Summary of Remedial Investigation Report and Ecological Risk Assessment Report – Area of Interest 10 (AOI 10)

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 10 (AOI 10) 2011 Remedial Investigation Report (RIR) and the 2016 Ecological Risk Assessment (ERA) Report. The AOI 10 RIR and ERA were prepared as part of the Pennsylvania Department of Environmental Protection (PADEP) Act 2 cleanup program. The AOI 10 RIR and ERA focus on a portion of the Refinery, as described in the general description below. The location of AOI 10 is identified on the maps of Figures 1 & 2 below.

The AOI 10 RIR is a technical report, which describes the condition of the land in AOI 10 as of 2011, historic processes, the chemicals present from past operations, and the next steps in the Act 2 process. The AOI 10 ERA is a technical report, which describes the condition of the ecological habitat in relation to ecological receptors in Lands Creek and the surrounding habitat, which is located along the eastern border of AOI 10. The complete AOI 10 RIR and ERA can be downloaded at https://phillyrefinerycleanup.info/act-2-documents/#aoi-10.

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 or ERA.

Commonly Used Terms

A few of the most common technical terms used in the AOI 10 reports 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.

Constituents of Potential Ecological Concern (CPECs) – A chemical or contaminant that is identified from investigation activities to potentially cause a risk to ecological receptors (birds, plants, etc.).

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 10. 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 10, there are two groundwater units, which are referred to as the shallow and the intermediate 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 10.

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 10 for ecological receptors

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 10 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. Since there were no buildings present in AOI 10 at the time of the RIR, no indoor air or ambient outdoor air samples were collected.

General Description of Area of Interest 10

AOI 10, also known as the Point Breeze West Yard (West Yard), covers approximately 80 acres and is located on the western side of the Schuylkill River and along Passyunk Avenue. The location of AOI 10 is shown on **Figure 1** and **Figure 2.** Some key features are:

- AOI 10 currently contains four past disposal areas that consist of former lagoons and landfills that received waste from the refinery during the 1950s and 1960s. Prior to demolition in 2005, AOI 10 also contained a tank area, a pump house, and two fuel docks.
- The current and future anticipated use of AOI 10 is for non-residential purposes.
- The geology beneath AOI 10 is fill, clay, sand, gravel and bedrock.
- The shallow groundwater, also called the water-table aquifer, starts at about 1 foot below the ground surface and extends down to where there is a layer of clay in most places. The shallow groundwater in the eastern portion of AOI 10 flows towards the east (toward the Schuylkill River) while the shallow groundwater in the western portion of AOI 10 flows towards the south. The intermediate groundwater starts beneath the clay and flows towards the southwest.

Figure 1. AOI 10

Figure 2. Areas Surrounding AOI 10

What was found during the Act 2 investigations in AOI 10?

Soil, groundwater, surface water, sediment and LNAPL samples were collected as part of the remedial investigation. The results of the sampling are:

- **LNAPL** – Thirteen LNAPL samples were collected from monitoring wells in AOI 10. The results of this sampling show that LNAPL consists of mostly weathered residual oil. There are no Act 2 Statewide standards for LNAPL, instead LNAPL's effect on soil or groundwater is evaluated by the Act 2 Statewide 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. LNAPL is delineated to various areas, as shown in **Figure 3** (see blue shaded areas on map).
- **Soil –** A total of 67 soil samples were collected from soil. The sample results were compared to the Act 2 Statewide standards and the results of this comparison are shown on **Figure 4** (Green dots are samples with no exceedances, orange dots are samples with exceedances of any chemical analyzed). The chemicals detected at concentrations over the Act 2 Statewide standards included: antimony, arsenic, barium, benzene, benzo(a)pyrene, cobalt, dibenzo(a,h)anthracene, dibenzofuran, 1,2-dichloroethene, ethylbenzene, manganese, mercury, methylene chloride, 2-methylnaphthalene, naphthalene, nickel, tetrachloroethylene, thallium, toluene, and zinc. Three samples exceeded the site-specific standard for lead. All of the chemicals that were found at levels over the standards are chemicals common to refinery operations.
- **Groundwater –** Thirty monitoring wells have had over 500 measurements to determine the direction of groundwater flow. More than 60 groundwater samples have been collected from monitoring wells in AOI 10. The groundwater impacts from AOI 10 do not extend under residential areas. The chemicals that have been detected above the Act 2 Statewide standards are:
    - **Shallow Groundwater** – (from around 1' below the ground down to a layer of clay that separates the aquifers) benzene, chrysene, lead, and naphthalene
    - **Intermediate Groundwater** – no chemicals were detected above the Act 2 Statewide standards in deep groundwater

  Figure 5 shows the locations of the monitoring wells where groundwater samples have been collected in relation to the Act 2 Statewide 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 standard in groundwater are common to refinery operations and are consistent with past operations.
- **Surface Water** – Five surface water samples were collected in AOI 10. The sample results were compared to Pennsylvania State Code Title 25, Chapter 93 Water Quality Standards. No chemicals were detected above the standards.
- **Sediment** – Five sediment samples were collected in AOI 10. The sample results were compared to Act 2 Statewide standards, the Severe Ecological Level (SEL) and the Low Ecological Level (LEL). The chemicals detected at concentrations over the SEL standard include: anthracene, arsenic, benzo(g,h,i)perylene, chromium, chrysene, copper, iron, lead, manganese, mercury, nickel, phenanthrene, pyrene, and zinc. Similar to the soil and groundwater data, all of the compounds detected over the standard in sediment are common to refinery operations and are consistent with past operations.

Figure 3. LNAPL Delineation

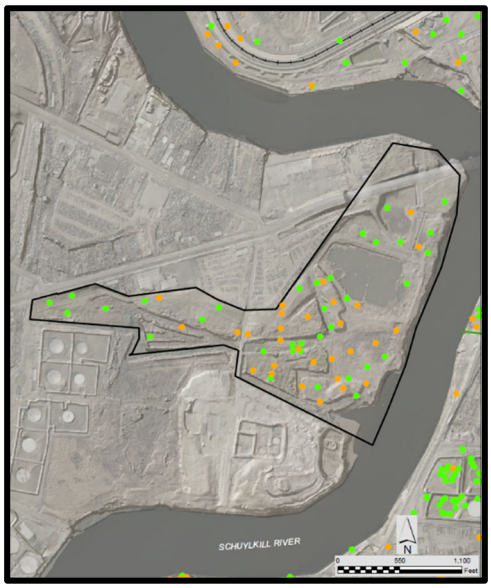

Figure 4. Soil Samples

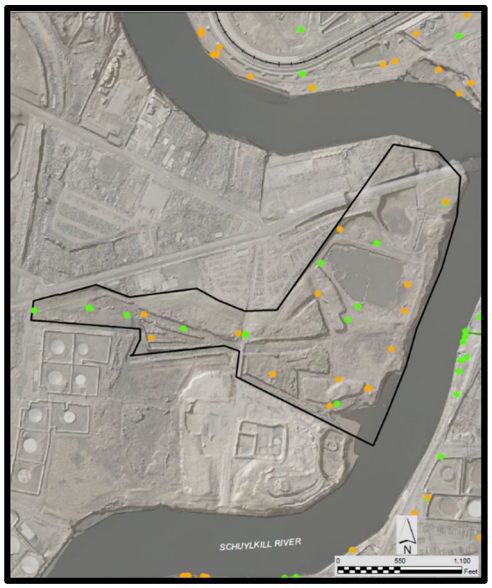

Figure 5. GW Samples

The full AOI 10 RIR has large-scale figures that illustrate the information collected in AOI 10 that are easier to read, as well as the complete data tables that have all laboratory results compared to the Act 2 standards. The full AOI 10 RIR also summarizes how much of the chemicals are present in AOI 10, including the extent of the chemicals in groundwater, and the associated monitoring wells.

Discussion of Potential Exposure Pathways

Chemicals detected in soil, groundwater and sediment include chemicals commonly associated with refinery operations. Potential human risks from AOI 10 are primarily from direct exposure to site soils, sediment, LNAPL, or offsite migration of groundwater. LNAPL, sediment, soil and groundwater conditions at AOI 10 will be further evaluated in future Act 2 submittals based upon Site redevelopment and any potential human 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; a visual site inspection, database searches and communication with state and federal agencies. The database search returned two potential conflict with ecological receptors that required additional review: the Great Egret and an unidentified threatened species. The AOI 10 RIR concluded with a recommendation to complete an ERA of the sediments in Land Creek.

The 2016 AOI 10 ERA included a visual site inspection, database searches, communication with state and federal agencies, and sediment sampling. The ecological assessment process is broken into 8 steps. The first five steps were completed during the AOI 10 RIR. Steps 6 through 8 were completed during the AOI 10 ERA, as summarized below:

- **Step 6 (Habitat Assessment)** – The updated database search returned a potential conflict with three ecological receptors: one threatened animal species (assumed to be the eastern redbelly turtle) and two plant species. A visual site inspection was completed of AOI 10 and the surrounding area. The habitat assessment found that there was habitat for the eastern redbelly turtle but did not find habitat for the two plant species.

- **Step 7 (Exposure Pathway Assessment)** – Chemicals that were detected above SELs in sediment in the AOI 10 RIR were compared (or "rescreened") to Act 2 Statewide standards, while also considering organic carbon detected in the sediment samples. No rescreened chemicals were detected above the standards.
- **Step 8 (Ecological Risk Assessment)** – Five samples were collected from sediment. These sediment samples, along with sediment samples from the AOI 10 RIR, were used in an ecological risk assessment to look at the potential ecological risk from chemical concentrations in the sediment. The concentration of chemicals in the sediment in Lands Creek were found to be acceptable for ecological receptors (for example birds or plants).

Remediation Summary

Currently, four capped past disposal units exist in AOI 10. These past disposal units consist of former lagoons and landfills. Below is a brief summary for the four capped disposal unites. Please see the RIR for additional details relating to the caps. The future Cleanup Plan (submitted after all RIRs are approved) will fully summarize all remediation systems and institutional or engineering controls at the facility including anticipated duration of operation.

Four past disposal units exist in AOI 10. Past disposal areas 1 and 2 are capped with clay materials and past disposal areas 3 and 4 are capped with clay and vegetative cover materials. All four areas were capped in the 1980s.

Conclusion

Based on the completed investigation activities, LNAPL and associated impacts to soil, groundwater, and sediment within AOI 10 have been investigated consistent with the requirements set forth in Act 2. The AOI 10 RIR identified that a combination of statewide health standards and site specific standards are under consideration for AOI 10. Any sampling or remediation activities conducted within AOI 10 since submittal of the RIR will be included in future reports.

Based on current Site conditions, results of Site characterization activities and previous assessments, and evaluation of potential receptors and exposure pathways, no further ecological evaluation of Lands Creek is necessary. Lands Creek does provide potentially suitable habitat for the eastern redbelly turtle; therefore, any future disturbances (remediation activities or redevelopment) in AOI 10 will be coordinated with the appropriate resource agencies.

The PADEP and EPA reviewed the 2011 AOI 10 RIR and it was approved by PADEP on January 6, 2012. The ERA was approved by PADEP on December 10, 2016.

Note: This document has been prepared to provide a plain-language description of the information included in the RIR for AOI 10 (Langan, 2011) and the ERA for AOI 10 (GHD, 2016). The RIR and ERA were prepared for Area of Interest 10 (AOI 10) 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 or the ERA submittal. These reports were 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 and ERA can be accessed at www.phillyrefinerycleanup.info.