



**MEMO**

**TO** Ragesh R. Patel *RRP*  
Regional Manager  
Environmental Cleanup and Brownfields

**FROM** C. David Brown, P.G. *CDB*  
Professional Geologist Manager

**THROUGH** Susan M. Kennedy, P.G. *SMK*  
Professional Geologist Manager

**DATE** February 22, 2018

**RE** ECB – Land Recycling Program  
Act 2 Technical Memo Summary  
Remedial Investigation Report  
eFACTS PF No. 769099  
Former Sunoco Philadelphia Refinery **AOI 6**  
3144 West Passyunk Avenue  
City of Philadelphia  
Philadelphia County

**Property Owner Name and Site Address:**

<b>Owner</b>	<b>Remediator</b>	<b>Site</b>
Philadelphia Energy Solutions Refining and Marketing LLC 3144 W. Passyunk Ave. Philadelphia, PA 19145	Evergreen Resources Management Operations 2 Righter Parkway, Suite 200 Wilmington, DE 19803	3144 W. Passyunk Ave. Philadelphia, PA 19145

Coordinates: 39.9026°N, 75.2074°W

**Act 2 Standard(s) Sought:**

Soil and groundwater—nonresidential site-specific standard

**Site Size:** 117 acres

**Project Site History:**

Petroleum refining began at the site circa 1870. The facility consisted of two refineries, Point Breeze operated by Atlantic Petroleum Corporation (formerly ARCO) and Girard Point by Chevron (formerly Gulf). Sunoco purchased these two refineries in 1988 and 1994 and consolidated them into a single facility. In 2012 Sunoco sold the refinery to the Carlyle Group and entered a joint venture to operate it as Philadelphia Energy Solutions (PES). Sunoco, Inc. is

now a subsidiary of Energy Transfer Partners, L.P. Evergreen Resources Management Operations is a Sunoco subsidiary responsible for its legacy environmental liabilities.

The refinery can process up to 330,000 barrels a day of crude oil. It produces gasoline, diesel, jet fuel, kerosene, home heating oil, and other petroleum liquids. The facility consists of multiple process units, above-ground storage tanks, pipelines, as well as truck, railcar, and barge transfer equipment.

Area of Interest 6 (AOI 6) is known as the Girard Point Chemicals Processing Area. It is bordered by the Schuylkill River to the west and other areas of the refinery on the remaining sides. A sheet pile bulkhead exists along the river frontage. Historic and current operations in AOI 6 include: petroleum and chemical processing, steam boiler plants, storage in regulated above-ground tanks, oil-water separators, maintenance buildings, office buildings, and a laboratory.

Petroleum contamination exists from historical operations including releases from tanks and pipelines. Evergreen (Sunoco) is participating in the Act 2 program to address contamination predating the transfer of the property to PES on September 8, 2012. Corrective action responsibilities under the Storage Tank and Spill Prevention Act are being addressed simultaneously. There are presently five open tank incidents associated with four regulated ASTs in AOI 6 (51-11554, 51-36558). A site characterization report for these tanks was submitted and is presently under review.

#### **Site Findings:**

Unconsolidated materials at AOI 6, with increasing depth, consist of fill, alluvium (silt, clay, and sand), the Trenton Gravel (only locally present), and the Potomac-Raritan-Magothy (PRM) formations (sand and clay units). The Wissahickon Formation schist bedrock is around 75' deep. Shallow groundwater depths range from ~1' to ~13'.

Soil sampling performed in 2002–2012 was focused at two leaded tank bottom SWMUs (92 and 95), four ASTs with releases, and selected other areas. Additional sampling in 2016 further characterized several historic releases and delineated exceedances. Surface (0–2') and subsurface (> 2') samples were obtained. There have been ~190 surface and ~55 subsurface samples collected 2002–2016. Analytes typically included 10 VOCs, 10 SVOCs, and lead from DEP's petroleum short list.

No leaded tank bottom materials were identified in SWMU 92. Suspected leaded tank bottom materials were found in SWMU 95, but sampling indicated no lead direct contact standard exceedances or TCLP exceedances.

Numerous soil-to-groundwater MSC exceedances were identified for benzene; a small number of samples exceeded for toluene, cumene, naphthalene, and lead. There were multiple exceedances of nonresidential direct contact MSCs throughout AOI 6. The substances with direct contact exceedances were the following.

Substance	Maximum (mg/kg)	NR DC MSC (mg/kg)	Locations	Comments
Benzene	1850	290/330	9	Tank 797 vicinity; 1.0–3.5'
Benzo(a)pyrene	59	11	1	area NW of SWMU 95
Lead	7490	2240	4	

Numerous shallow and four deep wells have been installed in AOI 6 since 1986. The shallow wells are commonly ~10–15' deep, and they are screened in the fill, alluvium, and/or Trenton Gravel. Recent sampling rounds were in 2012 and 2016; there were two sampling events in 2016, with 37 wells sampled in the first. Shallow groundwater flow is inferred to the southwest on the western side of the AOI, and there is a water table depression on the eastern side. Groundwater flow in the lower aquifer (lower sand unit of the PRM) is inferred to the south and southwest.

Measurable LNAPL was observed in five of 37 wells gauged in May 2016. Over 20 wells had LNAPL in a May 2017 event that included more wells. The primary LNAPL body is at the 27 Pump House area (< 1' thick), and isolated LNAPL was identified at other locations (generally < 0.5', maximum ~3'). LNAPL at two wells, B-39 and URS-5, has not been delineated adjacent to the river bulkhead. LNAPL was fingerprinted and classified as gasoline, middle distillate, and residual oil. API modeling indicated that the LNAPL bodies were not significantly mobile.

Monitoring well sampling indicated exceedances of nonresidential Statewide health standard MSCs for several substances. Analytes typically included 11 VOCs, 10 SVOCs, and lead. Benzene had the most widespread exceedances, with four wells exceeding 1000 mg/L, and a maximum concentration in 2016 of 480,000 mg/L (in B-150, which has LNAPL). Most benzene exceedances are around Tank 797, the 27 Pump House, and downgradient areas. This is also near the largest LNAPL plume in AOI 6.

One or two wells showed exceedances of toluene, cumene, 1,2,4-trimethylbenzene, 1,2-dibromoethane, and naphthalene. There were numerous exceedances of SVOCs, with concentrations generally < 10 mg/L. In 2016 only one well had a slight exceedance of dissolved lead. There were no 2016 exceedances in the lower aquifer.

For the vapor intrusion evaluation, 14 occupied buildings and a set of trailers were identified. Four buildings and the trailers were excluded from further assessment because they are elevated, are naturally ventilated, or have a sealed, blast-resistant construction. Two rounds of indoor air sampling were performed in 2016 and 2017. Benzene and naphthalene exceeded site-specific standard VI screening values in some buildings. Evergreen intends to collect another round of samples and perform an inhalation risk assessment. One round of outdoor air samples was also collected over two LNAPL plumes.

AOI 6 is industrialized and has impermeable surface covers in many areas. The land surface is unlikely to provide viable habitat. A 2016 PNDI request indicated three endangered and one

threatened species potentially present under Pennsylvania Fish and Boat Commission jurisdiction. Evergreen will initiate a habitat assessment performed by a qualified biologist.

**Site Cleanup History:**

NIR Received Date           October 16, 2006  
RIR Disapproved Date   November 27, 2013  
RIR Received Date       November 28, 2017

An initial NIR was submitted October 16, 2006; it was revised with updated information on November 17, 2014 and December 14, 2016. The facility entered into a consent order and agreement with DEP's Clean Water Program in December 1993; the agreement was succeeded by another in December 2003 which terminated in December 2013. The facility is currently subject to a DEP buyer-seller agreement which became effective September 8, 2012. A site characterization report was submitted for AOI 6 on September 29, 2006 under the Clean Water Program agreement. The site entered into the One Cleanup Program with DEP and EPA on November 8, 2011. A previous AOI 6 RIR was submitted September 5, 2013; DEP disapproved the report on November 27, 2013.

On May 6, 2015 DEP approved a site-specific numerical standard of 2240 mg/kg for lead in soil at the Philadelphia Refinery. This standard was developed in a risk assessment report received February 26, 2015.

**Discussion of Cleanup Involved and Demonstration of Attainment:**

A groundwater remediation system operated around the 27 Pump House from 2001 until 2010. Total fluids were collected at 12 recovery wells. Operations ceased because LNAPL recovery was greatly diminished. Absorbent socks and bailers were used to remove LNAPL in some wells until 2015. An estimated 12,900 gal of LNAPL was recovered.

Evergreen intends to attain a site-specific standard with pathway elimination for soil and groundwater. Soil direct contact exceedances and potential LNAPL exposure pathways will be addressed in a cleanup plan. The LNAPL plumes are within the AOI 6 boundaries, appear to be immobile, and aren't known to be impacting the Schuylkill River. Further vapor intrusion evaluation will be performed. Groundwater contamination will be managed with a use restriction. An environmental covenant will be required.

A groundwater fate-and-transport model will be developed for the entire refinery complex and provided in a future report. This analysis will include a surface water assessment. An ecological evaluation will be performed for the facility.

**DEP Final Action Approval/Disapproval Letter:**

I recommend approving the RIR. Soil and groundwater have been adequately characterized in AOI 6. Most deficiencies in the November 2013 disapproval have been resolved; others will be addressed in future reporting. U.S. EPA has reviewed the report and concurs with the approval. DEP will communicate several comments to Evergreen by e-mail and request follow-up.

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