Summary of Remedial Investigation Report – Area of Interest 3 (AOI 3)

Philadelphia Refining Complex
3144 Passyunk Avenue, Philadelphia, PA 19145

What is in this summary?

This document provides a plain language summary of the Area of Interest 3 (AOI 3) 2017 Remedial Investigation Report (RIR). The AOI 3 RIR was prepared as part of the Pennsylvania Department of Environmental Protection (PADEP) Act 2 Voluntary Cleanup Program. The AOI 3 RIR focuses on a portion of the Refinery, as described in the general description below. The location of AOI 3 is identified on the maps of Figures 1 & 2 below.

The AOI 3 RIR is a technical report which describes the condition of the land in AOI 3 as of 2017, historic processes, the chemicals present from past operations, and the next steps in the Act 2 process. The complete AOI 3 RIR can be downloaded at https://phillyrefinerycleanup.info/act-2-documents/#aoi-3.

To assist in the review of this and the other RIR summaries, Evergreen has also prepared a companion summary document titled “Overview of Former Sunoco Philadelphia Refinery Environmental Investigations” that describes the Act 2 process and what to expect to find in a RIR.

Commonly Used Terms

A few of the most common technical terms used in the AOI 3 report are explained below:

Act 2 Statewide Health Standards – The PADEP has set Act 2 Statewide Health Standards for soil and groundwater that are protective of human health and the environment. Additional investigation is not required if a chemical is detected at a level at or below the Act 2 standard.

Delineation – When a chemical is detected in soil or groundwater at a level above the Act 2 standard, additional samples are collected nearby to map the extent of the levels above the Act 2 standard. Delineation shows the extent of the chemical concentrations that are above the Act 2 standard.

Geology – The soils and rock (referred to as bedrock) beneath the Site. The soils were deposited over long periods of time. Soils are described by geologic units (or groupings of soils), which represent similar soils. Soils placed by humans rather than natural processes are called “fill”. Fill was used to make the land higher in order to build the Site, including AOI 3. Understanding the geology is important because it can influence how the chemicals in the ground will be found or move in the ground and in groundwater.

Groundwater – Groundwater is the water that is present in the spaces between grains of soil or rock. Groundwater is not an underground lake or stream, but it does flow from one area to another. Different groundwater units can be separated from one another if there are layers of soils that are packed very closely together, like a clay, between two groundwater units. Within AOI 3, there are two groundwater units, which are referred to as the shallow and the deep groundwater. Similar to the geology, understanding groundwater is important because it can influence where the chemicals will be found or move over time. If chemicals are present in an area of groundwater it is referred to as a groundwater plume.

Lead Site Specific Standard - The PADEP has approved a site-specific standard (SSS) for lead of 2,240 milligrams per kilogram (mg/kg). The calculation of the SSS was based on updated procedures by the EPA and PADEP and not due to conditions in AOI 3.

Light Non-Aqueous Phase Liquid (LNAPL) LNAPL is a petroleum hydrocarbon, oil for example, that floats on water. When LNAPL is found in an area of the soil or groundwater it is referred to as an LNAPL plume.

Potential Exposure Pathways – A potential exposure pathway is the way a receptor (for example a worker) may become exposed to a chemical in soil, groundwater or indoor air. A complete exposure pathway is when there is chemical present that can come into contact with a receptor and no barriers exist to prevent contact. A complete exposure pathway, for example, could be present if a worker could touch soils that have unacceptable levels of a chemical. In addition to considering various human receptors, an ecological assessment was also completed for AOI 3 for ecological receptors (birds, plants, etc.).

Commonly Used Terms Continued

Remediation – Remediation is the cleanup up of contamination in soil or groundwater. An example of remediation is pumping LNAPL and groundwater out of wells to a treatment plant. An example of soil remediation is excavation, removal, and disposal of soil in a permitted landfill. All current remediation in AOI 3 is called "interim" since an Act 2 Cleanup Plan has not been submitted. Other, permanent, remedial actions can include construction of surface caps as a barrier to chemicals in soil and groundwater, installation of vapor mitigation systems in buildings, and land use restrictions to prevent exposures.

Vapor Intrusion- Vapors from chemicals in soil or groundwater can move upwards as vapor and move into indoor air in buildings. In addition to collection of soil and groundwater samples, the remedial investigation collected indoor air samples from occupied buildings in AOI 3. The remedial investigation also collected outdoor air samples right above LNAPL plumes to see if there was any upward vapor movement from the LNAPL areas and ambient outside air samples to see what the background concentrations were. These samples are different than the air samples that were collected by the refinery to look at impacts.

General Description of Area of Interest 3

AOI 3 covers approximately 107 acres and is located on the eastern side of the Schuylkill River within the Point Breeze South Yard. AOI 3 consists of the #5 Tank Farm, the Guard Basin/Four Pond area, and the Former Chevron Ballfield. The location of AOI 3 is shown on **Figure 1** and **Figure 2.** Some key features are described below:

- The #5 Tank Farm consists of six aboveground storage tanks and is the northernmost feature within AOI 3. Two smaller aboveground storage tanks are located east of the #5 Tank Farm. Releases from tanks are investigated under the PADEP's Storage Tank Corrective Action Program by collecting soil and groundwater data from around the tanks. The results of the storage tank investigations are included in the AOI 3 RIR.
- The aboveground storage tanks have been used primarily to store petroleum products such as gasoline and diesel, petroleum distillates such as naphtha, and gasoline additives used for blending.
- The current and future anticipated use of AOI 3 is for non-residential purposes.
- The geology beneath AOI 3 is fill, clay, sand, gravel and bedrock.
- The shallow groundwater, also called the water-table aquifer, starts at about 25 feet below the ground surface and extends down to where there is a layer of clay in most places. Shallow groundwater flows radially to the center of AOI 3. The deep groundwater, also called the lower aquifer, starts beneath the clay and flows generally towards the southwest.

Figure 1. AOI 3

Figure 2. Areas Surrounding AOI 3

What was found during the Act 2 investigations in AOI 3?

Soil, groundwater and air samples (indoor air and outdoor air above LNAPL plumes) were collected as part of the remedial investigation. The results of the sampling are:

- **LNAPL** - Eight LNAPL samples were collected from monitoring wells in AOI 3. The results of this sampling show that LNAPL consists of mostly weathered gasoline and diesel, likely from the tank areas in AOI 3. There are no Act 2 Statewide Health Standards for LNAPL, instead LNAPL's effect on soil or groundwater is evaluated by the Act 2 Statewide Health Standards. The LNAPL was found to exist in the areas shaded in blue on **Figure 3.** The plume is considered stable, or unchanging in size or location, and does not appear to have the potential to migrate off-site. LNAPL is delineated to various areas, as shown in **Figure 3** (see blue shaded areas on map).
- **Soil –** A total of 100 soil samples were collected from soil borings and during the installation of monitoring wells. The sample results were compared to the Act 2 Statewide Health Standards and the results are shown on **Figure 4** (green dots are samples with no exceedances, orange dots are samples with exceedances of any chemical analyzed). Lead was the only chemical detected at concentrations over the Act 2 Statewide Health Standards. Four samples exceeded the site-specific standard for lead. Lead is a chemical common to refinery operations.
- **Groundwater –** Over 70 monitoring wells have had over 3,400 measurements to determine the direction of groundwater flow. More than 300 groundwater samples have been collected from monitoring wells in AOI 3. The groundwater impacts from AOI 3 do not extend under residential areas. The chemicals that have been detected above the Act 2 Statewide Health Standards are:
    - **Shallow Groundwater** – (from around 25' below the ground down to a layer of clay that separates the aquifers) 1,2,4-trimethylbenzene, ethylene dibromide (EDB), benzene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, lead, methyl tertiary butyl ether (MTBE), naphthalene, and toluene.
    - **Deep Groundwater** – benzene, lead, and MTBE
- **Figure 5** shows the locations of the monitoring wells where groundwater samples have been collected in relation to the Act 2 Statewide Health Standards (green dots mean no exceedances, orange dots are wells with exceedances of any chemical analyzed). Similar to the soil data, all of the compounds detected over the Act 2 Statewide Health Standard in groundwater are common to refinery operations and are consistent with past operations.
- **Air –** Fourteen air samples were collected in AOI 3. The air samples were indoor air samples collected in occupied buildings in AOI 3, ambient (background) outdoor air samples and outdoor air samples above LNAPL plumes. The sampling results were compared to the Act 2 Statewide Health Standards, Environmental Protection Agency Regional Screening Levels (EPA RSL), standards from the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH). The indoor air samples were below all of these standards with the exception of the EPA.

Figure 3. LNAPL Delineation

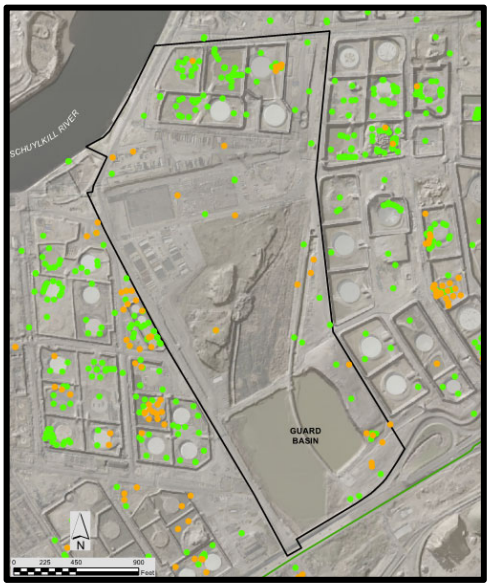

Figure 4. Soil Samples

Figure 5. GW Samples

The full AOI 3 RIR has large-scale figures that illustrate the information collected in AOI 3 that are easier to read, as well as the complete data tables that have all of the laboratory results compared to the Act 2 standards. The full AOI 3 RIR also summarizes how much of the chemicals are present in AOI 3, including the extent of benzene in groundwater, and the associated monitoring wells.

Discussion of Potential Exposure Pathways

Chemicals detected in soil, groundwater and air include chemicals commonly associated with refinery operations. Potential human health risks from AOI 3 are primarily from direct exposure to site soils, LNAPL or offsite migration of groundwater. These conditions were addressed by interim remedial actions implemented during the remedial investigation. LNAPL, soil and groundwater conditions at AOI 3 will be further evaluated in future Act 2 submittals based upon Site redevelopment and any potential human health risks will be addressed by the final remedial actions.

Ecological Assessment

An ecological assessment was completed as part of the RIR following the Act 2 process which included database searches and communication with state and federal agencies. No disturbance to ecological receptors (for example endangered birds or plants) was identified in AOI 3. In addition, sitewide ecological risk assessment activities have been completed and will be reported in future Act 2 submittals.

Remediation Summary

Currently, Evergreen does not operate remediation systems in AOI 3. A groundwater and LNAPL recovery system in AOI 3 was shut down in 2009 due to lack of recoverable LNAPL. During its operation, a total of approximately 30,827 gallons of LNAPL and 334,858,757 gallons of water were recovered. Recovered groundwater was pumped directly to the Point Breeze Processing Area Wastewater Treatment Plant while recovered LNAPL was stored in an 8,000-gallon holding tank that was periodically pumped out and the LNAPL recycled by the Complex. Please see the RIR for additional details relating to the system and operation. The future Cleanup Plan(s) (submitted after all RIRs are approved) will fully summarize all remediation systems at the facility including their anticipated duration of operation.

Conclusion

Based on the completed investigation activities, LNAPL and associated impacts to soil, groundwater, and air within AOI 3 have been investigated consistent with the requirements set forth in Act 2. The AOI 3 RIR identified that a combination of Statewide Health Standards and site-specific standards are under consideration for AOI 3. Any sampling or remediation activities conducted within AOI 3 since submittal of the RIR will be included in future reports.

The PADEP and EPA reviewed the 2017 AOI 3 RIR and it was approved by PADEP on June 14, 2017.

Note: This document has been prepared to provide a plain-language description of the information included in the RIR for AOI 3 (Langan, 2017). The RIR was prepared for Area of Interest 3 (AOI 3) of the Philadelphia Energy Solutions Refining and Marketing LLC (PES) Philadelphia Refining Complex (Complex) and includes information provided in and collected up to the time of the RIR submittal. The report was prepared for Evergreen Resources Group, LLC (Evergreen). Evergreen is responsible for managing the investigation and cleanup of the legacy (pre-PES ownership) environmental impacts at the former Sunoco South Philadelphia Refinery, which is now known as the PES Complex. Per Section 901 of the Pennsylvania Land Recycling and Environmental Remediation Standards Act, this document was prepared to enhance the opportunity for public involvement through establishment of a basic understanding of the remedial investigation process. This summary document does not constitute a Remedial Investigation Report, nor does it contain all the information provided in the referenced report. The full RIR can be accessed at www.phillyrefinerycleanup.info.