene	ND		1.00	1	11/16/2017 22:21	WG1041803
1,2,4-Trimethylbenzene	ND		1.00	1	11/16/2017 22:21	WG1041803
1,3,5-Trimethylbenzene	ND		1.00	1	11/16/2017 22:21	WG1041803
Xylenes, Total	ND		3.00	1	11/16/2017 22:21	WG1041803
(S) Toluene-d8	103		80.0-120		11/16/2017 22:21	WG1041803
(S) Dibromofluoromethane	108		76.0-123		11/16/2017 22:21	WG1041803
(S) 4-Bromofluorobenzene	112		80.0-120		11/16/2017 22:21	WG1041803

EDB / DBCP by Method 8011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0100	1	11/14/2017 08:37	WG1041884

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Anthracene	0.921		0.0500	1	11/15/2017 13:31	WG1042314
Benzo(a)anthracene	0.446		0.0500	1	11/15/2017 13:31	WG1042314
Benzo(a)pyrene	0.151		0.0500	1	11/15/2017 13:31	WG1042314
Benzo(b)fluoranthene	0.190		0.0500	1	11/15/2017 13:31	WG1042314
Benzo(g,h,i)perylene	0.0924		0.0500	1	11/15/2017 13:31	WG1042314
Chrysene	0.514		0.0500	1	11/15/2017 13:31	WG1042314
Fluorene	0.740		0.0500	1	11/15/2017 13:31	WG1042314
Naphthalene	0.857		0.250	1	11/15/2017 13:31	WG1042314
Phenanthrene	1.82		0.0500	1	11/15/2017 13:31	WG1042314
Pyrene	0.935		0.0500	1	11/15/2017 13:31	WG1042314
(S) Nitrobenzene-d5	79.7		31.0-160		11/15/2017 13:31	WG1042314
(S) 2-Fluorobiphenyl	111		48.0-148		11/15/2017 13:31	WG1042314
(S) p-Terphenyl-d14	67.9		37.0-146		11/15/2017 13:31	WG1042314



Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Lead,Dissolved	ND		2.00	1	11/15/2017 22:21	WG1043166

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc

Volatile Organic Compounds (GC/MS) by Method 8260C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	61.0		1.00	1	11/13/2017 03:10	WG1041803
1,2-Dichloroethane	ND		1.00	1	11/13/2017 03:10	WG1041803
Ethylbenzene	ND		1.00	1	11/13/2017 03:10	WG1041803
Isopropylbenzene	ND		1.00	1	11/13/2017 03:10	WG1041803
Methyl tert-butyl ether	16.4		1.00	1	11/13/2017 03:10	WG1041803
Toluene	ND		1.00	1	11/13/2017 03:10	WG1041803
1,2,4-Trimethylbenzene	ND		1.00	1	11/13/2017 03:10	WG1041803
1,3,5-Trimethylbenzene	ND		1.00	1	11/13/2017 03:10	WG1041803
Xylenes, Total	ND		3.00	1	11/13/2017 03:10	WG1041803
(S) Toluene-d8	110		80.0-120		11/13/2017 03:10	WG1041803
(S) Dibromofluoromethane	105		76.0-123		11/13/2017 03:10	WG1041803
(S) 4-Bromofluorobenzene	102		80.0-120		11/13/2017 03:10	WG1041803

EDB / DBCP by Method 8011

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Ethylene Dibromide	ND		0.0100	1	11/14/2017 09:00	WG1041884

Semi Volatile Organic Compounds (GC/MS) by Method 8270D-SIM

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Anthracene	ND		0.0500	1	11/15/2017 13:56	WG1042314
Benzo(a)anthracene	0.208		0.0500	1	11/15/2017 13:56	WG1042314
Benzo(a)pyrene	0.121		0.0500	1	11/15/2017 13:56	WG1042314
Benzo(b)fluoranthene	0.190		0.0500	1	11/15/2017 13:56	WG1042314
Benzo(g,h,i)perylene	0.0968		0.0500	1	11/15/2017 13:56	WG1042314
Chrysene	0.441		0.0500	1	11/15/2017 13:56	WG1042314
Fluorene	2.79		0.0500	1	11/15/2017 13:56	WG1042314
Naphthalene	0.425		0.250	1	11/15/2017 13:56	WG1042314
Phenanthrene	1.99		0.0500	1	11/15/2017 13:56	WG1042314
Pyrene	2.87		0.0500	1	11/15/2017 13:56	WG1042314
(S) Nitrobenzene-d5	70.3		31.0-160		11/15/2017 13:56	WG1042314
(S) 2-Fluorobiphenyl	99.0		48.0-148		11/15/2017 13:56	WG1042314
(S) p-Terphenyl-d14	73.2		37.0-146		11/15/2017 13:56	WG1042314



Volatile Organic Compounds (GC/MS) by Method 8260C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Benzene	ND		1.00	1	11/12/2017 22:35	WG1041803
1,2-Dichloroethane	ND		1.00	1	11/12/2017 22:35	WG1041803
Ethylbenzene	ND		1.00	1	11/12/2017 22:35	WG1041803
Isopropylbenzene	ND		1.00	1	11/12/2017 22:35	WG1041803
Methyl tert-butyl ether	ND		1.00	1	11/12/2017 22:35	WG1041803
Toluene	ND		1.00	1	11/12/2017 22:35	WG1041803
1,2,4-Trimethylbenzene	ND		1.00	1	11/12/2017 22:35	WG1041803
1,3,5-Trimethylbenzene	ND		1.00	1	11/12/2017 22:35	WG1041803
Xylenes, Total	ND		3.00	1	11/12/2017 22:35	WG1041803
(S) Toluene-d8	112		80.0-120		11/12/2017 22:35	WG1041803
(S) Dibromofluoromethane	106		76.0-123		11/12/2017 22:35	WG1041803
(S) 4-Bromofluorobenzene	102		80.0-120		11/12/2017 22:35	WG1041803

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Method Blank (MB)

(MB) R3265989-1 11/15/17 21:33

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Lead,Dissolved	U		0.240	2.00

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3265989-2 11/15/17 21:38 • (LCSD) R3265989-3 11/15/17 21:43

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Lead,Dissolved	50.0	50.9	48.3	102	97	80-120			5	20

L951041-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L951041-07 11/15/17 21:49 • (MS) R3265989-5 11/15/17 21:59 • (MSD) R3265989-6 11/15/17 22:05

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Lead,Dissolved	50.0	0.923	49.3	49.4	97	97	1	75-125			0	20



Method Blank (MB)

(MB) R3265895-2 11/12/17 21:36

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Benzene	U		0.331	1.00
1,2-Dichloroethane	U		0.361	1.00
Ethylbenzene	U		0.384	1.00
Isopropylbenzene	U		0.326	1.00
Methyl tert-butyl ether	U		0.367	1.00
Toluene	U		0.412	1.00
1,2,4-Trimethylbenzene	U		0.373	1.00
1,3,5-Trimethylbenzene	U		0.387	1.00
Xylenes, Total	U		1.06	3.00
(S) Toluene-d8	110			80.0-120
(S) Dibromofluoromethane	104			76.0-123
(S) 4-Bromofluorobenzene	103			80.0-120

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3265895-1 11/12/17 20:58

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	25.0	23.5	94.0	69.0-123	
1,2-Dichloroethane	25.0	25.5	102	67.0-126	
Ethylbenzene	25.0	23.5	94.0	77.0-120	
Isopropylbenzene	25.0	23.2	92.8	75.0-120	
Methyl tert-butyl ether	25.0	24.8	99.0	64.0-123	
Toluene	25.0	23.9	95.7	77.0-120	
1,2,4-Trimethylbenzene	25.0	23.3	93.2	75.0-120	
1,3,5-Trimethylbenzene	25.0	24.4	97.7	75.0-120	
Xylenes, Total	75.0	72.4	96.5	77.0-120	
(S) Toluene-d8			108	80.0-120	
(S) Dibromofluoromethane			105	76.0-123	
(S) 4-Bromofluorobenzene			102	80.0-120	

L949978-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L949978-06 11/13/17 01:51 • (MS) R3265895-3 11/13/17 04:48 • (MSD) R3265895-4 11/13/17 05:08

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	25.0	ND	25.4	23.9	102	95.6	1	34.0-147			6.08	20
1,2-Dichloroethane	25.0	ND	26.1	24.6	104	98.3	1	47.0-141			5.97	20
Ethylbenzene	25.0	ND	25.6	25.2	103	101	1	42.0-147			1.75	20



L949978-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L949978-06 11/13/17 01:51 • (MS) R3265895-3 11/13/17 04:48 • (MSD) R3265895-4 11/13/17 05:08

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Isopropylbenzene	25.0	ND	24.9	24.3	99.7	97.3	1	48.0-141			2.52	20
Methyl tert-butyl ether	25.0	ND	24.2	23.4	96.6	93.7	1	42.0-142			3.14	20
Toluene	25.0	ND	25.8	24.7	103	98.7	1	42.0-141			4.58	20
1,2,4-Trimethylbenzene	25.0	ND	24.8	23.5	99.1	94.0	1	41.0-146			5.32	20
1,3,5-Trimethylbenzene	25.0	ND	25.9	25.2	103	101	1	44.0-143			2.54	20
Xylenes, Total	75.0	ND	78.0	73.4	104	97.9	1	41.0-148			6.08	20
(S) Toluene-d8					112	109		80.0-120				
(S) Dibromofluoromethane					107	106		76.0-123				
(S) 4-Bromofluorobenzene					104	106		80.0-120				

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3265478-1 11/14/17 08:13

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	ug/l		ug/l	ug/l
Ethylene Dibromide	U		0.00240	0.0100

L949980-03 Original Sample (OS) • Duplicate (DUP)

(OS) L949980-03 11/14/17 09:00 • (DUP) R3265478-3 11/14/17 08:48

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	ug/l	ug/l		%		%
Ethylene Dibromide	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3265478-4 11/14/17 10:45 • (LCSD) R3265478-6 11/14/17 12:54

	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Analyte	ug/l	ug/l	ug/l	%	%	%			%	%
Ethylene Dibromide	0.250	0.259	0.283	103	113	60.0-140			9.13	20

L949980-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L949980-02 11/14/17 08:37 • (MS) R3265478-2 11/14/17 08:25

	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Analyte	ug/l	ug/l	ug/l	%		%	
Ethylene Dibromide	0.100	ND	0.114	114	1	72.0-146	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Method Blank (MB)

(MB) R3265765-3 11/15/17 06:49

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Anthracene	U		0.0140	0.0500
Benzo(a)anthracene	0.00661	J	0.00410	0.0500
Benzo(a)pyrene	U		0.0116	0.0500
Benzo(b)fluoranthene	U		0.00212	0.0500
Benzo(g,h,i)perylene	U		0.00227	0.0500
Chrysene	U		0.0108	0.0500
Fluorene	U		0.00850	0.0500
Naphthalene	U		0.0198	0.250
Phenanthrene	U		0.00820	0.0500
Pyrene	U		0.0117	0.0500
(S) Nitrobenzene-d5	51.5			31.0-160
(S) 2-Fluorobiphenyl	114			48.0-148
(S) p-Terphenyl-d14	95.7			37.0-146

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3265765-1 11/15/17 05:58 • (LCSD) R3265765-2 11/15/17 06:23

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Anthracene	2.00	2.03	2.11	102	105	64.0-142			3.67	20
Benzo(a)anthracene	2.00	1.83	1.99	91.3	99.6	59.0-134			8.74	20
Benzo(a)pyrene	2.00	1.50	1.70	75.2	85.1	61.0-145			12.3	20
Benzo(b)fluoranthene	2.00	1.63	1.69	81.5	84.3	57.0-136			3.38	20
Benzo(g,h,i)perylene	2.00	1.40	1.68	69.9	83.8	54.0-140			18.0	20
Chrysene	2.00	1.82	2.00	91.0	99.9	63.0-140			9.23	20
Fluorene	2.00	2.20	2.24	110	112	64.0-129			1.55	20
Naphthalene	2.00	2.08	2.11	104	105	68.0-129			1.54	20
Phenanthrene	2.00	2.02	2.03	101	102	62.0-132			0.502	20
Pyrene	2.00	1.73	1.89	86.7	94.4	58.0-156			8.44	20
(S) Nitrobenzene-d5				51.6	53.0	31.0-160				
(S) 2-Fluorobiphenyl				114	118	48.0-148				
(S) p-Terphenyl-d14				74.2	88.0	37.0-146				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier Description

J	The identification of the analyte is acceptable; the reported value is an estimate.
---	---

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE**.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Connecticut	PH-0197	North Carolina ¹	DW21704
Florida	E87487	North Carolina ²	41
Georgia	NELAP	North Dakota	R-140
Georgia ¹	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky ¹	90010	South Dakota	n/a
Kentucky ²	16	Tennessee ¹⁴	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

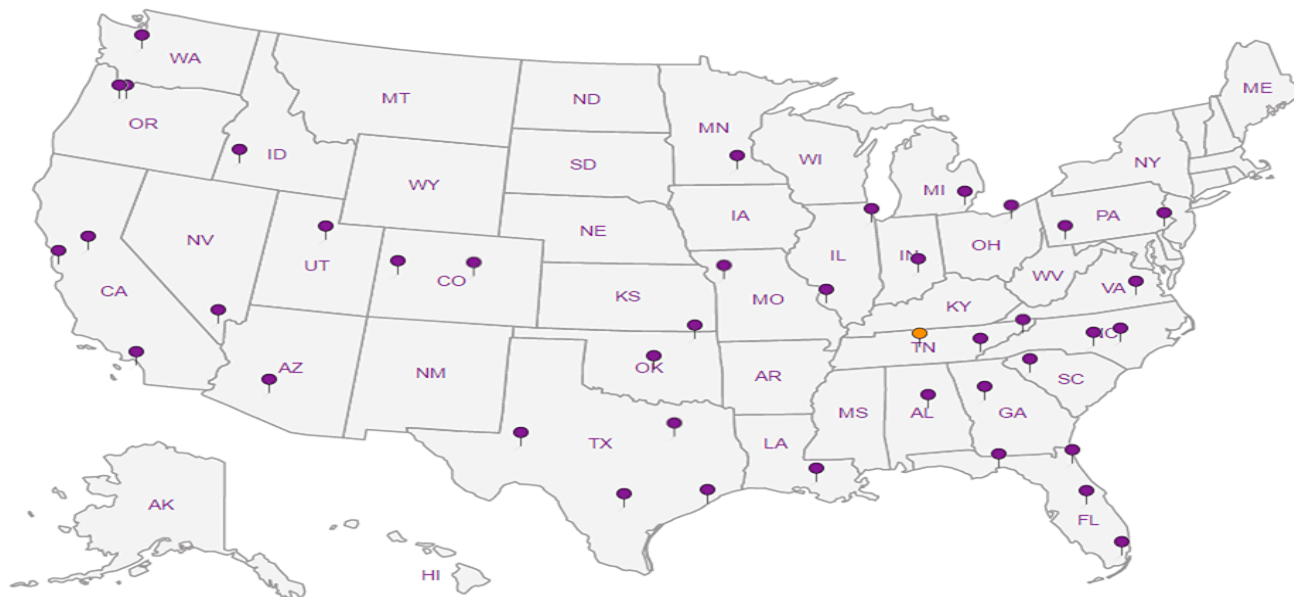
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ^{n/a} Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Aquaterra Technologies, Inc. - S/E

122 South Church Street
West Chester, PA 19382

Report to:
Michael Sarcinello

Billing Information:

Accounts Payable
122 S. Church St.
West Chester, PA 19382

Email To: ms@aquaterra-tech.com

Project Description: **A012 Deloach Dock**

City/State Collected: **Philadelphia, PA**

Phone: **610-431-5733**

Client Project #

Lab Project #
SUNAQUA-SHORT

Fax:

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

Rush? (Lab MUST Be Notified)

Quote #

Immediately Packed on Ice **N** **Y** **X**

Same Day Five Day
Next Day 5 Day (Rad Only)
Two Day 10 Day (Rad Only)
Three Day

Date Results Needed

No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Analysis / Container / Preservative
							Dissolved Pb 250mlHDPE-NoPres
							PAHSIMLVID 40mlAmb-NoPres-WT
							SV8011 40mlClr-NaThio
							V8260C 40mlAmb-HCl
S-405-20171108-W9	g	GW		11/8/17	1000	8	X X X X X
S-426-20171108-W9	g	GW		11/8/17	1015	8	X X X X X
S-427-20171108-W9	g	GW		11/8/17	1030	8	X X X X X
		GW				8	X X X X X
TRIP BLANK	g	GW				1	X

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other

Remarks:

Samples returned via:
UPS FedEx Courier **SWA**

Tracking #

pH Temp

Flow Other

Sample Receipt Checklist

COC Seal Present/Intact: **NP** **Y** **N**
COC Signed/Accurate: **Y** **N**
Bottles arrive intact: **Y** **N**
Correct bottles used: **Y** **N**
Sufficient volume sent: **Y** **N**
If Applicable
VOA Zero Headspace: **Y** **N**
Preservation Correct/Checked: **Y** **N**

Relinquished by: (Signature)

Date: **11/8/17** Time: **1350**

Received by: (Signature)

Aquaterra Refrigerator

Trip Blank Received: **Yes / No**
HA / MeOH
TBR

Relinquished by: (Signature)

Date: **11/9/17** Time: **1510**

Received by: (Signature)

[Signature]

Temp: **4.37** °C Bottles Received: **25**

If preservation required by Login: Date/Time

Relinquished by: (Signature)

Date: Time:

Received for lab by: (Signature)

Chauhan 860

Date: **11/10/17** Time: **8:45**

Hold:

Condition:
NCF **OK**

Chain of Custody Page **1** of **1**



12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859



L# **949980**

T# **E024**

Acctnum: **SUNAQUA**

Template: **T129700**

Prelogin: **P625906**

TSR: **134 - Mark W. Beasley**

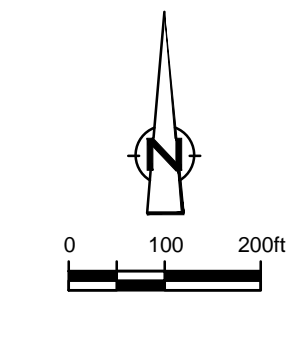
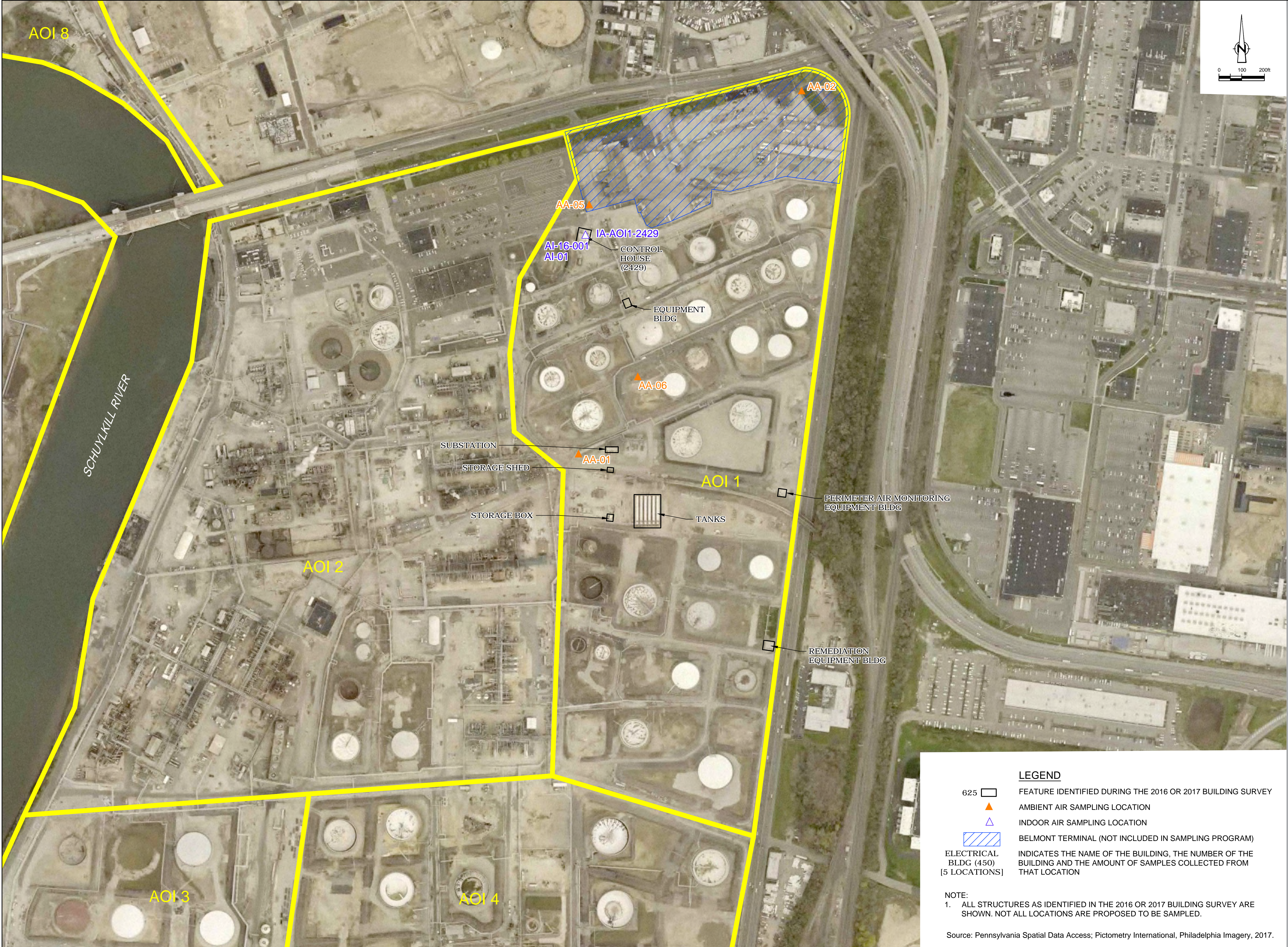
PB: **113-175**

Shipped Via: **FedEX Ground**

Remarks Sample # (lab only)

-01
-02
-03
-04

14 & 15



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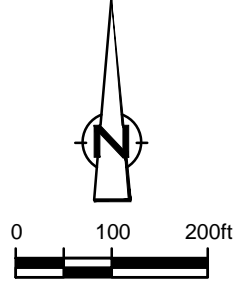
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No.	Issue	Drawn	Approved	Date
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Check		Check		
Project Manager	PM	Date	Nov 27, 2017	
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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 1

Sheet No.
FIGURE 1



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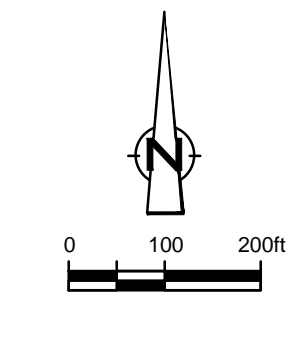
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Drafting		Design		
Check		Check		
Project Manager	PM	Date	Nov 30, 2017	
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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 2

Sheet No.

FIGURE 2



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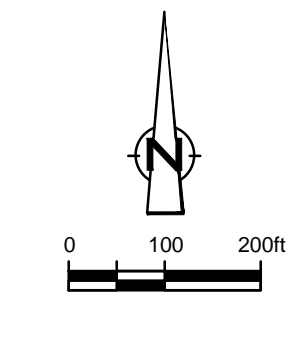
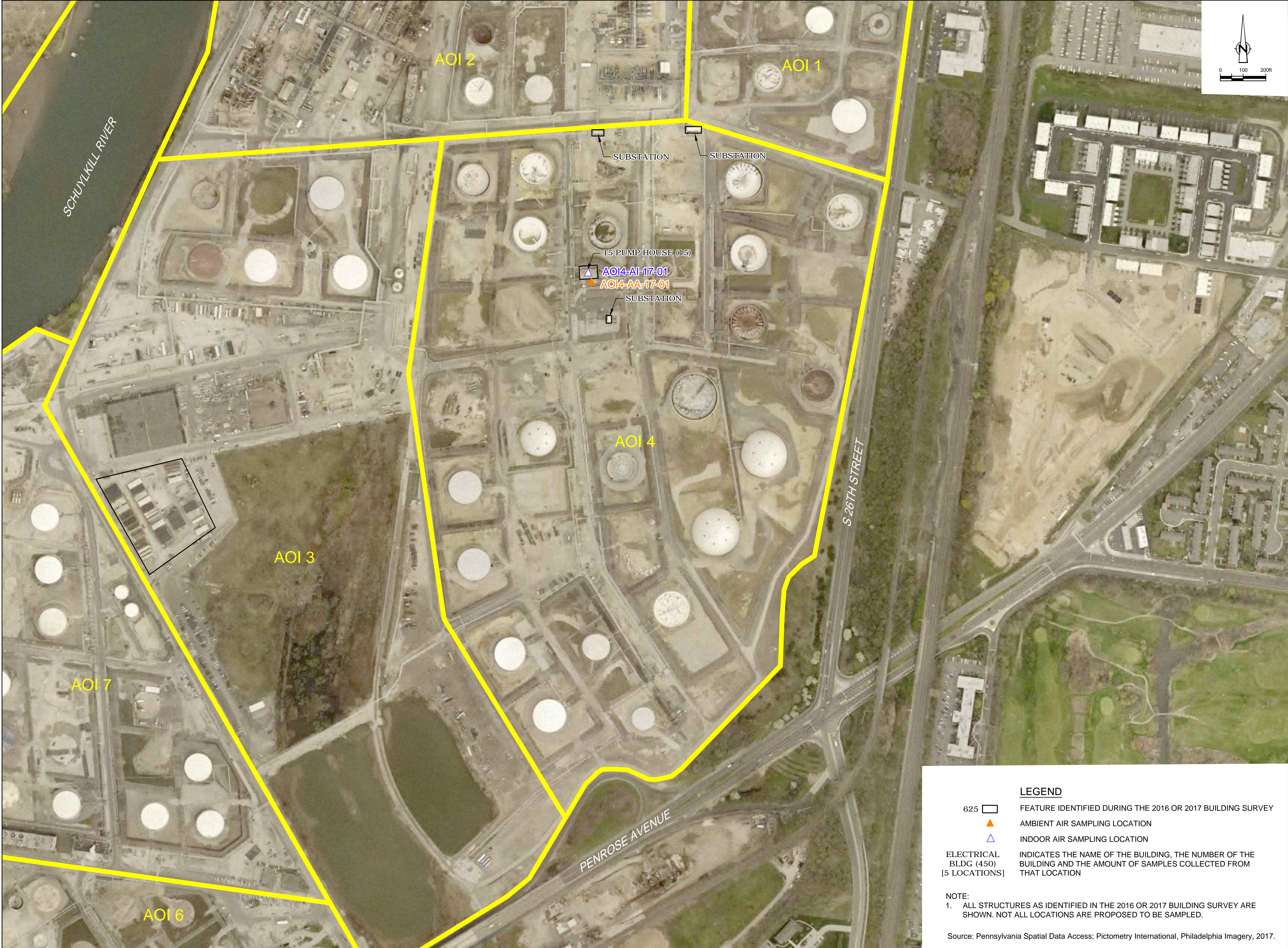
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		0 1"		

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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 3

Sheet No.
FIGURE 3



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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 4

Sheet No.
FIGURE 4



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Drafting Check Design Check

Project Manager **PM** Date **Nov 27, 2017**

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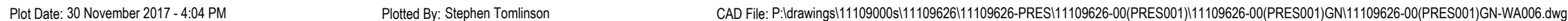
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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 6

Sheet No.

FIGURE 6



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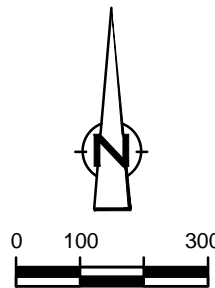
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Drafting Check	Design Check
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Title	BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 8
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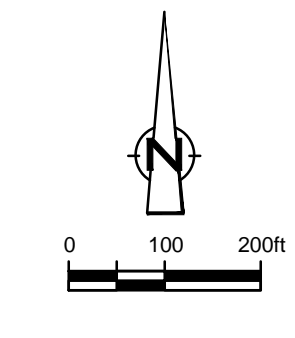
Sheet No.	
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FIGURE 8

- LEGEND**
- 625 FEATURE IDENTIFIED DURING THE 2016 OR 2017 BUILDING SURVEY
 - AMBIENT AIR SAMPLING LOCATION
 - INDOOR AIR SAMPLING LOCATION
 - ELECTRICAL BLDG (450) [5 LOCATIONS] INDICATES THE NAME OF THE BUILDING, THE NUMBER OF THE BUILDING AND THE AMOUNT OF SAMPLES COLLECTED FROM THAT LOCATION

NOTE:
1. ALL STRUCTURES AS IDENTIFIED IN THE 2016 OR 2017 BUILDING SURVEY ARE SHOWN. NOT ALL LOCATIONS ARE PROPOSED TO BE SAMPLED.

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



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Project Manager	PM	Date	Nov 27, 2017	
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Title
BUILDING SURVEY AND INDOOR AIR AND AMBIENT AIR SAMPLING LOCATIONS - AOI 9

Sheet No.

FIGURE 9

625

ELECTRICAL BLDG (450)

[5 LOCATIONS]

LEGEND

FEATURE IDENTIFIED DURING THE 2016 OR 2017 BUILDING SURVEY

AMBIENT AIR SAMPLING LOCATION

INDOOR AIR SAMPLING LOCATION

INDICATES THE NAME OF THE BUILDING, THE NUMBER OF THE BUILDING AND THE AMOUNT OF SAMPLES COLLECTED FROM THAT LOCATION

NOTE:

1. ALL STRUCTURES AS IDENTIFIED IN THE 2016 OR 2017 BUILDING SURVEY ARE SHOWN. NOT ALL LOCATIONS ARE PROPOSED TO BE SAMPLED.

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

Potentially Occupied Structure/Building Inventory Philadelphia Energy Solutions Facility												
AOI	Structure ID	Structure Type	Foundation Type	Foundation Contacting Ground	Fully Enclosed	Occupied for Shift Use	Includes Office	Structure Notes/Description/Use	Engineering Controls	Structure is of Concern for VI	Has IA Been Sampled	Proposed Additional Activity
1	Control House 2429	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
2	00 Building-CCR	Building	Raised Slab	Y	Y	Yes	Y	Central Control room	Under Positive Pressure	No - Raised	No	None
2	Short Pier 11	Building	Slab	Y	Y	Yes	Y	Building on short pier near Schuylkill River	N/A	Yes	Yes	None
2	Control House 2435	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
2	Maintenance Building 2448	Building	Slab	Y	Y	Yes	N	Maintenance Building	N/A	Yes	Yes	None
2	Old Control House 2520	Building	Slab	Y	Y	No	Y	Former Block House	N/A	No	Yes	None
2	Point Breeze Lab 3316	Building	Slab	Y	Y	Yes	Y	contains internal sources	N/A	Yes	Yes	None
2	Point Breeze Main Office Building 4210	Building	Slab	Y	Y	Yes	Y	Employees storing samples for/from the lab	N/A	Yes	Yes	None
2	Point Breeze Refinery Hall 5917	Building	Slab	Y	Y	Yes	Y	Refinery Hall	N/A	Yes	Yes	None
2	5920 Bio Area	Building	Slab	Y	Y	No	Y	Former BFW blockhouse - replaced by 6628	N/A	Yes	Yes	None
2	5933 Elevated Deloch Dock	Building	Slab	Y	N	Yes	Y	Elevated	N/A	No	Yes	None
2	Control Room 6624	Building	Slab	Y	Y	Yes	Y	Blast resistant	N/A	Yes	Yes	None
2	210 Unit Control Room 6228	Building	Slab	Y	Y	Yes	Y	Blast resistant - new 210/BFW blockhouse	N/A	Yes	Yes	None
2	14 Service Building	Building	Slab	Y	Y	No	N	Service building - occupancy not allowed	N/A	No	No	None
2	Old 210 Blockhouse 1465	Building	Slab	Y	Y	No	N	Former 210 unit blockhouse (now in 6628)	N/A	No	No	None
2	Bldg 2201	Building	Slab	Y	Y	Yes	Y	Old credit union building	Active subsurface mitigation system	No	No	None
2	2246	Building	Elevated	N	Y	No	N	Enclosure centrifuge building	N/A	No	No	None
2	Bldg 2449	Building	Slab	Y	Y	No	N	Change house building	N/A	No	No	None
2	2460	Building	Slab	Y	Y	No	N	Field shop building	N/A	No	No	None
2	New Control Room 6621	Blast Proof	On Ground	Y	Y	Yes	Y	New blast proof control room - replaced old 2520	N/A	No	No	None
2	2588 Blockhouse	Building	Slab	Y	Y	Yes	Y	Control blockhouse building	Under Positive Pressure	No	No	Additional Evaluation
2	2589	Building	Slab	Y	Y	No	N	Switch gear electrical building	Under Positive Pressure	No	No	None
2	2594/2595	Building	Slab	Y	Y	Yes	Y	Switch gear building and control room blockhouse	N/A	Yes	No	Sample
2	2597	Building	Slab	Y	N	No	N	Garage truck/former maintenance building, currently out of service	N/A	No	No	None
2	2612	Building	Slab	Y	Y	No	Y	Old blockhouse building that was turned into acid lab testing	Under Positive Pressure	No	No	None
2	Warehouse	Building	Elevated	N	Y	Yes	N	Warehouse #3 barrel building	N/A	No	No	None
2	6612	Blast Proof	Elevated	N	Y	Yes	Y	Blast proof pre-fab enclosure for permit writing	N/A	No	No	None
2	SE 887 Blockhouse	Building	Elevated	N	Y	Yes	Y	Blockhouse with substation on top	N/A	No	No	None
2	Gas Shack	Building	Slab	Y	N	Yes	N	Fuel dispensing building	N/A	No	No	None
2	Restroom and Storage Bldg	Building	Slab	Y	Y	No	N	Storage area and restroom	N/A	No	No	None
2	Filter Building	Building	Slab	Y	Y	No	N	Filter building west of building 2435	N/A	No	No	None
2	Instrument Rooms	Building	Slab	Y	N/Y	No	N	Equipment buildings	N/A	No	No	None
2	Cooling Tower Equipment Room	Building	Slab	Y	Y	No	N	Cooling tower equipment storage	N/A	No	No	None
2	Process Equipment Building	Building	Slab	Y	N	No	N	Process equipment building	N/A	No	No	None
2	2459 Bathroom	Building	Slab	Y	Y	No	N	Restroom building	N/A	No	No	None
3	New Shower	Shower	Elevated	N	N	Yes	N	Shower for people to decontaminate	N/A	No	No	None
3	Central Warehouse 3324	Building	Elevated	N	Y	Yes	N	Elevated	N/A	No	Yes	None
3	Contractor Process Center	Trailer	Elevated	N	Y	Yes	Y	Contractor Process Center enclosed by perforated skirts	N/A	Yes	Yes	None
3	Contractor Trailers (north of Central Warehouse)	Trailer	N/A	N	Skirt	Yes	Y	Some trailers fully or partially enclosed by skirt. Skirts are solid, but have significant openings/gaps between segments or where i-beams extend through skirt that vents to outdoors.	N/A	Yes	Yes	None
3	Gate Shack	GH	Slab	Y	N	Yes	N	Gate/guard shack that is open to the outdoors	N/A	No	No	None
3	Contractor Trailers (south of Central Warehouse)	Trailer	N/A	N	Skirt	Yes	Y	Most trailers fully or partially enclosed by skirt. Skirts are all perforated, soffit-type, that vents to outdoors.	N/A	Yes	Yes	None
4	15 Pump House	Building	Slab	Y	Y	Yes	N	Enclosed area for pumps	N/A	Yes	Yes	None
5	Wharf Dock Office 501	Building	Slab	Y	Y	Yes	Y	Dock office near Schuylkill River	N/A	Yes	Yes	None

Potentially Occupied Structure/Building Inventory Philadelphia Energy Solutions Facility												
AOI	Structure ID	Structure Type	Foundation Type	Foundation Contacting Ground	Fully Enclosed	Occupied for Shift Use	Includes Office	Structure Notes/Description/Use	Engineering Controls	Structure is of Concern for VI	Has IA Been Sampled	Proposed Additional Activity
5	GP Scale House 645	Building	Slab	Y	Y	No	N	Locked - "Not Intended for Occupancy" on door	N/A	No	No	None
5	Blending & Shipping Office 517	Building	Slab	Y	Y	Yes	Y		N/A	Yes	Yes	None
5	Wharf Dock Office 526	Building	Slab	Y	Y	Yes	Y	Dock office near Schuylkill River	N/A	Yes	Yes	None
5	625	Building	Slab	Y	Y	Yes	Y	Canteen/Locker and Permit Building	N/A	Yes	Yes	None
5	727 Lube/Oil Disposal	Building	Slab	Y	Y	No	Y	Lube/oil disposal	N/A	No	No	None
5	Blending & Shipping Trailers 34A/34B	Trailer	Elevated	Y	Y	Yes	Y	Trailers that serve as blending and shipping offices and have ventilated skirts	N/A	No	Yes	None
5	Boat House	Building	Slab	Y	Y	No	N	Boathouse	N/A	No	No	None
5	GP dock 2	Building	Slab	Y	Y	No	Y	GP dock 2	N/A	No	Yes	None
5	CR Block house	Building	Slab	Y	Y	No	Y	Used only during barge unloading	N/A	No	No	None
5	Number 2 Pump House/ Storage	Building	Slab	Y	Y	No	N	Number 2 pump house that also includes space for storage	N/A	No	No	None
5	Warehouse 2 - 620	Building	Elevated	N	Y	No	N	Ventilated crawl space and open warehouse doors	ventilated	No	No	None
5	Old STF Blockhouse	Building	Slab	Y	Y	No	N	Old south tank farm blockhouse	N/A	No	No	None
5	Unoccupied Building 138	Building	Slab	Y	Y	No	N	Unoccupied building with no electricity - locked	N/A	No	No	None
5	Guard House	GH	Slab	Y	N	Yes	N	Gate/guard shack	N/A	No	No	None
5	Warehouse 1	Building	Slab	Y	Y	No	N	Windows are missing and building ventilated to outdoor air.	ventilated	No	No	None
6	Control Room 739	Building	Slab	Y	Y	Yes	Y	Control Room	N/A	Yes	Yes	None
6	Building 6636	Building	Slab	Y	Y	Yes	Y	Scale House	N/A	Yes	Yes	None
6	Trade Shops 178	Building	Slab	Y	Y	Yes	Y	Trade shop	N/A	Yes	Yes	None
6	24 Gate Bldg 295	Building	Slab	Y	Y	Yes	Y	Office building	N/A	Yes	Yes	None
6	NTF Control Room 475	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
6	GP Main Office 650	Building	Slab	Y	Y	Yes	Y	Office building	N/A	Yes	Yes	None
6	GP Training Building 651	Building	Slab	Y	Y	Yes	Y	Training Building	N/A	Yes	Yes	None
6	Control Room 6627	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
6	Carpenter Shop 726	Building	Slab	Y	Y	Yes	Y	Carpenter Shop	N/A	Yes	Yes	None
6	WTP Control Room 745	Building	Slab	Y	Y	Yes	N	WTP control building	N/A	Yes	Yes	None
6	Lab/Bottle Washing 163	Building	Slab	Y	N	Yes	Y	Refinery laboratory, open and missing windows	N/A	No	No	None
6	Paint Shop 701	Building	Slab	Y	Y	No	N	Paint shop storage	N/A	No	No	None
6	Office	Building	Slab	Y	Y	No	Y	Office, blast resistant modular building	N/A	No	No	None
6	Former Boiler House #2	Building	Slab	Y	Y	No	N	Boiler house	N/A	No	No	None
6	Capital Projects Tank Group Trailer	Trailer	N/A	N	Y	Yes	Y	Office; Ventilatted trailer skirts	N/A	No	No	None
6	Control room	Building	Elevated	N	Y	Yes	Y	Control room SE of the boiler house	N/A	No	No	None
6	Boiler House #3	Building	Slab	Y	Y	No	N	Boiler house	N/A	No	No	None
6	Former Locker House 550	Building	Slab	Y	Y	No	N	Former locker building	N/A	No	No	None
6	Insulation Shop 265	Building	Slab	Y	Y	No	N	Insulation shop storage	N/A	No	No	None
7	Old Blockhouse 1232	Building	Slab	Y	Y	No	Y	Old blockhouse	N/A	No	No	None
7	Pland Pump House 380	Building	Slab	Y	Y	No	N	Plant pump house	N/A	No	No	None
7	BAM 385	Building	Slab	Y	Y	No	Y	Former refinery office building unit foreman, planners, and engineers	N/A	No	No	None
7	Cooling Tower Bldg 430	Building	Elevated	N	N	No	N	Cooling water pump house	N/A	No	No	None
7	440 Building	Building	Slab	Y	Y	Yes	Y	Shops/offices	N/A	Yes	Yes	None
7	Firehouse 442	Building	Slab	Y	Y	Yes	Y	Fire house	N/A	Yes	Yes	None
7	Electrical Building 450	Building	Slab	Y	Y	Yes	N	Electrical building	N/A	Yes	Yes	None
7	Former Control Room 463	Building	Slab	Y	Y	No	N	Former Control Room	N/A	No	No	None
7	Workshop 485	Building	Slab	Y	Y	No	Y	Unoccupied maintenance building	N/A	No	No	None
7	Catalyst Storage & Handling 488	Building	Slab	Y	Y	No	N	Catalyst storage and handling and sour water stripper unit maint storage building	N/A	No	No	None
7	Cooling Water Pump House 491	Building	Slab	Y	Y	No	N	Cooling water pump house	N/A	No	No	None
7	Locker Room 594	Building	Slab	Y	Y	No	N	Locker House	N/A	No	No	None
7	Canteen Bldg 595	Building	Slab	Y	Y	No	N	Canteen building	N/A	No	Yes	None
7	Control Room 6622	Building	Slab	Y	Y	Yes	Y	Control room, blast resistant	N/A	Yes	Yes	None
7	Control Room 6625	Building	Slab	Y	Y	Yes	Y	Control room, blast resistant	N/A	Yes	Yes	None
7	Control Room 6626	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
7	6651 Electric Building	Building	Elevated	Y	Y	No	N	Near building 6622	N/A	No	No	None
7	WTP Control House 711	Building	Slab	Y	Y	Yes	Y	WTP control house	N/A	Yes	Yes	None

Potentially Occupied Structure/Building Inventory Philadelphia Energy Solutions Facility												
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7	Storage 718	Building	Slab	Y	Y	No	N	Storage building	N/A	No	No	None
7	Old Control Room 720	Building	Slab	Y	Y	No	Y	Former Control Room	Under Positive Pressure	No	No	None
7	WTP Equipment Bldg 714	Building	Slab	Y	N	No	N	Waste water disposal & treating	N/A	No	No	None
7	Break Area	Building	Elevated	N	Y	Yes	Y	Permit building, no subgrade utilities, blast resistant	N/A	No	No	None
7	Trailer with no skirt	Trailer	N/A	N	N	Yes	Y	Handex trailer near WTP buildings	N/A	No	No	None
7	Unused Building	Building	Slab	Y	Y	No	N	Unused building	N/A	No	No	None
7	Pump House	Building	Slab	Y	N	No	N	Brick building around some pumping equipment with broken windows	N/A	No	No	None
7	AmQuip Trailer	Trailer	N/A	N	Y	Yes	Y	Am-Quip rental equipment trailer with corrugated skirt	N/A	No	No	None
8	North Yard Scale House 27 (old)	Building	Slab	Y	Y	No	N	Scale house for trucks	N/A	Yes	Yes	None
8	North Yard Scale House 3326 (new)	Building	Slab	Y	Y	Yes	Y	New scale house for trucks	N/A	Yes	Yes	None
8	6641/6642 Trailer Offices	Trailer	N/A	N	Skirt	Yes	Y	Offices	N/A	Yes	Yes	None
8	22 Boiler House	Building	Slab	Y	N	No	Y	Boiler house with significant openings	N/A	No	No	None
8	Bldg 209/906	Building	Slab	Y	Y	No	N	Old unused building	N/A	No	No	None
8	Trailers South of Railroad	Trailer	N/A	N	N	No	N	Unskirted trailers south of the rail road tracks	N/A	No	No	None
8	Trailers North of Railroad	Trailer	N/A	N	Skirt	Yes	Y	Loosely skirted trailers with significant openings north of the rail road tracks	N/A	No	No	None
8	Elevated Building	Building	Elevated	N	Y	No	N	North of the railroad tracks	N/A	No	No	None
8	Dock Shack	Shack	Raised Slab	Y	Y	No	N	Elevated shack at docks	N/A	No	No	None
8	Equipment building	Building	Slab	Y	Y	No	N	Equipment storage building	N/A	No	No	None
8	Electrical Building 6412	Building	Slab	Y	Y	No	N	Electrical building	N/A	No	No	None
8	PHL FD Marine Unit	Building	Slab	Y	Y	Yes	Y	PHL fire department building	N/A	Yes	Yes	None
9	SR16	Building	Slab	Y	Y	No	N	Fire truck garage	N/A	No	No	None
9	Guard Shack SR18	GH	Elevated	N	Y	Yes	N	Gate/guard shack	N/A	No	No	None
9	SR3	Building	Slab	Y	Y	No	N	Dye building	N/A	No	No	None
9	SR4	Building	Slab	Y	Y	No	N	Locker room / garage	N/A	No	No	None
9	SR7	Building	Slab	Y	Y	No	N	Maintenance shop	N/A	No	No	None
9	SRTF Main Pump House SR1	Building	Slab	Y	Y	Yes	Y	Control room	N/A	Yes	Yes	None
9	SR14	Building	Slab	Y	Y	Yes	Y	Office	N/A	Yes	Yes	None
9	SR19	Building	Slab	Y	Y	Yes	Y	Office area for blending	N/A	Yes	Yes	None
9	SR2	Building	Slab	Y	Y	Yes	Y	Office	N/A	Yes	Yes	None
9	SRFT Propane Loading SR9	Building	Slab	Y	Y	Yes	Y	Office for loading	N/A	Yes	Yes	None

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

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Main Office Bldg (safety office)					PB Main Office Bldg(medical area)					PB Main Office Bldg (1st floor lobby)				
									Sample	AOI2 SAMPLE 29					AOI2 SAMPLE 30					AOI2 SAMPLE 31				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	0.99		0.66	0.2	1.32	1.1		0.75	0.23	1.5	0.94		0.84	0.25	1.68
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	0.66	0.2	1.32	ND	U	0.75	0.23	1.5	ND	U	0.84	0.25	1.68
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	0.66	0.18	1.32	ND	U	0.75	0.21	1.5	ND	U	0.84	0.24	1.68
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	0.66	0.2	1.32	ND	U	0.75	0.23	1.5	ND	U	0.84	0.25	1.68
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.6		0.66	0.18	1.32	1.2		0.75	0.21	1.5	1.3		0.84	0.24	1.68
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	0.95		0.66	0.2	1.32	ND	U	0.75	0.23	1.5	ND	U	0.84	0.25	1.68
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.66	0.18	1.32	ND	U	0.75	0.21	1.5	ND	U	0.84	0.24	1.68
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.66	0.18	1.32	ND	U	0.75	0.21	1.5	ND	U	0.84	0.24	1.68
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	0.66		1.32	ND	U	0.75		1.5	ND	U	0.84		1.68
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	6.5		0.66	0.18	1.32	4.4		0.75	0.21	1.5	4.8		0.84	0.24	1.68
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	4.4		0.66	0.21	1.32	3.17		0.75	0.24	1.5	3.41		1.7	0.49	1.68

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

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

10

 - Result exceeds PA VI

10

 - Result exceeds 1/10th PA VI

10

 - Result exceeds OSHA PEL TWA

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁵)

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁶)

10

 - Result exceeds NIOSH REL

10

 - Result exceeds ACGIH TLVs

15

 - MDL or RL exceeds standard

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									Sample	AOI2 SAMPLE 32					AOI2 SAMPLE 33					AOI2 SAMPLE 34				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	ND	U	0.98	0.29	1.96	0.97		0.65	0.2	1.3	1.1		0.77	0.23	1.53
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	0.98	0.29	1.96	ND	U	0.65	0.2	1.3	ND	U	0.77	0.23	1.53
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	0.98	0.27	1.96	ND	U	0.65	0.18	1.3	ND	U	0.77	0.21	1.53
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	0.98	0.29	1.96	ND	U	0.65	0.2	1.3	ND	U	0.77	0.23	1.53
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.3		0.98	0.27	1.96	1.4		0.65	0.18	1.3	1.3		0.77	0.21	1.53
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	0.98	0.29	1.96	0.93		0.65	0.2	1.3	0.89		0.77	0.23	1.53
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.98	0.27	1.96	ND	U	0.65	0.18	1.3	ND	U	0.77	0.21	1.53
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.98	0.27	1.96	ND	U	0.65	0.18	1.3	ND	U	0.77	0.21	1.53
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	0.98		1.96	ND	U	0.65		1.3	<u>1.2</u>		0.77		1.53
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	5.2		0.98	0.27	1.96	5		0.65	0.18	1.3	4.9		0.77	0.21	1.53
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	2.5		2	0.57	1.96	4.6		1.3	0.38	1.3	4.6		1.5	0.44	1.53

Note:
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 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁶)

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 - Result exceeds NIOSH REL

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 - Result exceeds ACGIH TLVs

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 - MDL or RL exceeds standard

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Philadelphia Energy Solutions Refining Complex
Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Main Office Bldg, (2nd floor center file room)					PB Main Office Bldg (2nd floor east conference room)					PB Lab (west lab)				
									Sample	AOI2 SAMPLE 35					AOI2 SAMPLE 36					AOI2 SAMPLE 37				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	0.95		0.73	0.22	1.46	0.78		0.73	0.22	1.46	3.9		0.79	0.24	1.57
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	0.73	0.22	1.46	ND	U	0.73	0.22	1.46	ND	U	0.79	0.24	1.57
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	0.73	0.2	1.46	ND	U	0.73	0.2	1.46	ND	U	0.79	0.22	1.57
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	0.73	0.22	1.46	ND	U	0.73	0.22	1.46	1.4		0.79	0.24	1.57
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.2		0.73	0.2	1.46	0.94		0.73	0.2	1.46	11		0.79	0.22	1.57
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1		0.73	0.22	1.46	0.74		0.73	0.22	1.46	11		0.79	0.24	1.57
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.73	0.2	1.46	ND	U	0.73	0.2	1.46	1.3		0.79	0.22	1.57
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.73	0.2	1.46	ND	U	0.73	0.2	1.46	ND	U	0.79	0.22	1.57
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	0.75		0.73		1.46	1.5		0.73		1.46	ND	U	0.79		1.57
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	5.9		0.73	0.2	1.46	4		0.73	0.2	1.46	88		0.79	0.22	1.57
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	5.1		1.5	0.42	1.46	3.47		1.5	0.42	1.46	51.1		1.6	0.46	1.57

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

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

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

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Lab (2nd floor office)					PB Refinery Hall (2nd floor conference room)					PB Refinery Hall (2nd floor east wing)				
									Sample	AOI2 SAMPLE 38					AOI2 SAMPLE 39					AOI2 SAMPLE 40				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	11		0.75	0.22	1.49	1.1		0.83	0.25	1.66	1.5		0.65	0.2	1.3
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	0.75	0.22	1.49	ND	U	0.83	0.25	1.66	ND	U	0.65	0.2	1.3
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	0.75	0.21	1.49	ND	U	0.83	0.23	1.66	ND	U	0.65	0.18	1.3
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	3.9		0.75	0.22	1.49	ND	U	0.83	0.25	1.66	ND	U	0.65	0.2	1.3
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	8.4		0.75	0.21	1.49	1.4		0.83	0.23	1.66	2		0.65	0.18	1.3
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	6		0.75	0.22	1.49	1.1		0.83	0.25	1.66	1.4		0.65	0.2	1.3
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	2.6		0.75	0.21	1.49	ND	U	0.83	0.23	1.66	ND	U	0.65	0.18	1.3
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.75	0.21	1.49	0.96		0.83	0.23	1.66	1.6		0.65	0.18	1.3
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	1.4		0.75		1.49	1.4		0.83		1.66	2.3		0.65		1.3
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	330		7.5	2.1	14.9	6.4		0.83	0.23	1.66	8.8		0.65	0.18	1.3
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	31.6		0.75	0.43	1.49	5.3		1.7	0.48	1.66	7.2		1.3	0.38	1.3

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

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

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	PB Maintenance Shop (break room)					PB Maintenance Shop (office)					PB Bldgs (adjacent gate area)				
									Sample	AOI2 SAMPLE 41					AOI2 SAMPLE 42					AOI2 SAMPLE 43				
									Date	10/25/2012					10/25/2012					10/25/2012				
									Collected By	Stantec					Stantec					Stantec				
									Sample Matix	Indoor Air					Indoor Air					Ambient Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	3.1		0.79	0.24	1.57	2.5		0.7	0.21	1.4	0.93		0.81	0.24	1.62
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	0.79	0.24	1.57	ND	U	0.7	0.21	1.4	ND	U	0.81	0.24	1.62
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	0.79	0.22	1.57	ND	U	0.7	0.2	1.4	ND	U	0.81	0.23	1.62
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	1.1		0.79	0.24	1.57	0.87		0.7	0.21	1.4	ND	U	0.81	0.24	1.62
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.8		0.79	0.22	1.57	1.7		0.7	0.2	1.4	1.2		0.81	0.23	1.62
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1.3		0.79	0.24	1.57	1.1		0.7	0.21	1.4	ND	U	0.81	0.24	1.62
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	0.79	0.22	1.57	ND	U	0.7	0.2	1.4	ND	U	0.81	0.23	1.62
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	0.79	0.22	1.57	ND	U	0.7	0.2	1.4	ND	U	0.81	0.23	1.62
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	0.79		1.57	ND	U	0.7		1.4	ND	U	0.81		1.62
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	9		0.79	0.22	1.57	8.2		0.7	0.2	1.4	10		0.81	0.23	1.62
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	7.1		1.6	0.46	1.57	6.3		1.4	0.41	1.4	3.79		1.6	0.47	1.62

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
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The RSL for 1,2,4 and 1,3,5- trimethylbenzene were calculated using the September 2016 final Integrated Risk Information System Reference Concentration.
OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
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ND - Not detected
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NA - Not analyzed

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

10

 - Result exceeds PA VI

10

 - Result exceeds 1/10th PA VI

10

 - Result exceeds OSHA PEL TWA

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁵)

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁶)

10

 - Result exceeds NIOSH REL

10

 - Result exceeds ACGIH TLVs

15

 - MDL or RL exceeds standard

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Summary of Indoor Air Quality Analytical Results
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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Outdoor Near River					Bio Area					Bio Area, Bldg 6628				
									Sample	AOI2-AA-16-001					AOI2-AI-16-001					AOI2-AI-16-002				
									Date	3/22/2016					3/22/2016					3/22/2016				
									Collected By	GHD					GHD					GHD				
									Sample Matix	Ambient Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	1.8	J	4.9	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	7.7	1.5	1	ND	U	7.7	1.5	1	ND	U	7.7	1.5	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	4	0.81	1	ND	U	4	0.81	1	ND	U	4	0.81	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.9	J	3.2	0.64	1	3.7		3.2	0.64	1	4.6		3.2	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	1.5	J	4.3	0.87	1	ND	U	4.3	0.87	1	2.9	J	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	5.2	2.6	1	ND	U	5.2	2.6	1	ND	U	5.2	2.6	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	1.3	J	3.8	0.75	1	3.9		3.8	0.75	1	8.9		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	6.7	J	4.3	0.87	1	1.9	J	4.3	0.87	1	11.5	J	4.3	0.87	1

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
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OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
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Qualifiers:
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Exceedances:

10 - Result exceeds PA VI

10 - Result exceeds 1/10th PA VI

10 - Result exceeds OSHA PEL TWA

10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁵)

10 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁶)

10 - Result exceeds NIOSH REL

10 - Result exceeds ACGIH TLVs

15 - MDL or RL exceeds standard

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Philadelphia, Pennsylvania

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Control Room, Kitchen, on Stove					Control Room					Control Room				
									Sample	AOI2-AI-16-003					AOI2-AI-16-004					AOI2-AI-16-005				
									Date	3/22/2016					3/22/2016					3/22/2016				
									Collected By	GHD					GHD					GHD				
									Sample Matix	Indoor Air					Indoor Air					Indoor Air				
									Unit	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	6.6		4.9	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	7.7	1.5	1	ND	U	7.7	1.5	1	ND	U	7.7	1.5	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	4	0.81	1	ND	U	4	0.81	1	ND	U	4	0.81	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	2.2	J	4.9	0.98	1
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	2.8	J	3.2	0.64	1	3.2		3.2	0.64	1	5.9		3.2	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	4.3	0.87	1	ND	U	4.3	0.87	1	1.3	J	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	5.2	2.6	1	ND	U	5.2	2.6	1	3	J	5.2	2.6	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	2.6	J	3.8	0.75	1	3	J	3.8	0.75	1	4.4		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	3	J	4.3	0.87	1	3.07	J	4.3	0.87	1	6.9	J	4.3	0.87	1

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

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

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

Analyte	CAS Number	PADEP VI	1/10th PADEP VI	OSHA PEL TWA	EPA RSL Cancer Risk = 10 ⁻⁵ HQ = 0.1	EPA RSL Cancer Risk = 10 ⁻⁶ HQ = 0.1	NIOSH RELs	ACGIH TLVs	Location	Short Pier Bldg 11				
									Sample	AOI2-AI-16-006				
									Date	3/22/2016				
									Collected By	GHD				
									Sample Matix	Indoor Air				
									Unit	Result	Q	RL	MDL	DF
1,2,4-Trimethylbenzene	95-63-6	31	3.1	NS	3.1	3.1	125,000	123,000	ug/m3	1.2	J	4.9	0.98	1
1,2-Dibromoethane	106-93-4	0.2	0.02	153,700	0.2	0.02	346	NS	ug/m3	ND	U	7.7	1.5	1
1,2-Dichloroethane	107-06-2	4.7	0.47	202,400	3.1	0.47	4,000	40,500	ug/m3	ND	U	4	0.81	1
1,3,5-Trimethylbenzene	108-67-8	31	3.1	NS	NS	NS	125,000	123,000	ug/m3	ND	U	4.9	0.98	1
Benzene	71-43-2	16	1.6	3,190	13	1.6	319	1,600	ug/m3	1.3	J	3.2	0.64	1
Ethylbenzene	100-41-4	49	4.9	435,000	49	4.9	435,000	86,800	ug/m3	ND	U	4.3	0.87	1
Isopropylbenzene (Cumene)	98-82-8	1,800	180	245,000	180	180	245,000	246,000	ug/m3	ND	U	4.9	0.98	1
Methyl Tert-Butyl Ether	1634-04-4	470	47	NS	470	47	NS	180,000	ug/m3	ND	U	3.6	0.72	1
Naphthalene	91-20-3	3.6	0.36	50,000	1.3	0.36	50,000	52,000	ug/m3	ND	U	5.2	2.6	1
Toluene	108-88-3	22,000	2,200	754,000	2,200	2,200	375,000	75,400	ug/m3	4.3		3.8	0.75	1
Total Xylenes	1330-20-7	440	44	435,000	44	44	435,000	434,000	ug/m3	3.9	J	4.3	0.87	1

Note:
PADEP VI- Pennsylvania Department of Environmental Protection Vapor intrusion Screening Value. Indoor Air Statewide Health Standard Non-Residential Vapor Intrusion Screening Level (November 2016).
OSHA PEL TVWA - Occupational Safety and Health Administration Time-Weighted Average Permissible Exposure Limit.
EPA RSL - United States Environmental Protection Agency Industrial Regional Screening Level.
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OSHA PELs, NIOSH RELs, and ACGIH TLVs from GHD's Air Data Evaluation Letter (Reference No. 11109626), November 9, 2016.
CAS - Chemical Abstract Registry Number
ug/m3 - micrograms per cubic meter
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MDL - Method detection limit
RL - Reporting limit
DF - Dilution factor
ND - Not detected
NS - No standard
NA - Not analyzed

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

10

 - Result exceeds PA VI

10

 - Result exceeds 1/10th PA VI

10

 - Result exceeds OSHA PEL TWA

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁵)

10

 - Result exceeds EPA RSL (HQ = 0.1, Target Cancer Risk = 10⁻⁶)

10

 - Result exceeds NIOSH REL

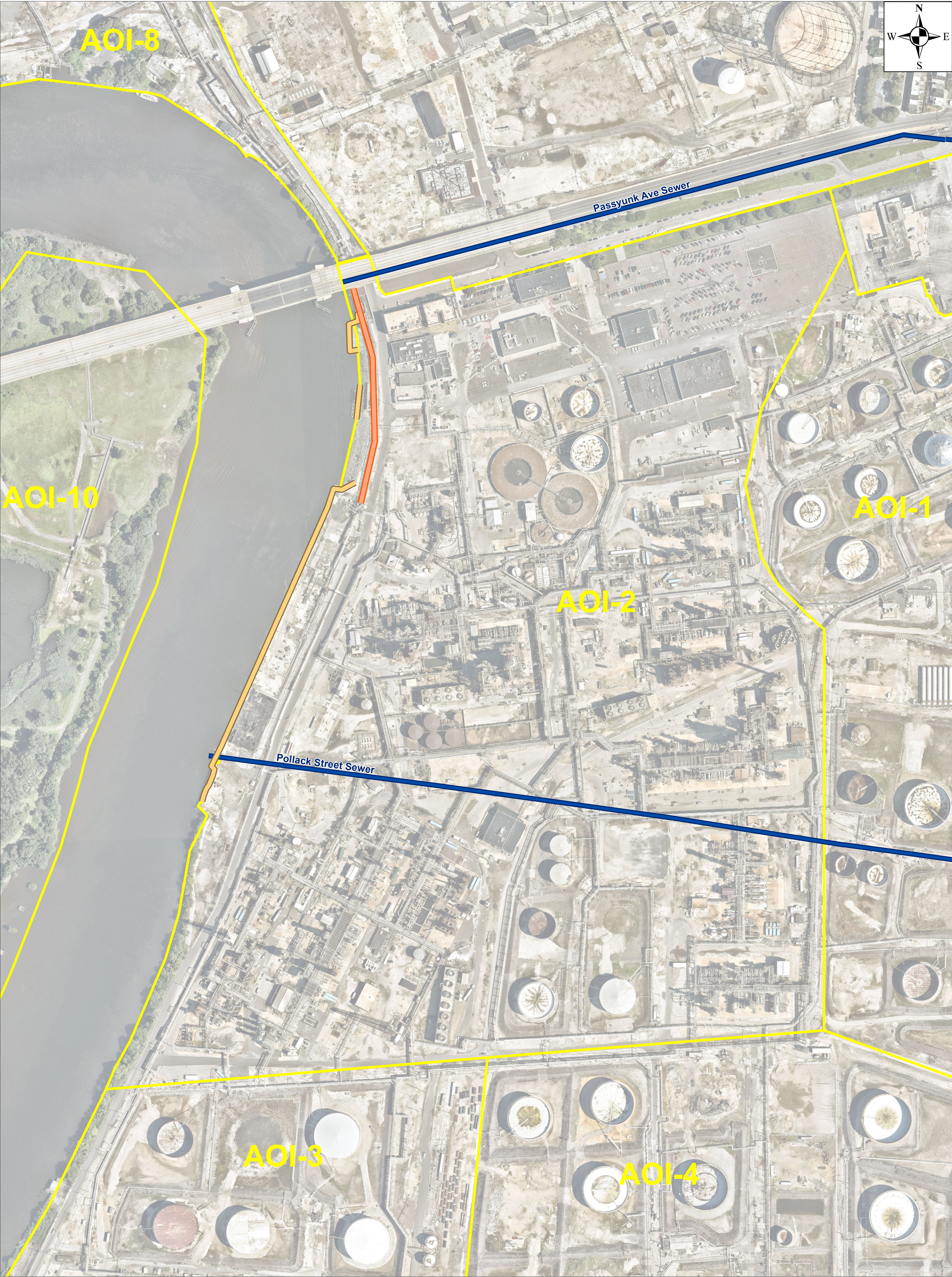
10

 - Result exceeds ACGIH TLVs

15

 - MDL or RL exceeds standard

20



- Legend**
- Vertical Wall
 - Bulkhead
 - Sewers
 - AOI Boundary

Notes:
1. Aerial photography provided by Nearmap.com, dated 7/29/2015.
2. Area of Interest boundaries referenced from 2011 ALTA/ACSM Land Title Survey, prepared for Sunoco Inc. (R&S).

Figure 2: Site Plan
AOI-2 Remedial Investigation Report
PES Philadelphia Refining Complex
Philadelphia, Pennsylvania



Philadelphia Refinery Operations
A Series of Evergreen Resources
Group, LLC.
2 Righter Parkway, Suite 200
Wilmington, DE 19803

0 75 150 300 Feet

SCALE: 1" = 150'
DATE: December 18, 2017
DRN: BY: MMK
CDD: BY: VM
JOB#: 2574602