Proposed Plan January 2025
Indian Refinery – Texaco Lawrenceville Site
Operable Units 1, 2, 3, 4, and 5
Lawrenceville, Lawrence County, Illinois

Introduction

The Illinois Environmental Protection Agency (Illinois EPA) is issuing this **Proposed Plan** to present Illinois EPA's preferred remedies for the Indian Refinery **Superfund** Site in Lawrenceville, Illinois, and to solicit public review and comment on the alternatives considered. Illinois EPA is the lead agency for the Site and the United States Environmental Protection Agency (US EPA) is the support agency in accordance with the **Superfund Memorandum of Agreement (SMOA)**.

Illinois EPA, will select a final remedy for **Operable Unit** (OU)-1, OU-2, OU-3, OU-4, and OU-5 addressed by this Proposed Plan after reviewing and considering public comments submitted during the public comment period, from January 15, 2025 through February 13, 2025. The final plan will be announced in a **Record of Decision** (ROD). The public's comments will be considered and addressed in the **Responsiveness Summary** included in the ROD.

The Site has been organized into separate OUs, as follows:

- OU-1: Tank Farms, Main Process Area, and Road Rights-of-Way/City Storm Sewer Investigation Area (Soil);
- OU-2: Oily Soil Areas, Indian Acres, Separator 7 Area (Soil);
- OU-3: Land Treatment Unit (Soil);
- OU-4: Floodplain Forest (Soil);
- OU-5: **Light Non-Aqueous Phase Liquid** and Groundwater Management Area;
- OU-6: Waste Water Treatment System (WWTS).

Illinois EPA is proposing remedial alternatives for OU-1 through OU-5 in this Proposed Plan. The Waste Water Treatment System (OU-6) will remain in use during remedial actions for the other OUs and will be addressed after remediation of the other OUs is complete. OU-6 is not discussed further in this Proposed Plan.

Illinois EPA is proposing the following remedial alternatives to be the selected remedies to clean up contaminated media:

- OU-1, Tank Farms and Main Process Area: Alternative TF/MPA-2A: Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined **Institutional Controls**

- OU-1, Road Rights-of-Way and CSSI Area: Alternative ROW-2: Layered Government Controls, Proprietary Controls, and Monitoring
- OU-2, Oily Soil Areas: Alternative OSA-4: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation at the Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-2, Indian Acres: Alternative IA-4: Excavation of Indian Acres North, Indian Acres East and Pump House Road, Consolidation at Indian Acres West (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-2, Separator 7 Area: Alternative Sep 7-2: Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-3, Land Treatment Unit: Alternative LTU-2: Soil Cover, Combined Institutional Controls
- OU-4, Floodplain Forest: Alternative FF-2A: Targeted Excavation of Soil with On-Site Consolidation and Institutional Controls
- OU-5, LNAPL Management Area: Alternative LNAPL-2: LNAPL Compositional Changes (by Passive Bioventing, Air Sparging, Sulfate Land Application, and /or Natural Source Zone Depletion (NSZD)), Monitored Natural Stability, and Combined Institutional Controls
- OU-5, Groundwater Management Area: Alternative GW-2: Monitored Natural Attenuation, Combined Institutional Controls, and Performance Monitoring at the Consolidation Cells and LTU

These Alternatives will be protective of human health and the environment, will meet **applicable or relevant and appropriate requirements (ARARs)**, will be cost effective, will be effective in the long term, and will constitute the final remedy for these OUs and will be consistent with a final remedy for the Site as a whole.

Illinois EPA is issuing this Proposed Plan to provide background information on the Site and OUs, and to solicit public comments on the preferred alternatives and the other alternatives considered to remedy the OUs addressed by this plan. This Proposed Plan is issued to fulfill the public participation requirements under §117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and §300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation (RI)** Report (SECOR et al 2008), **Baseline Human Health Risk Assessment** Addenda (Trihydro 2016 and 2017), **Baseline Ecological Risk Assessment** Addendum (Trihydro 2017), and **Feasibility Study** Volumes 1 through 6 (Trihydro and Stantec 2024) and other documents contained in the **Administrative Record** for the Site.

The selected cleanup plan could differ from the preferred alternatives described in this Proposed Plan depending on information or comments Illinois EPA receives during the public comment period. Therefore, Illinois EPA encourages the public to review and comment on this Proposed Plan, the rationale supporting the preferred alternatives, and any of the alternatives presented. The public is also encouraged to attend and participate in an availability session to be held on January 29, 2025 from 3:30 pm to 5:00 pm, and a public meeting at the Lawrenceville High School on January 29, 2025 from 6:00 pm to 8:00 pm.

Public comments may be submitted in written form using the comment form attached to this Proposed Plan or on a copy of this form, or electronically at Epa.publichearingcom@illinois.gov. Written comments may be sent to Illinois EPA, Office of Community Relations, Mail Code #5, PO Box 19276, Springfield, IL 62794-9276.

Supporting documents that address the Site can be found at the Lawrence Public Library and the Illinois Environmental Protection Agency. Contact:

Lawrence Public Library
814 12th St.
Lawrenceville, IL 62439
618-943-3016
Hours of operation
M-F 9:30 am – 5:00 pm
Sat 10:00 am – 3:00 pm

Illinois Environmental Protection Agency
Rodolfo Alanis, Community Relations Coordinator
312-832-2160
Rodolfo.Alanis@illinois.gov

Note: Words that appear in **bold font** are defined in the Glossary at the end of this document. A list of abbreviations used in this Proposed Plan can be found after the Glossary.

Background

The Indian Refinery – Texaco Lawrenceville Site ("Indian Refinery" or "Site") is a former petroleum refinery of approximately 990 acres (*Figure 1*) in Lawrenceville, Lawrence County, Illinois. The Site includes the former refinery property and forested floodplain. It is bordered by cultivated farmland to the west and southwest, alluvial lowlands to the southeast, the Embarras River to the east and industrial and residential areas to the north and northwest.

The Site has been organized into separate OUs for remediation, as follows (*Figure 2*):

- OU-1 includes the Tank Farms (TF), Main Process Area (MPA), and Road Rights-of-Way (ROW)/City Storm Sewer Investigation (CSSI) Area. The MPA is approximately 125 acres and is next to approximately 177 acres which comprise Tank Farms A through F. The OU also includes the road ROWs that abut these areas and the City Storm Sewer Investigation Area (CSSI), a non-contiguous area to the north of the refinery property. The ROWs and CSSI comprise another 10 acres. This OU includes surface soil and subsurface soil contaminated with **polynuclear aromatic hydrocarbons (PAHs)**, benzene, ethylbenzene, naphthalene, arsenic, and lead. Contamination sources are likely the result of refinery operations over the decades, including releases associated with tanks and piping.

- OU-2 includes the Oily Soils Areas, Indian Acres (approximately 90 acres); and the Separator 7 Area (approximately 18 acres). These areas include contaminated surface soil, subsurface soil, and wastes. The Oily Soil Areas include three locations impacted with **hydrocarbons** from refinery operations, including the former B&O Pond, Lime Sludge Ponds, and **solid waste management unit** (SWMU) 9 North Drainage Ditch. Disposal of byproducts from lubricating oil polishing and historic settling operations within Indian Acres have caused the accumulation of waste materials, including tarry acidic sludges and filter cake material. Some acidic sludges may release sulfurous gases if disturbed. The Separator 7 Area includes two oil/water separators and a disposal pit for sludge and oily wastes. An accumulation of acidic pitch and oily clay-like sludges have contributed to contamination of surface and subsurface soils; all wastes have been removed from Separator 7. In each of these areas, surface and subsurface soils have been contaminated with PAHs, benzene, ethylbenzene, naphthalene, arsenic, and lead.

- OU-3 is the former Land Treatment Unit (LTU, 109 acres) which was a **Resource Conservation and Recovery Act (RCRA)**-permitted facility used from 1981 - 1988 to treat refining process byproducts such as API separator sludge, slop oil emulsion solids, leaded tank bottoms, and waste water treatment plant sludges; some of which are **listed hazardous wastes**. A portion of the LTU was used for disposal of lime sludge and asbestos-containing material, and a portion was and remains open space. The treatment conducted here was land farming, in which the contaminated media were applied in liquid and solid forms and disced into the top 18 inches of soil to help degrade or break down contamination. Surface and subsurface soils are contaminated with metals, primarily arsenic, chromium, lead, mercury, and zinc.

- OU-4 includes the Floodplain Forest, an area of approximately 200 acres, including lowlands, sloughs, and oxbow ponds along the east and southeast of the Site. The northwest portion of the Floodplain Forest is adjacent to Tank Farm B and likely received raw water clarifier sludge, boiler blowdown, and tank levee drainage from Tank Farm B. The northeast portion is immediately south of the SWMU 9 North Drainage Ditch. Releases from these sources have affected discontinuous areas of contaminated soils totaling approximately one acre. Surface soils are contaminated with chromium, lead, and zinc.

- OU-5 is the Light Non-Aqueous Phase Liquid (LNAPL) and Groundwater Management Areas which extend throughout the Site, primarily in the Tank Farm and MPA areas. Ongoing groundwater monitoring indicates that contaminated groundwater does not occur beyond the Site's boundaries.

Site History

Indian Refining Company (IRC) and Central Refining Company owned and operated the refinery in the early 1900s. In 1928, Central Refining, owners of the Indian Acres area, conveyed its land and operations to IRC. In the early 1930's Texaco acquired the Site from IRC. Texaco or one of its subsidiaries operated the refinery until 1985, when refinery operations ceased. The refinery produced a typical range of refined petroleum products.

In December 1988 the Site was sold and various companies owned and operated the refinery through the mid-1990s. American Western Refining, L.P. (AWR) bought the refinery in 1995. In 1997, AWR sold the above-ground structures through a bankruptcy auction to a limited partnership formed by Clark Oil Trading Company (COTC) and Blastco Services. COTC/Blastco removed or demolished most of the aboveground structures by 2003. In 2011, Texaco Downstream Properties Inc. (TDPI), a subsidiary of Chevron U.S.A., acquired the Site and remaining structures from AWR Liquidating Trust (in bankruptcy) with approval of the bankruptcy court. Since that time Chevron Environmental Management Company (CEMC), on behalf of TDPI, has been providing maintenance and security for the Site including operating the on-Site WWTS in accordance with its **National Pollution Discharge Elimination System (NPDES)** permit.

Currently, the former refinery area and Indian Acres are fenced and access is generally controlled. River access to the property is possible, though incidents of trespass are rare. Only a few aboveground structures remain at the Site today, including one inactive oil/water separator, the functioning waste water treatment ponds, and the former rail car Fabrication Shop (now used for equipment storage) located along the eastern side of the former MPA. A small building, formerly the Guard Gate/Time House, at the entrance of the Site, serves as a Site museum. Three trailers provide offices for the environmental staff under contract to CEMC who conduct investigations and other activities at the Site.

History of Remedial Activities

Enforcement Activities

In 1992, Illinois EPA and IRC entered into a consent decree (CD) requiring the investigation of certain portions of the Site, primarily the SWMUs. To comply with the CD, IRC conducted environmental assessments, submitted a RCRA Interim Status Closure Plan for the LTU and conducted monitoring activities including soil and groundwater sampling and analysis at the LTU. Illinois EPA approved the Interim Status Closure Plan in 1993 with conditions. IRC objected to the conditions and appealed to the Illinois Pollution Control Board. The appeal was later discontinued by IRC when the Site was placed on the **National Priorities List (NPL)** and Illinois EPA incorporated the LTU closure into the CERCLA process.

On June 5, 1996, Illinois EPA placed Indian Acres and the B&O Pond under a "Seal Order" prohibiting access to the property under threat of criminal prosecution.

In 1996, Illinois EPA completed a Hazard Ranking System (HRS) Documentation Record which resulted in a HRS score that qualified the Site for the NPL. In July 1998, the Site was proposed for the NPL.

In June 1997, the US Fish and Wildlife Service discovered an oil discharge and an area of stressed vegetation within the floodplain area at the southeastern boundary of Tank Farm B. US EPA investigations revealed hydrocarbons floating on groundwater. Additional investigations within the Tank Farm prompted the installation of an interceptor trench to collect and route fluids to an on-Site oil water separator. In October 1997, Texaco and the US EPA entered into an Administrative Order by Consent to perform a removal action of suspected low-pH tarry material that was identified in the residential area north of Indian Acres.

In 1999, an Administrative Order by Consent was entered into by Texaco, US EPA, and Illinois EPA for the performance of a **Remedial Investigation and Feasibility Study (RI/FS)**. US EPA and Illinois EPA decided to change the lead agency to Illinois EPA and as a result the Administrative Order by Consent was terminated and replaced by a CD between Texaco and the State of Illinois. In accordance with the SMOA, Illinois EPA has been coordinating with US EPA throughout the RI/FS and remedy selection process.

The Site was finalized on the NPL on December 1, 2000. The CD required Texaco to complete a RI/FS for the Site as well as gather data needed to complete a natural resources injury determination.

In 2011, Illinois EPA, Illinois Department of Natural Resources (IDNR), and Texaco entered into a Consent Order that provided for the payment of certain sums of money and transfer of 2,300 acres of land south of the refinery for habitat restoration and the establishment of the Embarras River Bottoms State Natural Area (ERBSNA). This property transfer and associated

funding to the State for restoration work settled **natural resources damages** claims pursuant to CERCLA. IDNR's monitoring, research, and restoration work in ERBSNA is ongoing. ERBSNA is available to walking traffic for passive activities and/or hunting opportunities per statewide hunting regulations.

Previous Investigations

From 1981 through 2001, investigations were conducted at the Site by various parties. Texaco conducted investigations throughout the 1980s to evaluate geologic and hydrogeologic conditions, the nature and extent of waste materials in certain areas, and for other purposes. In the early to mid-1990s, various studies and planning documents were undertaken by IRC to support investigation of the SWMUs identified pursuant to the 1992 CD. Investigations were also performed within residential areas near the Site to evaluate the potential presence of Site-related waste materials. The data generated by these investigations and additional data from environmental investigations conducted prior to the RI are included in the RI Report.

In 2000, investigations were undertaken which helped support the CERCLA RI, including reports regarding nearby residential property to the north and northwest of the Site, review of polychlorinated biphenyls (PCB)-bearing electrical equipment, and a wetlands assessment. While non-native materials were found on some residential properties, these materials were found to not be related to the former refinery. All PCB equipment was properly documented, maintained, and decommissioned. The US Army Corps of Engineers reviewed the wetland survey of the Site. In 2001, a targeted study was conducted of one residential property. The study found the residential site to have low-pH tarry material in the yard assumed to be Site-related. This material was later excavated; confirmation samples indicated no further action was warranted.

Domestic wells at Lawrenceville residences downgradient of portions of the Site have been sampled in three events from 1997 through 2006 by CEMC and Illinois EPA. In each sampling event, no constituents related to the Site had migrated to domestic wells off-Site. Illinois EPA tested wells in the Kirkwood Addition in 1999 and CEMC tested select residential wells in May 2006 which confirmed these findings.

Some of the more significant studies and reports are:

- 1990 – SWMU Field Investigation (Trihydro Corporation)
- 1991 - Proposed Phased Approach to Investigating Solid Waste Management Units (Trihydro Corporation)
- 1991 - Groundwater Investigation (Trihydro Corporation)
- 1993 - Prioritization Plan for Investigating Solid Waste Management Units (Trihydro Corporation)
- 1996 – Work Plan for Investigating Solid Waste Management Units (Chemical and Environmental Consultants Inc.)

- 1997 - Report - Consent Decree Work Plan Phase I and Supplemental Work Plan (Chemical and Environmental Consultants Inc.)
- 1997, 1998 - Site Investigation Report (Fluor Daniel GTI Inc.)
- 2000 – Investigation Report for Residential Area Near Former Indian Refinery Site, Lawrenceville, Illinois (SECOR International Inc.)
- 2000 – Wetland Assessment Report, Former Indian Refinery Site (ELM Consulting, LLC)
- 2001 - Addendum to Investigation Report for Residential Area Near Former Indian Refinery Site, Lawrenceville, Illinois (SECOR International Inc.)

Remedial Investigation

CEMC conducted the RI from 2001 to 2006. The RI approach to investigating the nature and extent of contamination at the Site comprised three-phases that built on the results of each previous phase. Phase I began with an investigation of the perimeter of the Site to determine whether contamination was migrating beyond the property boundary, followed by investigations of the Tank Farms, LTU, Indian Acres, and areas where no dismantlement activities were being performed. Phase II focused on the interior of the Site (i.e., MPA) and addressed data gaps identified during Phase I investigations. Phase III targeted areas with ongoing operations units such as Oil/Water Separator 8 and the wastewater aeration ponds and addressed data gaps identified during the previous RI phases. *Figure 3* shows RI sample locations.

The RI also included laboratory **treatability** testing on waste materials from Indian Acres and the Separator 7 Area to evaluate potential remedial techniques. These lab tests were documented as Technical Memoranda and also discussed in detail in the RI Report.

The 2008 RI report documented the results of five years of field activity and included results of soil, groundwater, surface water, and sediment samples, extent of LNAPL, areas of waste deposition and results of treatability testing. The RI Report also included background and regional information; descriptions of field investigation activities and sampling methods; discussion of the geological, hydrogeological, geotechnical, geophysical, and ecological features of the Site; the nature and extent of contamination at the Site; a discussion of contaminant fate and transport; a Baseline Ecological Risk Assessment (BERA); and a Baseline Human Health Risk Assessment (BHHRA). A summary of the results is provided later in this Proposed Plan.

Illinois EPA conditionally approved the RI Report in 2012, with full approval pending resolution of the human health and ecological risk assessments. Three addenda to the risk assessments (in 2016 and 2017) and resolution of outstanding issues resulted in Illinois EPA's final approval of the RI including risk assessments in 2018.

Other Investigations

Embarras River Modeling

In 2011, CEMC initiated a preliminary Embarras River Model to evaluate whether a potential remedy of capping and or covering materials in Indian Acres, the Separator 7 Area, and the former Lime Sludge Ponds would affect future floodwater flow in the floodplain of the Embarras River. These areas are situated within the 100-year floodplain of the Embarras River.

The model was completed with data and information from the Federal Emergency Management Agency (FEMA), IDNR, National Flood Insurance Program of Illinois, and Illinois Department of Transportation (IDOT). A comparison of the water surface profiles from existing and proposed floodplain conditions indicated no appreciable rise in base flood elevation. The model determined that proposed placement of caps/covers constructed in the floodplain would not result in any significant flooding impacts.

Storm Water Runoff Sampling Program

In 2015, CEMC proposed to initiate storm water runoff sample collection after significant rain events from select areas of the Site to evaluate long term management options for storm water. Surface water samples were collected after significant rain events from select areas of the Site during six sampling events from June 2015 to November 2015. These samples were analyzed for **volatile organic compounds (VOCs)**, **semi-volatile organic compounds (SVOCs)**, and **inorganic compounds**.

Laboratory analytical results were compared to surface water quality criteria regulations of 35 Illinois Administrative Code (IAC) 302.210 and 302.208. With the exception of mercury in samples from a single location, the surface water sample analytical results met the water quality standards. That single location (MPA-SB) is within the southern half of the Main Process Area, which is graded to drain to the waste water treatment ponds (WWTPs), and discharge from the WWTPs consistently meets the requirements in the Site's NPDES permit.

Remediation Activities

Certain remedial activities were implemented before the State's CD was in effect and under the authority of other regulatory programs or under the oversight of US EPA. The major activities included:

- 1993 -1995: Closure of the LTU was initiated, pursuant to the LTU's interim status under RCRA. IRC conducted certain activities such as soil and groundwater sampling, and installing a vegetative cover in order to comply with the RCRA closure regulations.

- In 1997, US EPA responded to an oil release into the wetlands beyond the refinery fence line near the southern portion of Tank Farm B. US EPA collected water/hydrocarbon

fluids discharging into the wooded low-lying area southeast of Tank Farm B. US EPA constructed collection pits in the oil seep area to capture oil discharge, pumped collected fluids to the on-Site oil/water separator #8, excavated oil-soaked soils to the on-Site **biocells**, and installed a 760-foot long interceptor trench. The trench was 18 feet deep and included a gravity fed collection sump. A total of 10,287 cubic yards of contaminated soils were excavated from the impacted area and placed in on-Site biocells, and approximately 11,000,000 gallons of water/hydrocarbon were pumped to the oil water separator during the removal activities.

- Residential cleanup north of Indian Acres and investigation of residential areas to the north and northwest of the Site. At various times in 1996, 1997, 2000, and during the RI, investigations of residential properties adjacent to the Site and the Hickory Street ballfield were investigated by visual inspection, soil borings, air monitoring, and lab analysis of collected samples. The investigations resulted in three removal efforts in 1996, 1997, and 2000 of waste material and soil from certain properties on Hickory Street and Fourth Street. Subsequent investigations revealed no other residential areas requiring remediation.

Since submittal of the RI Report, several interim remedial activities have been completed at the Site, all of which have worked to reduce risk to both potential human and ecological receptors and which support and are consistent with the proposed final remedial action for the Site. A brief summary of these activities is presented below.

<u>Non-Time Critical Removal Action for Pipeline Removal</u>

The State's CD provided for the coordination of Texaco's work dismantling the refinery's infrastructure with RI/FS work. Even though there was no imminent threat to human health or the environment associated with the pipeline corridors, CEMC drained and removed the buried pipelines remaining on Site for three reasons: 1) to eliminate the potential for residual hydrocarbons in these pipes to be released to the environment, 2) to allow for the collection of data within the pipeline corridors, and 3) to conduct a removal action consistent with the likely final remedy for the Site. The scope of work included decommissioning underground pipelines, cleaning sewer lines, decommissioning other underground structures such as septic tanks, and removing foundations and other material located within the MPA.

To that end, in 2007, Illinois EPA and US EPA-approved a non-time critical removal action for pipeline decommissioning throughout the tank farms. This action also included the demolition of four above ground storage tanks in Tank Farm E. The associated Engineering Evaluation/Cost Analysis (EE/CA) was expanded in scope in 2011 to include pipelines within the MPA. The EE/CA also provided for establishing biocells to treat hydrocarbon-impacted soil, post-decommissioning surface restoration and soil sampling. Pipelines were decommissioned in the Tank Farms from 2008 to 2011 and in the MPA from 2011 to 2014.

Texaco decommissioned all underground pipelines and most underground infrastructure within the six Tank Farms and MPA. The storm sewer system in the MPA was cleaned and removed with the exception of the discharge lines connecting the API Separators to the aeration ponds. Most of the below-grade concrete was demolished and removed. Two above-ground storage tanks (ASTs) were demolished by June 2015. Decommissioning activities included:

- Excavation and eventual backfilling of 180,900 linear feet of trench;
- Decommissioning of approximately 930,000 linear feet of pipeline, of which 915,000 linear feet were removed and 14,830 linear feet were abandoned in-place;
- Decommissioning of 36,000 linear feet of storm sewer and 22 septic tanks in the MPA;
- Management of 273,200 cubic yards of hydrocarbon-impacted soil in the on-Site biocell for reuse as approved backfill;
- Management of 25,920,000 gallons of wastewater in accordance with the Site's NPDES permit;
- Clean out and demolition of above-ground tanks 729 and 730, including management of 1,200 tons of RCRA **K049** hydrocarbon slurry and 22 tons of K049 tank bottom sludge;
- Recycling of 10,200 tons of recovered steel;
- Recovery and resale of 394,000 gallons of hydrocarbons from pipeline draining and cleaning;
- Management of 170 tons of RCRA **F037** residual sewer sediment;
- Demolition and processing of 219,000 cubic yards of concrete.

At the completion of underground structures removal in the tank farms and MPA, all field **screening** results were reviewed to help select soil boring locations. These investigations were completed to address data gaps at the completion of the RI because of safety concerns from collecting samples while the pipelines were still in place.

In 2021, additional pipelines were removed from the Separator 7 Area as an extension of the 2011 MPA work. Overburden soil from these pipelines was returned to its excavated location and will be addressed as part of the remedy for the Separator 7 Area.

Figure 4 shows all pipeline removals that have occurred.

<u>Biocell Treatment</u>

Soils removed during pipeline removals and berm removals that met Ill 35 IAC 742 criteria for industrial/commercial properties were deemed suitable to use as backfill.

Soils that did not meet these criteria were transported to biocell processing areas in Tank Farm B. The biocell areas were enclosed by berms. Soils placed within these areas were mechanically turned and aerated. Treated soil was analyzed for VOCs, PAHs, metals, and cyanide. The treated

soils which met the 35 IAC 742 soil objectives were deemed suitable for backfill while the treated soils that did not meet these criteria were subject to additional treatment in the biocells.

An estimated 75,000 cubic yards of soil, including the biocell soils that meet the criteria described above, are currently areas available at the Site for use as potential future on-Site backfill.

Berm Sampling

In 2011, CEMC proposed sampling and testing the earthen berms around the tank-hold areas of the Tank Farms to evaluate whether that soil could be used as supplemental backfill on Site. Berm soil sampling activities were initially conducted throughout 2011, 2015, and 2017 in Tank Farms A through F and the MPA. Based on sample results, an estimated 16,800 cubic yards of berm soil were placed as backfill in the MPA from August 2015 to June 2017.

City Sewer Replacement in Tank Farm C

In 1985, Texaco donated three storm sewer lines running through the refinery property (along with their associated easements) to the City of Lawrenceville. One of the sewer lines was a 36-inch concrete storm sewer that ran through the western portion of Tank Farm C. Based on the RI, a portion of the sewer line was replaced to eliminate the potential for LNAPL and groundwater to enter the aging storm sewer and to eliminate a potential preferential migration pathway.

Construction activities were completed in 2013 and included the replacement of 1,391 linear feet of existing 36-inch concrete storm sewer with high density polyethylene (HDPE) pipe. In addition, five new replacement manholes were installed along the length of the sewer. A mixture of sand and bentonite was placed around pipe joints and manholes for additional protection against infiltration of LNAPL and groundwater. Post construction inspections and maintenance as required were conducted. Monthly inspections are ongoing.

Pump House Decommissioning

Following the curtailment of refinery operations in 1995, the pump house was idled, and the above-ground structures were decommissioned in 2004. In 2013, CEMC submitted a Section 404 Nationwide Permit 3 Application to the U.S. Army Corps of Engineers for the removal of the pump house historically used to provide the former Indian Refinery with water from the Embarras River.

Dismantling, demolishing, and removing the existing pump house, associated structures (pipes, motors, parking pads, etc.), the intake structure, and backfilling the excavation to within three feet of ground surface was completed in April 2014.

API Oil/Water Separator #8 Decommissioning

Oil/Water Separator #8 (Separator #8) was a former below-grade oil/water separator. It received the majority of storm water flow from the Site after the decommissioning of the refinery. Separator #8 was approximately 186 feet long, 96 feet wide, and 12 feet deep. Discharge water from Separator #8 drained to the WWTS.

Cleaning Separator #8, including removal of sediment was conducted in August 2012. A total of 1,408,293 pounds of sediment, classified as RCRA listed hazardous waste, **K051**, and was disposed of off-site. Additional sediment removal was conducted in 2015 with 682 tons of non-hazardous sediment disposed off-site.

Final decommissioning of Separator #8 was completed in 2017. Approximately 90 tons of steel was removed and transported for off-site recycling. A total of 3,466 tons of concrete and 29 tons of painted concrete and brick were transported and disposed off-site. Final excavation backfilling and ground surface grading were completed in July 2017.

Post-demolition soil sampling was conducted as the concrete walls were removed and soils exposed. When the concrete was removed from the floor of the separator, the underlying soils were saturated with water; therefore, bottom soil samples were not collected.

Barometric Basin Decommissioning

The former Barometric Basin is located in the southwestern portion of the former MPA. The basin consisted of three concrete bays, each approximately 79 feet long by 21 feet wide and 6.5 feet deep. In 2017, CEMC decommissioned the Barometric Basin. Sediment removed from the basin was transferred to the on-Site biocell for treatment. Decommissioning of the Barometric Basin was completed in September 2017.

PCB Impacted Soil Removal

During the RI, shallow soil was determined to contain concentrations of PCBs above 35 IAC Part 742 (TACO) Tier 1 soil objectives at a concrete slab that formerly held an electrical transformer bank. PCB impacted soil was removed in 2013. The concrete slab was crushed by a hydraulic hammer and removed. Soil beneath the concrete slab was visibly stained. Stained soil was removed along with several pipes and additional concrete structures. A total of approximately 15 cubic yards of soil was disposed off-site. Confirmation samples confirmed remediation was complete.

Embarras River Stabilization

In 2007, a portion of the Embarras River bank was observed to have eroded into the eastern most former settling pond (i.e., a former borrow area and former wastewater settling ponds) adjacent to the river. The Embarras River bank was observed to be eroding towards the west at estimated rates of multiple feet per year. In 2016, CEMC requested to implement riverbank stabilization as a Site maintenance item. CEMC completed a stabilization design and the project

was permitted pursuant to US Army Corps of Engineers (USACE) Nationwide Permits in May 2017.

Construction began in 2017 and included cutting back the riverbank, placing geotextile fabric and rock armoring, installing concrete culverts at the toe of the rock armoring, developing a spillway, and regrading the disturbed forested wetlands. Following construction, the disturbed forested wetlands were reseeded and planted with USACE approved tree seedlings. Monitoring of the riverbank and tree planting is ongoing.

Asbestos Removal in OU-3

A small area within OU-3 (outside of the LTU treatment area) was used between 1980 and 1981 for disposal of asbestos-containing material (ACM). Field work associated with ACM removal commenced in late October 2021 in accordance with an Illinois EPA-approved work plan and a project-specific health and safety plan. The project involved delineation, excavation, and transport of 3,083 tons of ACM (including ACM/soil mixture) to a properly permitted off-Site landfill for disposal. Following completion of the work, the ACM project area was backfilled, graded, and seeded to establish grass cover and prevent erosion. The project completion report was approved by Illinois EPA in 2023.

Feasibility Study

To support the Feasibility Study, CEMC conducted laboratory and field studies for Indian Acres and the Separator 7 Area in OU-2. The purpose of the studies was to determine appropriate types and mixes of amendments to blend with soils and wastes in order to more easily transport them or strengthen them to support a cover. These studies indicated that different mixes of cement, quicklime, flyash, and/or other soils may be needed because of the variable nature of the soils and waste being treated. The results indicated treatment of soils and wastes could be conducted to adequately strengthen the material to support caps or covers and remain stable during construction activities without causing a significant ongoing threat to groundwater from leaching of contaminants from the treated material. This information was incorporated in the FS.

A Conceptual Site Model and Natural Source Zone Depletion Studies were also conducted to characterize LNAPL and determine if recoverable LNAPL remained. Based on these studies**,** the LNAPL is not considered recoverable or removable from the subsurface.

The Feasibility Study Report included five of six OUs and was submitted in separate volumes for each OU. Volume 1 addressed the Site's background and history as well as presented remedial action objectives, remedial goals, and potential ARARs. Volumes 2 through 6 presented the evaluation of remedial alternatives for each of the OUs 1 through 5. Illinois EPA approved the FS as a whole in April 2024.

CEMC continues to conduct field-scale pilot tests of air sparging, bioventing and sulfate land application in Tank Farms E and F to support the remedial alternatives for OU-5.

Public Outreach to Date

From 1996 through 1998, Illinois EPA had an active presence in the community. Community interviews were conducted throughout 1996, focusing on neighborhoods nearest the Site. Interviews focused on residents' observations of soil, groundwater, or air contamination. Door to door interviews were conducted to inform nearby residents about soil removal actions conducted by US EPA. The local information repository at the Lawrence Library was established. In 1997, Illinois EPA participated in meetings with Lawrenceville government, a joint press conference with US EPA, and public availability sessions to address the Site's NPL listing, possible residential well contamination, and residential soil removal. In 1998, community interviews were expanded and outreach to local media continued regarding asbestos cleanup and ongoing demolition work at the refinery. Based on community input, Illinois EPA finalized its Community Relations Plan in 1998.

Fact Sheets were distributed to the community from 1996 through 2008 to keep the community updated on Site investigation progress.

On September 17, 2008, a public availability session was held to present findings of the Remedial Investigation.

In 2001 Chevron, with the cooperation and approval of Illinois EPA and US EPA organized a Community Advisory Council (CAC), including community leaders and representatives of various stakeholder groups. Community interviews were conducted to gauge interest, and 22 members of the community comprised the first CAC. The CAC has been meeting since January 2003 and currently meets every other month. Membership of the CAC has recently been expanded to include residents and businesspeople near the Site. Illinois EPA attends the meetings and provides an update of State activities.

As the FS was nearing completion in 2024, fact sheets were distributed to the community to provide a Site update. In March 2024, an online community survey was publicized and made available through a QR code, the CAC, and by flyers posted in area businesses, churches, and government buildings. The survey responses provided information to gauge current questions, concerns, or information needs about the Site. Based on information provided, the Community Relations Plan was revised in August 2024.

II. Site Characterization

Description of the Site

The Site is located in Lawrence County, Illinois, southeast of the City of Lawrenceville and comprises approximately 990 acres. It is situated in a light industrial and residential area and is bordered by cultivated farmland to the west and southwest, alluvial lowlands to the southeast, the Embarras River to the east and residential areas to the north and northwest. The main Site features are the MPA, Indian Acres, six tank farms, lime sludge ponds, waste water treatment ponds, the floodplain forest, firewater pond, area adjacent to the Embarras River, and the LTU. See *Figure 5* for Site features.

The Consent Decree defines the Site as consisting of the refinery, a land farm (the LTU), Tank Farms A-F, Tank 572 oil release site, and Indian Acres, including the City of Lawrenceville's NPDES-permitted on-site waste water treatment facility. Additional areas evaluated in the FS consist of rights-of-ways along roadways/utility corridors that cross or are adjacent to the Site.

The current land use of the Embarras River basin is dominated by agriculture. The majority of the land cover in the Embarras River watershed is cropland. Grassland is the second most abundant land cover type. There are three distinct habitats associated with the Site including:

- Floodplain forest;
- Mowed/managed/open areas; and,
- Aquatic areas, which include the permanent water bodies (found mostly in the floodplain forest as well as the Embarras River and the northern tributary to Indian Creek), and managed ponds (found mostly in the mowed/managed/open areas).

Topography

Regional topography is characterized by low relief and broad terraced valleys containing low gradient streams. The main refinery lies on a plateau next to alluvial lowlands associated with the Embarras River. An alluvial terrace bluff line runs along the eastern edge of Tank Farm B and across the MPA. The low bluff line roughly coincides with the 420-foot topographic elevation and the western extent of the 100-year floodplain.

The surface topography at the Site is relatively level. Across the main refinery west of the bluff line, the ground surface slopes gently from the west to the east. Across the western portion of the LTU the ground surface slopes gently from east to west toward the northern tributary to Indian Creek. In Tank Farm C, there is a gradual slope toward C-Pond and its steep banks. The alluvial lowlands east of the bluff line are relatively flat, with sloping levees along the river bank separating the floodplain from the main river channel.

Significant engineered features such as earthen berms and containment dikes have been built to contain and divert run-off waters throughout the main refinery and tank farms. Other prevalent engineered features include the large raw water reservoir in the MPA, and small firewater ponds in the MPA and Tank Farm E. A large active permitted WWTS (aeration lagoons) exists in the southeastern portion of the Site, and directly north of this location are the former waste water settling ponds adjacent to the river. Elevated roadways separate the various former disposal plots in the LTU.

Geology/Hydrogeology

Geology

Regional geology was shaped by the melting of glacial ice sheets that caused the ancestral Embarras River to erode a wide valley as much as 100 feet deep into the bedrock. Subsequent deposition of glacial-derived sediments filled in much of the valley with outwash sand and gravel, till, lacustrine silt and clay, and alluvial deposits. The present day Embarras River has eroded and deposited an alluvial sediment system over the glacial sediments.

Based on nearly 1,500 exploratory borings advanced on and around the Site during the RI, the local geology of the Site can be divided into four layers west of the bluff line. These four layers consist of:

- Soil and near-surface sediments (upland area to the west and a lowland floodplain of the Embarras River to the east) from 2 to 20 feet thick in the upland and alluvial sediments to 39 feet thick in the floodplain. These different types of soils represent the same water bearing zone.
- An extensive stiff, low permeability clay confining layer; referred to as the “basal clay” because it defines the base of the shallow water-bearing zone and as the “confining clay” because it confines the shallow aquifer from the deeper one. The clay appears to extend throughout the Site as a single continuous layer, forming a massive **aquiclude** which underlies the near surface aquifer. West of the bluff line, the clay layer is observed at about 9-25 feet below ground surface (bgs) and ranges in thickness from 10 to 32 feet. East of the bluff line, the clay layer ranges in thickness from 19 to 31 feet.
- Deeper unconsolidated sediments comprised of silt or clay alternating with layers of sand or silty sand from 1 to 23 feet thick, underlain by bedrock.
- Bedrock comprised of sandstone, shale, limestone, and occasional coal beds. Bedrock is encountered at 32 to 102 feet bgs.

Hydrogeology

Regional **hydrogeologic** features include two major bedrock valleys carved by the ancestral Wabash and Embarras rivers. Both bedrock valleys have been largely filled in by glacial outwash

sand and gravel, lacustrine silt, and clay, and by more recent alluvial sand, gravel, silt, and clay. The near-surface sand and gravel zones form the primary water-bearing zone in the east portion of the Site. Wind-blown silts and sands form the primary water-bearing zone west of the bluff line. The main source of recharge for shallow groundwater at the Site is infiltration of precipitation through overlying soils.

Aquifer tests performed during the RI indicate that the calculated **hydraulic conductivity** values for the shallow water-bearing zone ranged from $7x10^{-2}$ to $6x10^{-4}$ **cm/s**. The shallow water-bearing zone, from the middle of Tank Farm E to C-Pond, has a calculated linear groundwater flow velocity range of between 1.36 ft/day and 1.06 ft/day. The shallow water-bearing zone, across the Embarras Floodplain Area, has a calculated linear groundwater flow velocity range of between 0.20 ft/day and 0.15 ft/day.

Water movement in the basal clay layer that underlies the shallow water bearing zone is much slower. The vertical permeability of the basal clay averages $1.3x10^{-7}$ cm/s. The slow vertical movement combined with the observed thickness of the clay layer (between 10 and 32 feet) significantly reduces or eliminates the potential for downward migration of contaminants.

The overall groundwater flow characteristics of the Site do not vary significantly by season. Generally, horizontal flow in the unconsolidated near-surface water-bearing zone for most of the Site has been consistently east to southeast toward the Embarras River. There are localized exceptions, such as flow to the northeast at Tank Farm A, and west-southwest from the western portion of the LTU, among other variations.

Areas of groundwater recharge include C-Pond, Turner Pond southeast of Tank Farm B, and possibly the WWTS ponds. The Northern Tributary of Indian Creek appears to be hydraulically connected to the shallow groundwater in the LTU and Tank Farm E and receives groundwater discharge from these areas. However, at times of extremely low water table, the creek may become perched above the nearby shallow water-bearing zone. The Embarras River is the ultimate receiving body for groundwater discharge from the Site.

Measurements in wells screened within the deep unconsolidated sediments just above bedrock indicate water level elevations within or above the elevation of the basal clay unit, suggesting this deeper water-bearing zone is under confined conditions. Groundwater in these deeper water bearing zones flows east toward the Embarras River.

Water Usage

Regionally, Lawrence County has two major subsurface hydrogeologic features, which are a pair of valleys carved by the ancestral Wabash and Embarras rivers into the Pennsylvanian bedrock. Both bedrock valleys have been largely filled in by glacial outwash, sand and gravel, lacustrine silt, and clay, and by more recent alluvial sand, gravel, silt, and clay. The sand and gravel zones are highly permeable and form a prolific aquifer. These unconsolidated glacial and alluvial

sediments compose the primary water-bearing formations for Lawrence County and are an important source of municipal, irrigation, and rural domestic water.

Groundwater within the shallow unconfined aquifer at the Site has been categorized by the Illinois EPA as Class I groundwater. Deeper on-Site groundwater below the basal clay in unconsolidated sediments is also considered Class I groundwater[1].

The City of Lawrenceville is served by four active wells. There are no potable wells located on the Site. The city water supply has not been threatened by the waste in Indian Acres or other areas of the Site. The groundwater flow from the Site is toward the river (southeast), in the opposite direction of the City's wells. The City wells consistently meet federal health standards.

Residential wells sampled in July 1996 were at various depths. While some naturally occurring arsenic was present in a few wells, no other contaminants were present at levels that would violate Federal and State health standards. The Illinois Department of Public Health notified residents about the arsenic levels at that time.

Nature and Extent of Contamination

The nature and extent of contamination in soil, groundwater, surface water and sediment is discussed below. Additionally, the nature and extent of LNAPL and non-native materials other than LNAPL are also discussed below.

Soil

The extent of contamination in soil is based on comparisons of soil analytical results to Tier 1 Soil Remediation Objectives (Tier 1 SROs) in Illinois regulation (35 IAC 742, Tiered Approach to Corrective Action Objectives, or "TACO") and Site-specific soil remediation objectives (SROs) developed from the risk assessment results. These comparison values are based on industrial/commercial land use because this is the anticipated future use of most of the Site property. Other values were based on appropriate ecological receptors and habitat.

Contamination in soil generally occurs between zero and 10 feet bgs, with significantly fewer occurrences below 10 feet bgs. The soil impacts appear to be confined to either the near-surface soils or the upper-most zone above the confining clay layer. No soil impacts are known to penetrate through the confining clay.

The primary VOCs detected in soil samples at concentrations above industrial/commercial Tier 1 TACO values were benzene, ethylbenzene, toluene, xylenes (BTEX), and naphthalene.

[1] Class 1 groundwater is capable of being used for potable purposes, by virtue of its location, productivity, and other hydrogeologic characteristics. Whether or not the source of groundwater is currently being used as a drinking source has no bearing on its classification.

Occurrences were typically between one and ten feet bgs in direct or close proximity to known potential sources such as former refining infrastructure.

Chlorinated VOCs were detected infrequently. Concentrations above industrial/commercial Tier 1 TACO SROs were identified within the northwest portion of the former process area, south central SWMU 28, the Separator 7 Area, several isolated areas of Tank Farm B, and one boring in the LTU.

SVOCs detected at concentrations above industrial/commercial Tier 1 TACO SROs were primarily limited to PAHs. Typically, select PAHs (predominantly benzo(a)pyrene) were detected along with BTEX constituents.

Inorganic compounds detected above industrial/commercial Tier 1 TACO SROs included arsenic, lead, and to a lesser extent mercury, chromium, selenium, and thallium. These constituents were detected primarily in the LTU, disposal or fill areas, in areas of piping and/or former tankage, and process areas. Inorganic compounds detected above those SROs were most frequently detected near ground surface (zero to three feet bgs) with a vertical extent typically no greater than seven to ten feet bgs.

The predominant detected contaminants in soil include benzene, benzo(a)pyrene (and associated carcinogenic PAHs), arsenic, and lead.

The spatial distributions of benzene and benzo(a)pyrene strongly coincide with the extent of LNAPL and tarry material observed in soil borings located in close proximity to piping, former tankage, process areas, or waste areas. The frequency and distribution of benzo(a)pyrene from 0 to 3 ft-bgs are very similar to those from 3 to 10 ft-bgs, with fewer detected concentrations in the 3 to 10 ft interval. Benzene, however, is much more prevalent in 3 to 10 ft than 0 to 3 feet.

The spatial distributions of arsenic and lead above site-specific SROs are similar. Both metals occur predominantly in former waste disposal or fill areas including shallow soils in the LTU, and in the vicinity of the Separator 7 Area, SWMU 28, and the B&O Pond (lead) in Indian Acres. Lead and arsenic also have sporadic occurrences in shallow soils in Tank Farm A and the northern border of the Main Process Area, and in SWMU 9.

Groundwater

The nature and extent of contamination in groundwater is based on comparisons of groundwater analytical results to US EPA's Maximum Contaminant Levels (MCLs, 40 CFR 141), State groundwater quality standards for Class I groundwater (35 IAC 620.410), or, for constituents not listed in Section 620.410, to the State's TACO Tier 1 Groundwater Remediation Objectives (Tier 1 GROs) for Class I groundwater (35 IAC 742). Those standards and objectives are collectively referred to below as the Class I groundwater standards or "the standards."

VOCs previously detected in shallow groundwater at concentrations greater than the Class I groundwater standards included benzene, ethylbenzene, naphthalene, methylene chloride, acetone, 1,1,1- trichloroethane, 1,1-dichloroethylene, and vinyl chloride. Of these VOCs, benzene was the most frequently detected above the standards with most occurrences located near identified source areas such as LNAPL plumes, underground pipelines, and the former waste disposal area in Indian Acres. Limited and well-defined occurrences of chlorinated VOCs have been detected above the standards in two areas of the Site including SWMU 28 (a solid waste and debris disposal area of the WWTS and next to the river) and the northeastern corner of Tank Farm B.

SVOCs detected above Class I standards in shallow groundwater include bis(2-ethylhexyl)phthalate, phenol, and pentachlorophenol. Bis(2-ethylhexyl)phthalate was detected in only five wells and is considered to be a laboratory/sampling **artifact**. Phenol was detected in one sample in central SWMU 2 (north portion of Tank Farm B) collected from a well set in a **perched groundwater** zone of non-native fill material and can likely be attributed to the impacted shallow subsurface material identified at this location. Historically, pentachlorophenol has been detected in two locations along the north border of the LTU and at one location adjacent to the former cooling water tower at the northeast corner of Tank Farm B. Due to its common use as a wood preservative, pentachlorophenol can likely be attributed to the railroad line immediately north of the LTU, and to treated lumber used to construct the former cooling tower.

Dissolved inorganic constituents detected above Class 1 standards are primarily manganese and thallium, with less frequent occurrences of iron, nickel, cadmium, arsenic, and beryllium. All of these are naturally occurring in groundwater. The widespread distribution of manganese and thallium and the presence of these naturally occurring minerals and metals at concentrations similar to regional background levels indicate that these analytes are indicative of local background conditions.

Total inorganics detected above Class 1 standards in shallow groundwater have historically included manganese, iron, lead, vanadium, thallium, arsenic, nickel, chromium, beryllium, antimony, and cadmium. Based on the background study conducted during the RI, arsenic, chromium, iron, lead, manganese, nickel, thallium, and vanadium were present at concentrations above the Class 1 groundwater standards and are consistent with regional concentrations, not indicative of Site-related impact.

Deep aquifer wells screened below the confining clay layer have not detected VOCs above the Class I standards. The SVOC bis(2-ethylhexyl)phthalate has been detected above the standard in the deeper water-bearing zone, but was reported at an estimated concentration below the laboratory reporting limit and is likely a laboratory artifact. Dissolved manganese, a naturally occurring mineral in groundwater, was reported above the Class 1 standard at a concentration near the regional background level and is not believed to represent a Site-related impact to deep groundwater. Taken together, the data indicate that constituent concentrations in

samples of the deeper groundwater at the Site consistently meet the Class I groundwater standards.

In general, groundwater contamination is associated with the LNAPL smear zone. CEMC continues to monitor the groundwater on an annual basis, with samples taken in April and October of alternating years from 27 wells. The monitoring program focuses on perimeter wells and continues to show that no Site groundwater contaminants are migrating off-site. As of April 2024, benzene was the only site-related chemical above standards in the perimeter well network and occurred above standards in two wells included in the sampling network. Both wells are located in areas where groundwater flows onto Site property.

Surface Water and Sediment

The nature and extent of contamination in surface water and sediment was based on comparisons to Risk-Based Screening Levels (RBSLs) for human and ecological receptors. The majority of surface water and sediment analytes reported above an RBSL were naturally occurring metals present at concentrations similar to regional background levels and reference locations; and therefore, are not considered site-related.

Certain SVOCs, such as phthalates in surface water and PAHs and phthalates in sediment, were detected at concentrations greater than the reference locations and above RBSLs in samples collected on Site. These locations include the firewater ponds and former treatment ponds, the C-Pond drainage pathway, the SWMU 9 North drainage pathway, the NPDES Outfall near the WWTS, and ephemeral water bodies within Indian Acres. Statistical analysis indicates these constituents may be site-related.

Inorganic analytes such as lead and chromium, and to a lesser extent arsenic, barium, copper, mercury, selenium, zinc, and cyanide were detected at concentrations greater than the off-site reference locations and above RBSLs in samples collected from the SWMU 9 North drainage pathway, ephemeral water bodies in SWMU 9 South, and Turner Pond. Statistical analysis indicates these constituents may be Site-related.

LNAPL and Smear Zone

LNAPL consists of concentrations of hydrocarbons that can occupy pore spaces between soil grains. If fully saturated, the LNAPL may be recoverable from the soil. In general, LNAPL measured at or below a residual saturation level becomes held or stuck within pore spaces and cannot be recovered. The depth interval at which LNAPL is present is known as the smear zone. The smear zone thickness changes as the groundwater elevation fluctuates during wet and dry periods.

The extent of the LNAPL smear zone at the Site is based on direct measurements in temporary wells and monitoring wells, observations in soil borings logs, groundwater and soil analytical

results, and field screening results.[2] The LNAPL characterization comprised multiple phases of data collection to provide a thorough understanding of LNAPL composition, horizontal and vertical distribution, potential mobility, and ability to be recovered from the subsurface.

Based on these studies, the extent of LNAPL is assumed to be throughout much of the Tank Farms and MPA, as well as smaller areas east of Crackle Street, and other small satellite areas with a vertical extent up to 10 feet, as depicted on *Figure 6.* While recovery efforts occurred in the past, there is no longer recoverable LNAPL present.

Other Non-Native Materials

The extent of non-native materials other than LNAPL is based on geophysical surveys, as well as direct observations in soil borings, test pits, and/or at the ground surface.

Two areas of the Site – Indian Acres and the Separator 7 Area – contain a significant amount of non-native material including subsurface fill and tarry or oily sludge present at the surface and in the subsurface. Based on knowledge of historic Site operations and waste handling and laboratory tests, the wastes in Indian Acres and the Separator 7 Area are not listed wastes. Some samples from the former sludge pit at Separator 7 indicated that some waste is **characteristically hazardous** for lead.

Additional refinery wastes are known to have been placed in the LTU, where they were treated via landfarming. The landfarming operations – conducted in accordance with the LTU's RCRA interim status permit - purposefully incorporated the wastes into the soil as a method of treatment. As a result of the permitted treatment, those wastes, unlike the wastes in Indian Acres and the Separator 7 Area, are no longer a distinct medium. The LTU also includes several small discontinuous areas of asphalt material which has been disposed near the surface in the northeast corner. Sampling indicates the material is of neutral pH. Asphalt-related contaminants of potential concern do not appear to have affected soil in the area.

Source Materials, Principal Threat Wastes

The principal threat concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water or air, or acts as a source for direct exposure. USEPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

[2] The presence of LNAPL was based on (in order): observed LNAPL thicknesses in permanent monitoring wells; visual observations of LNAPL (free product or sheen) noted in available soil boring logs; detection of benzene greater than 1 milligram per liter (mg/L) in groundwater samples; detection of benzene greater than 1 milligrams per kilogram (mg/kg) in soil samples; and detection of total volatiles greater than 500 parts per million (ppm) in headspace of soil samples during sample collection using a photoionization detector (PID).

Much of the waste at the Site includes large quantities of relatively lower threat wastes. These types of wastes are difficult to treat and lend themselves to containment. Source materials are present at the Site (i.e., Indian Acres), and some hazardous wastes are or were present (e.g., the LTU). The direct toxicity of wastes at the Oily Soil Areas, Indian Acres, and the Separator 7 Area have not been assessed, so it is unknown if toxicity alone would warrant a designation of principal threat waste. However, the wastes at the Oily Soil Areas and Separator 7 do not appear to have migrated to groundwater, surface water, or air and can be contained reliably. These wastes are not liquid or highly mobile. While LNAPL is often identified as a principal threat waste and is a potential threat to air at the Site, recoverable amounts are no longer present.

At Indian Acres, it is likely that some wastes present a risk through direct contact and can release sulfurous gases if disturbed. Low pH acidic sludge is present, particularly in the Spray Pond Area. The State of Illinois' 1996 Seal Order on this portion of the Site remains in effect.

Based on the threat from direct exposure, Illinois EPA identifies the acid sludges (e.g., at the Spray Pond) wastes at Indian Acres as principal threat wastes. All proposed alternatives for Indian Acres involve treatment of the Spray Pond wastes.

Scope and Role of Response Action

Overall Strategy for Site Remediation

End State Vision

Long-term goals for the Site include remediation of impacts in order to protect human health and the environment; appropriate reuse of historically developed portions of the property, where possible; and management of historically undeveloped areas to support ecological values. The current End-State Vision for the Site also includes areas of potential future light industrial development, areas of in-place waste management, and areas of long-term floodplain and forest management *(Figure 7)*. All areas of the Site will have appropriate **Institutional Controls (ICs)** placed upon them to protect against potential exposure by human workers to residual contaminants at the Site.

Sequence of Operable Units

CERCLA provides for the division of a complex site into OUs as an incremental step toward comprehensively addressing site problems. OUs may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site. The designation of OUs will not impede implementation of subsequent actions, and must be consistent with the including final action at the Site.

For the purpose of implementing the remedies identified in the Feasibility Study (FS), the Site is divided into the six OUs depicted on *Figure 2*. Four of the OUs (OU-1 through OU-4) address geographical portions of the Site, with a focus on soil and waste (if present):

- OU-1 encompasses three remedial areas and addresses soil: TFs (approximately 177 acres), MPA (approximately 125 acres), and Road ROWs/City Storm Sewer Investigation Area (approximately 10 acres). See *Figure 8*.

- OU-2 encompasses three remedial areas and addresses soil and waste: Oily Soil Areas (including the B&O Pond, Lime Sludge Ponds, and SWMU 9 North Ditch), Indian Acres (approximately 90 acres), and Separator 7 Area (approximately 18 acres). The OU-2 remedial areas were identified in the RI Report and subsequent documents as the "presumed remedy areas" and "assumed remedial action areas", with those two terms used interchangeably. See *Figure 9*.

- OU-3 encompasses a single remedial area, the LTU (approximately 109 acres) and addresses soil. Due to the origin of some of the wastes treated in the LTU, the soils in a 60-acre area are considered RCRA listed hazardous wastes. Some of the remaining 49 acres of the LTU were utilized for the disposal of lime sludge and asbestos-containing material (both non-hazardous), while the remaining acreage was never used. As part of the pre-work to support the FS, asbestos-containing material has been removed. See *Figure 10*.

- OU-4 encompasses a single remedial area, the Floodplain Forest (approximately 200 acres), and addresses soil. The OU-4 remedial area occurs along the east and southeast portion of the Site. See *Figure 11*.

- OU-5 is media-specific, addressing LNAPL and site-related impacts to groundwater. The LNAPL and groundwater plume exists beneath public roadways and ROWs between Site parcels (between the MPA and the various Tank Farms), as well as within a small area immediately adjacent to and up-gradient from the west boundary of the Site (east of Crackle Street). *See Figures 6 and 12.*

The scope of the response actions proposed will address five of the OUs at the Site. It is anticipated that the Separator 7 Area in OU-2 will receive wastes from OUs -1 and OU-4, so will likely be the last OU addressed. The response action at OU-3 is anticipated to occur independently of the other OUs, and OU-5, which is site-wide in scope, will remain ongoing. The actions taken at each OU are anticipated to be the final actions for those OUs.

Summary of Site Risks and Hazards

This section summarizes the results of the risk assessments for both human and ecological receptors that may be exposed either currently or in the future to site-related contamination.

Human Health Risk Assessment

The BHHRA follows a four-step risk assessment process that is consistent with US EPA guidance:

- Data evaluation, to identify site-related constituents of potential concern (COPC);
- Exposure assessment, to determine the human receptors who may be exposed, potential exposure pathways, and quantify the potential exposures by human receptors;
- Toxicity assessment, to determine the types of effects associated with exposures; and,
- Risk characterization, to characterize the potential for adverse health effects to occur based on estimates of cancer risks and noncancer hazards associated with exposures to site-related contaminants.

Data used in the risk assessment included sample results from soil, groundwater, surface water, and sediment. Data from the RI, as well as data collected after the RI during the pipeline and other infrastructure removals, were incorporated into the BHHRA.

Risk assessments require that both current and future land uses are evaluated. Because the Site is currently nonoperational, the only regular on-site human receptor is a maintenance worker. However, other receptors may experience infrequent and irregular exposure on-site and adjacent to the Site including trespassers, trespassers/hunters, swimmers (in the Embarrass River), waders in the North Tributary of Indian Creek, and off-site residents. These receptors were evaluated to represent current exposures and were associated with specific **exposure units (EUs)**.

In the future it is anticipated that the Site will most likely continue to support commercial/industrial operations. Therefore, maintenance workers, commercial/industrial workers and construction workers were evaluated to represent future exposures. Trespassers/hunters, swimmers, and waders were also evaluated under potential future conditions.

Finally, though the Site is not expected to be used for residential purposes, a hypothetical future resident was evaluated in order to document the risks and hazards such a receptor may experience as a result of potential exposure to Site-related contamination in soil.
There is currently no exposure to on-site groundwater occurring nor is any anticipated in the foreseeable future. Therefore, on-site potable groundwater use was not evaluated for current or future conditions.

Exposure units represent the exposure areas over which receptors are assumed to be potentially exposed. Different EUs were identified for different human receptors as listed below, and depicted in *Figure 13*:

- Current/future maintenance workers, future commercial/industrial workers, future construction workers, and hypothetical on-site residents -- 39 EUs including the Tank Farms, MPA, and LTU;
- Current/future trespassers/hunters – 17 EUs which encompassed the entire Site;
- Current/future off-site swimmers – Embarrass River;
- Current/future off-site waders – North Tributary to Indian Creek;
- Current/future off-site residents – area immediately surrounding the Site.

The **Conceptual Site Model (CSM)** identifies potentially complete exposure pathways by showing which receptors could come in contact with site-related constituents and how they may be exposed. The CSM is shown in *Figure 14.*

Two types of risk are evaluated: cancer risk and non-cancer hazards. Cancer risk is represented by a probability that exposure to chemicals at the Site may cause additional cancer in a population above the chances of cancer occurring from all other sources. This is represented as an excess lifetime cancer risk (ELCR) of $1x10^{-6}$ ("one in a million") to $1x10^{-4}$ ("one in 10,000") from exposure to the Site. For example, if a site represented $1x10^{-4}$ cancer risk, this would mean that for every 10,000 people that could be exposed, one extra cancer case may occur as a result of exposure to site contaminants above the chance represented from all other potential causes. In general, CERCLA requires remediation of sites that present risks greater than one in ten thousand or $1x10^{-4}$ and does not require remediation for risks less than one in a million or $1x10^{-6}$. Risks in between, for example $1x10^{-5}$ ("one in 100,000"), may or may not be remediated, depending on other site-specific reasons. Illinois EPA prefers that any risks greater than one in million are addressed when possible.

Non-cancer hazards are represented by a hazard index or HI. A HI of less than 1 indicates that the chemical is present below a threshold for which non-cancer health effects are not likely to occur. In general, CERCLA requires remediation of sites with HIs above 1.

Risks from lead are evaluated using a different method than other contaminants. Risks from lead are presented as a probability of exceeding a certain level of lead in the blood. Since on-site residential risk has not been evaluated Site-wide, lead risks were based on the Adult Lead Model, which is used to estimate risks to sensitive adult populations, such as pregnant workers.

EU-specific carcinogenic risks (risks) and noncarcinogenic hazards (hazards) were calculated for each receptor under current and future conditions as summarized above. Risks were compared to the US EPA target risk range of 1 in a million (1×10^{-6}) to 1 in ten thousand (1×10^{-4}), while hazards were compared to a target hazard of 1. Risks associated with potential exposure to lead in soil were evaluated using tools developed by US EPA.

Soil - For soil, there were no non-cancer hazards above 1 in any of the EUs for any receptor; therefore, the summaries below address cancer risks only. Lead presents risks in surface soil (0-3 ft bgs) to all receptors (except the hunter/trespasser) and is one of the risk drivers in the Tank Farms/MPA and LTU.

OU-1, Tank Farm/MPA: Cancer risks in the middle of the risk range are present to commercial/industrial workers and maintenance workers throughout the TF and MPA (EUs 10 through 32 and 38). These risks are driven by PAHs and metals within the upper three feet of soil, and the VOCs benzene, ethylbenzene, and naphthalene. Cancer risks for other receptors (construction workers and hunter/trespasser) are below the low end of the risk range, that is, below 1 in a million.

OU-1, ROWs and CSSI: Soil concentrations adjacent to the ROWs were considered to be representative of concentrations within these areas and were compared directly to SROs in 35 IAC 742. Because concentrations are assumed to exceed these values based on adjacent property results, risks are assumed to be present to construction workers and hypothetical residents. These risks are driven by benzene, ethylbenzene, xylenes, naphthalene, and mercury. Similarly, in the CSSI, samples collected in this area were directly compared to the 35 IAC 742 residential and construction worker cleanup values and risk assumed to the construction worker on that basis, with naphthalene and mercury being the primary contributors to risk.

OU-2, The Oily Soil Areas, Indian Acres, and the Separator 7 Area: The Oily Soil Areas, Indian Acres, and the Separator 7 Area were assumed to require remediation, so were not included in the BHHRA; however, cleanup goals have been developed for these areas consistent with other areas of the Site, and as described in the following sections of this Proposed Plan. One area of OU-2, the B&O Pond was included in the revised risk assessment. No risks above cancer targets are indicated for the B&O Pond. Deeper soils from the B&O Pond may present risks if brought to the surface, and remedial goals have been developed for the B&O Pond on this basis.

OU-3, LTU: Cancer risks at the low end of the risk range are present to industrial/commercial workers and maintenance workers within the human health EUs and the hunter/trespasser within the ecological EUs. The highest risk is 6×10^{-5} (six in one hundred thousand, in the middle of the risk range) and cancer risks are generally driven by levels of arsenic. Lead is the primary risk driver in OU-3.

OU-4, Floodplain Forest: Cancer risks were equal to or below the low end of the cancer risk range for the hunter/trespasser, the only human receptor evaluated for OU-4.

Groundwater – Exposure to groundwater does not occur under current conditions on-site, so was not evaluated in the risk assessment. Future on-site exposure is possible for

construction workers. Four EUs within the TF/MPA Area indicate risks above 1 in a million due to groundwater exposure, with EU30 in the MPA with the highest risk of 3 in 100,000, primarily due to benzene. Non-cancer hazards greater than 1 were also due to benzene.

Groundwater risks to current and future off-site adult and child residents were assessed for a hypothetical direct exposure to groundwater and through exposure via indoor air using concentrations from individual on-Site perimeter wells. Risks ranged from 1 in a million to 2 in 100,000. Adult and child HIs above 1 were due to thallium, iron, and manganese, thought to be consistent with background concentrations.

LNAPL – There is no direct exposure to LNAPL, but LNAPL may provide a source of contamination to air. A vapor intrusion (VI) screening level evaluation showed that groundwater concentrations at many locations within the LNAPL footprint exceeded VI-based screening levels. This may indicate potential human health risk to indoor air within any buildings constructed at those locations in the future. Potential future risks to industrial/commercial workers (due to potential vapor intrusion in the absence of appropriate mitigation) are assumed to exist Site-wide within the LNAPL footprint.

Sediment – All cancer risks are less than 1 in a million for all receptors, except for the off-site hunter. A cancer risk of $2x10^{-5}$ was calculated for potential exposure to sediment in the North Tributary to Indian Creek. This risk estimate for sediment was based on one sample for arsenic which was located approximately 1000 feet west of the Site. Illinois EPA concluded that this result was not likely site-related and did not warrant action. All hazards for all receptors were less than 1.

Surface Water – All receptor-specific exposures (e.g., swimming and wading) to surface water are associated with risks of less than 1 in a million and hazards less than 1.

In summary:

- Sediment and surface water do not pose cancer risks or non-cancer hazards to human health.
- Risks from groundwater are limited and primarily due to benzene. Data continue to show that contaminated groundwater is not migrating past Site boundaries so off-site risks are hypothetical.
- Cancer risk to future industrial/commercial and construction workers is likely present due to LNAPL's effect on future indoor air due to various VOCs.
- Soil is the environmental medium that poses the most significant risk. Contaminants in soil present cumulative cancer risks from the low end to the high end of the cancer risk range to current and future commercial/industrial workers and maintenance workers throughout the Site, but primarily within the LTU and TF/MPA. Contaminants that contribute to cumulative cancer risk in soil are benzene, benzo(a)pyrene, dibenzo(a,h) anthracene, benzo(b)fluoranthene, benzo(a)anthracene, ethylbenzene, naphthalene, and arsenic. Elevated levels of lead

represent risks to commercial/industrial workers/maintenance workers, construction workers, and residents.

- All non-cancer risks were below the threshold for all receptors in all EUs of the Site.
- Finally, for exposure to soil, cumulative cancer risks exceeded risk thresholds for the hypothetical on-site resident throughout the Site. Again, this receptor is not ever expected to be present. However, the exceedances of risk thresholds establishes the need to ensure that on-site residential development does not occur.

Ecological Risk Assessment

Ecological risk assessments are conducted in a similar manner to human health risk assessments. However, risks are characterized by a hazard quotient or HQ, rather than cancer risk. HQs of greater than 1 indicate potential harm to a species or type of organism. Several different types of species are evaluated to reflect the Site-specific environment.

The **baseline ecological risk assessment (BERA)** was included in the 2008 RI, but was revised in 2017 to include additional risk evaluations for the LTU and Floodplain Forest, incorporate additional soil data from the pipeline removals, and to achieve lower detection limits for some chemicals. The BERA Addendum reevaluated ecological risks for a range of vegetation management options (i.e., frequency in mowing and subsequent variation in herbaceous vegetation height), and associated receptors, to account for a range of viable property uses (e.g., solar farm, parking lot, and other potential uses), including long-term management of floodplain and forested areas.

The RI, BERA and BERA Addendum evaluated risk to ecological receptors in five EUs that were identified based on general habitat type, historical Site use, and in one case for a specific receptor (*Figure 15*):

- EU-1 is the LTU;
- EU-2 is mowed/managed areas outside the LTU (e.g., the MPA and tank farms); and
- EU-3 is the floodplain forest
- EU-4 includes the permanent and managed water bodies, such as the Embarras River, tributary to Indian Creek, Turner Pond, oxbow ponds, the lime sludge area pond, settling ponds, firewater pond, C Pond, and other depressions and ponded areas within the Tank Farms;
- EU-5 is the Embarras River (for mink only).

Receptors included various birds and mammals that best represented the feeding patterns and **trophic levels** characteristic of the habitats. Plants, soil invertebrates, sediment-dwelling invertebrates, and other aquatic life were also evaluated. The Cerulean Warbler and the Yellow-Crowned Night Heron were initially evaluated as state of Illinois Threatened and Endangered Species in the 2008 BERA. It was later confirmed that these two species are unlikely to be on-site; however, they were retained for risk evaluations as receptors that are representative of their respective feeding guilds (avian insectivore and avian omnivore).

Site contamination presents unacceptable risks for the Red-winged Blackbird, Eastern Meadowlark, American Woodcock, Song Sparrow, and Northern Short-Tailed Shrew. HQs greater than 1 indicate that these organisms, plus others that they represent (i.e., in similar feeding habits, habitat, and function in the environment) may experience adverse effects from exposure to Site contaminants. The Eastern Meadowlark, American Woodcock, and Northern Short-Tailed Shrew were the receptors determined to be the most sensitive.

In summary, the BERA Addendum concluded that risk to ecological receptors is limited to a small number of metals, including lead, chromium, zinc, and mercury in surface soil (0-3 ft-bgs).

- In the LTU (i.e., ecological EU-1) risks to avian and mammalian receptors is present from all four metals, and largely limited to the center of the EU. Lead is the most prevalent contaminant with exceedances of mercury, zinc, and chromium frequently co-located with lead;
- In EU-2, chromium, lead, and zinc presented risks to avian and mammalian receptors. The spatial distribution of lead, chromium, and zinc is widely distributed throughout the Tank Farms and MPA;
- In EU-3, risks to avian and mammalian receptors are present from lead, chromium, and zinc, with impacts concentrated in two discrete locations.

Quantified risks to all receptors and EUs are presented in the FS.

Since the planned remedial actions are anticipated to improve sediment and surface water quality, post-remediation monitoring will be conducted for these two media. Additional investigations may be conducted as needed to determine if unacceptable ecological risk is present from these media.

Basis for Taking Action

It is Illinois EPA's current judgement that the Preferred Alternatives identified in this Proposed Plan, or one of the other active measures described in the Proposed Plan, are necessary to protect public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment.

The risks and hazards present on-site to human receptors, primarily workers, from soil will be addressed through remediation of the Site OUs. Groundwater risks, though low, will be addressed through remediation to State and Federal regulatory levels. LNAPL remediation will address an ongoing source of contamination to groundwater and potential future indoor air inhalation risks. Risks present to ecological receptors will be addressed through remediation of soil at Site OUs.

Remedial Action Objectives

Remedial Action Objectives (RAOs) are statements that describe the goals for the cleanup of the Site. These goals are developed to address potential human health and ecological risks on site- and media-specific bases. As such, the RAOs form the basis for evaluating and comparing the effectiveness of the various potential remedial alternatives. Due to the size and complexity of the Site, RAOs were developed and applied to each remedial area within its respective OU. RAOs can be met by eliminating or limiting the exposure pathway and/or reducing or eliminating chemical concentrations.

RAOs for soil, LNAPL, groundwater, and indoor air for each OU are presented in Tables 1a through 1e and discussed below.

For soil, the focus of remedial and management efforts will be to minimize the potential for exposure to contaminated soils that would pose unacceptable human health or ecological risk at the Site. These remedial and management efforts will also address potential physical hazards posed by certain low pH and/or oily materials present at the surface in some areas of the Site.

The LNAPL-specific RAO focuses on the protection of groundwater and the return of groundwater within the smear zone (and footprint of the LNAPL plume) to beneficial use within a reasonable timeframe. Because LNAPL acts as the source of **contaminants of concern** (COCs) to groundwater, the LNAPL and groundwater remedy will need to act together to address the RAOs. That is, the LNAPL remedy will affect the timeframe that COCs migrate from the source to groundwater, and the groundwater remedy will address the dissolved phase plume.

Groundwater RAOs address constituents within groundwater, with the related goals of returning groundwater to beneficial use and protecting potential off-site receptors from migration of COCs.

Based on the screening risk assessment for indoor air, an RAO specific to indoor air was developed. This RAO applies to future scenarios where portions of the Site could be redeveloped for commercial/industrial use and will require mitigation of COC levels above health-based objectives, if needed.

Preliminary Remediation Goals

Preliminary Remediation Goals (PRGs) are the proposed cleanup objectives for the Site's contaminated soil and groundwater. Cleanup objectives support the RAOs for the Site. By meeting the cleanup objectives, the RAOs are achieved.

Site documents historically refer to these proposed soil cleanup objectives as soil remediation objectives (SROs) rather than PRGs. For the sake of continuity between project documents, this Proposed Plan continues to use the term SROs when discussing these objectives. Likewise,

cleanup objectives for groundwater are referred to in the FS and this Proposed Plan as the groundwater remediation objectives (GROs).

Human health SROs for surface soil (0-3 ft-bgs) were developed for the commercial/industrial worker based on the EUs in the BHHRA. Human health SROs for subsurface soil (0-10 ft-bgs) were developed for the construction worker assuming the potential exposure areas during localized construction activity. SROs were developed for a list of human health COCs associated with unacceptable levels of risk (risks greater than 1 in a million). SROs for lead were developed to address specific localized hotspots for workers. The COCs for soil for which SROs were developed are:

- Arsenic
- Benzene
- Benzo(a)pyrene equivalents (BAP)
- Ethylbenzene
- Naphthalene
- Lead

Commercial/industrial- and construction worker-specific SROs for these COCs are presented below.

Soil SROs were calculated for each relevant human health receptor by incorporating site-specific conditions and are based on the results of the BHHRA. The SROs controlling remedial actions are those that are the most stringent of all the receptors associated with the OU. For most of the OUs, remediation is based on the Industrial/Commercial Worker and Maintenance Worker SROs. Similarly, soil SROs were calculated for each relevant ecological receptor based on results of the BERA.

SROs for soil and GROs for groundwater are presented in Tables 2a through 2d and 3 and are summarized below. The SROs and GROs are considered "preliminary" and will be finalized in the ROD.

Human Health Soil Remediation Objectives
OUs 1, 2, and 3

Contaminant of Concern	Construction Worker SRO (**mg/kg**)[2]	Industrial/Commercial Worker Or Maintenance Worker SRO (mg/kg)[3]
Arsenic	125	12.1[6]
Benzene[7]	230	4.4
Benzo(a)Pyrene (equivalents)[1, 7]	59	5.8
Ethylbenzene[7]	350[4]	22
Naphthalene[7]	344	14
Lead[5]	945	525

1. To be applied to the sum of the 7 benzo(a)pyrene equivalent carcinogenic PAHs.
2. With the exception of lead, the SRO is based on HQ of 1.
3. With the exception of lead, the SRO is based on a cancer risk level of one in one million or 1x10-6.
4. Based on soil saturation limit.

5. Based on Adult Lead Model blood lead level of 5 µg/dL.
6. Based on site-specific background, which is higher than a risk-based SRO of 3.9 mg/kg.
7. Organic contaminants of concern do not apply to OU-3.

The most sensitive ecological receptors were found to be the Eastern Meadowlark (EU-1), American Woodcock (EU-3) and Northern Short-Tailed Shrew (EUs-1, 2, and 3). The SROs below will be applied to each remedial area based on the presence of the receptor. For instance, American Woodcocks are not present in EUs-1 and 2 based on habitat, so the Meadowlark SRO will be used to scope the remedial action for those EUs.

Ecological Soil Remediation Objectives
OUs 1, 2, 3, and 4

Contaminant of Concern	Ecological (Avian) SRO (mg/kg) 0-1 ft bgs		Ecological (Mammalian) SRO (mg/kg) 0-3 ft bgs
	Meadowlark	Woodcock	Short-tailed Shrew
Lead	763	652	2783
Mercury	3	NA	14
Chromium	405	471	938
Zinc	666	768	1110

The GROs consist of the lower of the Illinois Class I groundwater quality standards (35 Ill. Adm. Code 620) or Federal MCLs. While groundwater risks were low across the Site, groundwater remediation is driven by ARARs (e.g., regulatory standards), including State groundwater quality standards for Class 1 groundwater and Federal MCLs. (The Federal MCLs are the same as the State groundwater quality standards for the groundwater COCs.) Therefore, the GROs are not site-specific, but based in regulation. The Site-wide GROs are:

Groundwater Remediation Objectives
OU-5 (Site-wide)

Contaminant of Concern	GRO mg/L	Basis
Benzene	0.005	35 IAC 620.410
Ethylbenzene	0.7	
Toluene	1.0	
Xylenes	10	
Naphthalene	0.14 (0.077)[1]	35 IAC 620.410 (proposed 35 IAC 620.410)

1. Illinois' groundwater quality standards are currently proposed for revision, including the Class 1 standard for naphthalene. If the proposed groundwater regulations are adopted before the ROD is finalized for the Site, the GRO for naphthalene will be 0.077 mg/L.

Summary of Remedial Alternatives

This section describes the various remedial alternatives that were developed and evaluated for each OU in the FS to achieve the RAOs.

USEPA generally considers the following expectations in developing appropriate remedial alternatives, as described in 40 Code of Federal Regulations 300.430 (a)(iii)(A-F):

- Use treatment to address principal threats wherever practicable.
- Use engineering controls for waste that poses a relatively low long-term threat or when treatment is impracticable.
- Use a combination of methods as appropriate to achieve protection of human health and the environment.
- Use ICs to supplement engineering controls as appropriate.
- Consider using innovative technologies.
- Return usable groundwater to beneficial uses when practicable and when restoration of groundwater is not practicable, prevent further migration, prevent exposure, and evaluate further risk reduction.

ICs are administrative and legal controls that help minimize the potential for human exposure to impacts and assist in protecting the integrity of the cleanup and management actions taken. ICs are not effective at minimizing risk to ecological receptors.

Other Assumptions

Based on conservative application of theoretical VOC degradation rates (DeVaull 2017) and supported by observations at other petroleum-impacted sites in equivalent or colder climates, natural attenuation is expected to reduce the observed maximum benzene (and other VOC) concentrations in shallow soil to SROs within 25 years. If the performance monitoring date collected data at a frequency approved by the Agency indicate that attenuation is not progressing at a rate that would result in meeting the SROs within 25 years, active measures (e.g., bioventing or sulfate enhancement) will be evaluated.

The distinguishing technical and/or regulatory features of each alternative is presented along with information about associated costs and timeframe. Costs are presented as capital costs (construction), Operation and Maintenance (O&M), and total present worth. More detail about each alternative may be found in the FS.

General timeframes are presented for the construction portion of each alternative. A timeframe for reaching SROs or GROs is also presented. In some cases, the timeframe for achieving final soil or groundwater RAOs is significantly longer than the construction phase. These longer timeframes will not prevent any potential redevelopment from occurring as long as the appropriate controls are implemented.

CERCLA and the NCP require a “no-action” alternative to be evaluated. With the “no-action” alternative, no remedial action is evaluated, RAOs are not achieved, and no costs or O&M are associated with the alternative.

All remedial alternatives were first screened against three criteria: effectiveness (both short-term and long-term), implementability (including technical and administrative feasibility), and relative cost (including capital and operation and maintenance (O&M) costs). Based on this initial screen, some alternatives were carried through to a detailed analysis and some were excluded. The reason for excluding certain alternatives is provided below.

Common Elements of All Alternatives

Components that are common to most or all alternatives (except the “no-action” alternative) regardless of OU, are presented below in order to focus the alternative descriptions on distinguishing features.

- All alternatives, unless otherwise indicated, will meet requirements for protection of human health and the environment, and will meet SROs, GROs, and applicable or relevant and appropriate requirements (ARARs);
- Soil used as backfill for excavated areas or as cover soils will be derived from on-site sources to the extent possible. All backfill or cover soils will be approved by Illinois EPA for use and will be tested as needed to ensure no new contamination is brought on to the property or placed at the Site. Topsoil will also be tested for agricultural parameters to ensure it can sustain vegetation;
- Stormwater and surface water management plans will be developed during Remedial Design. CEMC maintains a National Pollution Discharge Elimination System (NPDES) permit for the on-site treatment system. The stormwater management plan will detail any updates needed to the NPDES permit to accommodate the treatment and discharge of stormwater and surface water that needs to be managed during remediation activities. The remedial action will comply with applicable portions of the Clean Water Act;
- Air monitoring plans will be developed during Remedial Design;
- Sediment management plans from construction activities will be developed during Remedial Design;
- ICs will be implemented. Current and future land use will be restricted by use of environmental covenants that run with the land. Restrictions include:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Conditions on the handling and management of impacted soils via a soil management plan;

    - For those alternatives that make use of a soil cover or cap: preventing access to and disturbance of waste containment areas or capped/covered areas;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
- Perform O&M as warranted of any engineered components;
- Long term monitoring of soil and groundwater to ensure compliance with RAOs;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs, O&M, and any soil and water monitoring.

OU-1

Tank Farm and MPA Areas

The following alternatives were evaluated for the Tank Farm/MPA area:

- Alternative TF/MPA -1: No Action
- Alternative TF/MPA-2A: Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative TF/MPA-2B: Targeted Excavation with Off-Site Disposal, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative TF/MPA-3A: Soil Cover and Seeding, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative TF/MPA-3B: Partial (0-1 Foot) Soil Cover and Seeding, Monitored Natural Attenuation, and Combined Institutional Controls

Illinois EPA recommends Alternative TF/MPA-2A, Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls as the Preferred Alternative for the Tank Farm and MPA Areas.

Alternative TF/MPA-2B was eliminated from detailed analysis. Off-site disposal of contaminated Tank Farm and MPA soils would involve over two thousand truck trips from the Site,[3] through residential and business areas of Lawrenceville, increasing traffic and risking accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site would limit or extend the timeframe for full implementation.

Common elements for all remaining TF/MPA alternatives include those described above as well as:

[3] A cubic yard is a cube of material that is one yard (3 feet) wide, long and high. The average commercial dump truck can haul from 10 to 14 cubic yards of soil. Based on an assumption of 30,000 cubic yards of soil from the TF/MPA areas, off-site hauling would require approximately 2,100 truckloads.

- Assuring any remaining VOCs do not present risk to commercial/industrial workers by testing of soil, or use of an additional engineered barrier, if needed;
- Contingency remedies of bioremediation/land farming, in-situ bioventing, and sulfate enhancement for treatment of VOCs in soil if natural attenuation is not proceeding as expected;
- Approximately half of the TF/MPA area is within the 100-year floodplain. In those areas where remediation is conducted within the floodplain, actions will conform to the substantive provisions of federal and state nation-wide permits and Clean Water Act provisions governing floodplain management and watershed restoration.

Alternative TF/MPA-2A: Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls

Alternative TF/MPA-2A would involve excavation of metals and PAH-impacted soil that poses unacceptable risk in the TF and MPA to depths of 0-3 ft bgs. The planned excavated areas are depicted on *Figure 16*. Soils impacted by VOCs would be addressed via **natural attenuation.** Excavated soil would be transported to an on-site containment cell in OU-2. Approximately 18.6 acres would require excavation to depths ranging from 0 to 3 ft-bgs for a total of approximately 30,000 cubic yards. Excavated areas would be backfilled and vegetated.

For the locations where VOC (benzene, ethylbenzene, and naphthalene) concentrations in shallow (0-3 ft-bgs) soil exceed commercial/industrial SROs and contribute to cumulative cancer risks, natural attenuation via aerobic biodegradation would be used to meet the SROs (*Figure 17*)[4]. Soil sampling would be conducted at five-year intervals to track attenuation progress. Remediation (via bioventing or sulfate enhancement, if necessary) would be conducted in conjunction with the LNAPL remedy in those areas that are not meeting the anticipated 25 year timeframe for reaching VOC SROs.

Estimated Capital Cost:	$ 4,540,314
Estimated O&M Cost:	$ 106,027
Estimated Present Worth Cost:	$ 4,646,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years for PAHs, and metals 25 years for VOCs

Alternative TF/MPA-3A: Soil Cover and Seeding, Monitored Natural Attenuation, and Combined Institutional Controls

This alternative involves installation of a 1-foot thick soil cover over 18.6 acres to address metals and PAH-contaminated soil above the SROs. VOCs in soil would be addressed as described above in Alternative TF/MPA Alternative 2A.

[4] VOCs in soil below three feet are associated with the LNAPL smear zone and are addressed by remedial alternatives described for OU-5.

Estimated Capital Cost:	$ 1,717,716
Estimated O&M Cost:	$ 1,060,269
Estimated Present Worth Cost:	$ 2,778,000
Estimated Construction Time:	6 months
Time to Achieve RAOs:	1-2 years for PAHs, and metals 25 years for VOCs

Alternative TF/MPA-3B: Partial (0-1 Foot) Soil Cover and Seeding, Monitored Natural Attenuation, and Combined Institutional Controls

This alternative is the same as Alternative TF/MPA-3A, except that the soil cover would be placed only on areas where soil contamination is present to one foot bgs. The area requiring this limited cover would be approximately 14 acres. Other areas with subsurface soil impacts already have one foot of soil that meets the SROs above impacted soil. Soils with deeper VOC impacts would be addressed as described in TF/MPA Alternative 2A.

Estimated Capital Cost:	$ 1,357,499
Estimated O&M Cost:	$ 792,351
Estimated Present Worth Cost:	$ 2,150,000
Estimated Construction Time:	6 months
Time to Achieve RAOs:	1-2 years for PAHs, and metals 25 years for VOCs

Road Rights-of-Way (ROW) And City Storm Sewer Investigation (CSSI) Area

The following alternatives were evaluated for the Road ROWs and CSSI:

- Alternative ROW-1: No Action
- Alternative ROW-2: Layered Government Controls, Proprietary Controls, and Monitoring

Active remediation within these areas was not subject to a detailed evaluation in the FS due to implementability issues. The most likely receptor for these areas is the construction worker; and placement of a cap or engineered barrier would not be effective against exposures if construction or intrusive activities were required. Therefore, these options were not evaluated further. Removing pavement, which already serves as a de facto cap, in order to excavate impacted soil would require reconstruction of the road. Removing pavement, excavating or treating soil, importing fill/subbase, and rebuilding the roads which are in good condition would be disruptive, and difficult to implement due to space restrictions; therefore, treatment and excavation options were not presented.

Illinois EPA recommends Alternative ROW-2, Layered Government Controls, Proprietary Controls, and Monitoring as the Preferred Alternative for the ROWs and CSSI Area.

Alternative ROW-2: Layered Government Controls, Proprietary Controls, and Monitoring

This alternative would control exposure to contaminants within ROWs and the CSSI area by the use of layered ICs, including: prohibiting future development and/or construction activities to those only deemed necessary by State, County, Township, or City authorities as applicable; a contingency plan that provides protection to workers in the cases that intrusive work is required; preventing residential development; preventing access to and use of contaminated groundwater; and a Long-Term Stewardship Plan. Additional controls for the CSSI area include: health and safety plan for construction workers; establish conditions on handling and management of impacted soil, evaluation of risks from indoor air and use of VI mitigation technology if a new building is constructed. The Government and Proprietary Controls would be implemented through mechanisms available to the State, including Highway Authority Agreements or environmental covenants pursuant to the Uniform Environmental Covenants Act. The controls would address an area of approximately 1.5 acres associated with State Highway 1, two acres associated with County Road 950N, 1.5 acres associated with 1160E, (see *Figure* 8), and five acres of the CSSI, immediately north of Indian Acres (*Figure 18*).

Estimated Capital Cost:	$ 85,000
Estimated O&M Cost:	$135,000
Estimated Present Worth Cost:	$ 220,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years

OU-2: Oily Soil Areas, Indian Acres, Separator 7 Area

All OU-2 alternatives that were evaluated in detail involve on-site consolidation of wastes and containment within on-site containment cells. The locations of these cells are areas where wastes and contaminated soil have historically been disposed and thus are unlined, but also serve to shrink the overall footprint of areal contamination Site-wide.

Oily Soil Areas

The following Alternatives were evaluated for the Oily Soil Areas:

- Alternative OSA-1: No Action
- Alternative OSA-2A: Excavation of SWMU 9N Drainage Ditch and Lime Sludge Ponds with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative OSA-2B: Excavation of SWMU 9N Drainage Ditch and Lime Sludge Ponds with Off-Site Disposal, Monitored Natural Attenuation, and Combined Institutional Controls

- Alternative OSA-3A: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation, Backfilling of Lime Sludge Ponds, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative OSA-3B: Excavation of SWMU 9N Drainage Ditch with Off-Site Disposal, Backfilling of Lime Sludge Ponds, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative OSA-4: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation at Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds, Monitored Natural Attenuation, and Combined Institutional Controls

Illinois EPA recommends Alternative OSA-4: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation at Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds, Monitored Natural Attenuation, and Combined Institutional Controls for the Oily Soil Areas.

Alternatives OSA-2B and OSA-3B were eliminated from further analysis. Off-site disposal of contaminated SWMU 9N Drainage Ditch and Lime Sludge Ponds soils would involve thousands of truck trips from the Site[5], through residential and business areas of Lawrenceville, increasing traffic and risking accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site would limit or extend the timeframe for full implementation.

Alternative OSA-3A was also eliminated from further analysis. OSA-3A would relocate the SWMU 9 North Ditch material to the Separator 7 containment cell and utilize backfill material meeting Illinois EPA-approved criteria to fill the Lime Sludge Ponds to the surrounding grade. It is as equally protective as Alternative OSA-4, but less efficient and more costly, due to the difference in material handling costs.

Common elements for all remaining Oily Soil Area alternatives include:

- Final remedial boundaries will be determined with additional delineation sampling and/or confirmation sampling;
- Excavation of approximately 15,000 cubic yards of contaminated soils in the SWMU 9 North Drainage Ditch. It is anticipated that an area of approximately 185 feet by 230 feet (north and west of the Ditch) and the 70-foot by 800-foot Ditch will require excavation to an estimated depth of 4 feet;
- Regrading the excavated drainage ditch and contouring it to serve as a drainage ditch. The ditch would also be covered with three to six inches of topsoil and re-vegetated.
- Monitoring the drainage ditch and Lime Sludge Ponds would be conducted to ensure vegetative restoration is successful;
- Routine inspection of containment cell caps to be determined during RD and included in the Long Term Stewardship plan, and required maintenance, repair and monitoring as needed;

[5] Based on an estimate of 48,000 cy from the Lime Sludge Ponds and 15,000 cy from the drainage ditch, off-site hauling would require approximately 4500 truck loads for Alternative 2B and 1070 truck loads for Alternative 3B.

- In addition to the ICs included in all alternatives, the Oily Soil Areas will incorporate an additional IC restricting exposure to deeper soils at the B&O Pond;
- Though not anticipated, for locations where volatile hydrocarbon (benzene, ethylbenzene, and naphthalene) concentrations in shallow (0-3 ft-bgs) soil exceed commercial/industrial risks greater than one in 100,000 ($1x10^{-5}$) active measures may be used (e.g., sulfate application, excavation); otherwise, natural attenuation via aerobic biodegradation would be used to meet the SROs. Soil sampling would be conducted at five-year intervals to track attenuation progress;
- Flood Impact Study to update the findings of the 2011 study to reflect current conditions after riverbank stabilization.

Alternative OSA-2A: Excavation of SWMU 9N Drainage Ditch and Lime Sludge Ponds with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls

Alternative OSA-2A will include excavation of the Lime Sludge Ponds (48,000 cubic yards) in addition to the drainage ditch. Drier soil will be used to mix with contaminated soils to provide strength for consolidating soils in an on-site containment cell in the Separator 7 Area. It is likely contaminated soils excavated from the TF and MPA would be used for these purposes. In all, a volume of approximately 76,000 cubic yards from the oily soil areas will be contained on-site. The Lime Sludge Ponds would be backfilled and vegetated.

Estimated Capital Cost:	$ 9,573,703
Estimated O&M Cost:	$ 259,566
Estimated Present Worth Cost:	$ 9,833,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years; 25 years if MNA required

Alternative OSA-4: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation at Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds, Monitored Natural Attenuation, and Combined Institutional Controls

Alternative OSA-4 involves using the excavated soil from the 9N Drainage Ditch as backfill for the Lime Sludge Ponds. The Lime Sludge Ponds would then be capped in place with an engineered clay cap, topsoil, and vegetated. *Figure 19* shows a conceptual plan of the capped ponds. This would restore the Lime Sludge Ponds to surrounding grade. The cap would be armored and seeded to control effects of potential flooding. Routine inspection of the cap would ensure long term integrity.

Estimated Capital Cost:	$ 2,848,413
Estimated O&M Cost:	$ 169,467
Estimated Present Worth Cost:	$ 3,018,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years; 25 years for VOCs

Indian Acres

The following Alternatives were evaluated for Indian Acres:

- Alternative IA-1: No Action
- Alternative IA-2A: Excavation of Indian Acres, Solidification and Neutralization of Former Spray Pond, On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative IA-2B: Excavation of Indian Acres, Solidification and Neutralization of Former Spray Pond, Off-Site Disposal, Monitored Natural Attenuation, and Combined Institutional Controls
- Alternative IA-3: Excavation of Indian Acres North and Pump House Road, Consolidation at Indian Acres South, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)
- Alternative IA-4: Excavation of Indian Acres North, Indian Acres East, and Pump House Road, Consolidation at Indian Acres West, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)

Illinois EPA recommends Alternative IA-4: Excavation of Indian Acres North, Indian Acres East, and Pump House Road, Consolidation at Indian Acres West, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap) for Indian Acres.

Alternative IA-2B was eliminated from further analysis. Off-Site disposal of contaminated Indian Acres soils would involve thousands of truck trips from the Site[6], through residential and business areas of Lawrenceville, increasing traffic and risking accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site would limit or extend the timeframe for full implementation.

In addition to the components common to all alternatives, the elements common to all remaining Indian Acres alternatives are:

- Final remedial boundaries will be determined with additional delineation sampling and/or confirmation sampling;
- With the exception of the No Action alternative, each alternative will include the **neutralization** and/or **solidification** of soils and wastes;
- The acidic material in Indian Acres could generate sulfurous gasses during excavation, solidification, and neutralization. Dust and vapor suppression and air monitoring would be used, and workers could be required to use **Level B PPE;**

[6] Based on an estimate of 266,000 cy of waste and material, off-site hauling would require approximately 19,000 truck loads.

- Routine inspection of containment cell caps to be determined during RD and included in the Long Term Stewardship plan, and required maintenance, repair, and monitoring as needed;
- Excavated areas will be backfilled and graded for water management. Three to six inches of topsoil will be placed and revegetated;
- Flood Impact Study to update the findings of the 2011 study to reflect current conditions after riverbank stabilization;
- An updated access agreement with the City of Lawrenceville, allowing ingress/egress to Indian Acres via City-owned property (i.e., the east end of Cedar Street).

Alternative IA-2A: Excavation of Indian Acres, Solidification and Neutralization of Former Spray Pond, On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls

Alternative IA-2A involves the excavation of approximately 225,000 cubic yards of soil and waste (acid sludge and filter cake) located throughout Indian Acres (i.e., Indian Acres North, South, the former Spray Pond, and the Pump House Road). The excavated material (impacted soil, acid sludge, and filter cake) would be placed in a containment cell in OU-2.

The acid sludge would require neutralization and solidification with quicklime and/or Portland cement. The northeastern portion of the Spray Pond would be neutralized/solidified with Portland cement. In many areas, this acid sludge is layered with soil so less amendment would be required to solidify the pitch-like waste. All details of soil amendments used will be subject to refinement during remedial design. Following solidification and neutralization, the total volume of material to be managed is anticipated to be approximately 266,000 cubic yards.

Amendments will be mixed using an excavator mounted bucket, skeleton bucket, fork attachment, or similar type of equipment prior to transportation to the on-site containment cell. Solidifying the acidic sludge in the former Spray Pond would increase the viscosity making it easier to excavate, transport, and place. Neutralizing during solidification mixing would help reduce the generation of sulfurous gasses when the acid sludge is disturbed.

To minimize the transport of waste and soil across city streets, an effort would be made to obtain an agreement with CSX railroad to construct a temporary access road across the active rail line.

Estimated Capital Cost:	$ 51,128,459
Estimated O&M Cost:	$ 855,866
Estimated Present Worth Cost:	$ 51,984,000
Estimated Construction Time:	2-3 years
Time to Achieve RAOs:	2-3 years

Alternative IA-3: Excavation of Indian Acres North and Pump House Road, Consolidation at Indian Acres South, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)

Alternative IA-3 involves the excavation of approximately 52,000 cubic yards of soil and waste from Indian Acres North and the Pump House Road. The waste and impacted soil in those areas would be solidified in place, excavated, and transported to a containment cell to be constructed in Indian Acres South. Waste and soils within the former Spray Pond and the rest of Indian Acres South would be solidified and neutralized in place as described in Alternative IA-2A to ensure the materials have the proper strength to support the placement of the excavated materials and the cap.

The engineered cap is anticipated to be 19 acres in size and to cover Indian Acres South and the former Spray Pond to a height of approximately five to ten feet above the surrounding ground elevations. The uppermost foot of waste/impacted soil would be graded consistent with the final design slopes and then covered with, from bottom to top either (1) 18 inches of low permeability clay meeting engineer-provided specifications (to be defined during remedial design) to minimize water infiltration and six inches of vegetated topsoil or with (2) a geomembrane, 18 inches of soil, and 6 inches of vegetated topsoil. Together the soil and vegetation would protect the underlying liner (clay or geomembrane) from erosion, UV exposure, etc. With use of appropriate armoring/seeding using flood resistant grasses, erosion of the proposed cap during a 100-year flood is not expected.

Estimated Capital Cost:	$ 27,594,138
Estimated O&M Cost:	$ 1,059,239
Estimated Present Worth Cost:	$ 28,653,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years

Alternative IA-4: Excavation of Indian Acres North, Indian Acres East, and Pump House Road, Consolidation at Indian Acres West, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)

Alternative IA-4 is like Alternative IA-3, including neutralization and solidification of the Spray Pond. However, the eastern portion of Indian Acres South would be excavated in addition to Indian Acres North and the Pump House Road, resulting in excavation of approximately 100,000 cubic yards of soil and waste. The consolidation cell would occupy approximately 10 acres in the western portion of Indian Acres South and would include the footprint of the former Spray Pond. *Figure 20* shows the conceptual location of the containment cell. The excavated area would be backfilled, graded, and sloped for water management.

Except for the footprint and consolidation cell height, the design of the cap would be equivalent to the cap described under Alternative IA-3. The maximum height of the unit is anticipated to be approximately 20 feet above the existing ground surface.

Estimated Capital Cost:	$ 30,679,506
Estimated O&M Cost:	$ 593,237
Estimated Present Worth Cost:	$ 31,273,000
Estimated Construction Time:	2-3 years
Time to Achieve RAOs:	2-3 years

Separator 7 Area

The following Alternatives were evaluated for the Separator 7 Area:

- Alternative Sep7-1: No Action
- Alternative Sep7-2: Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)
- Alternative Sep7-3: Solidification, Neutralization, and Excavation with Off-Site Disposal, Monitored Natural Attenuation, and Combined Institutional Controls

Illinois EPA recommends Alternative Sep7-2: Alternative Sep7-2: Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap) for the Separator 7 Area.

Alternative Sep7-3 was eliminated from further analysis. Off-site disposal of contaminated Separator 7 Area soils would involve thousands of truck trips from the Site[7], through residential and business areas of Lawrenceville, increasing traffic and risking accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site would limit or extend the timeframe for full implementation.

Alternative Sep7-2: Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit, Monitored Natural Attenuation, and Combined Institutional Controls (Engineered Cap)

This alternative involves consolidating soil and waste material under an engineered cap of approximately 15-20 acres. Consolidated wastes would include:

- 9,000 cubic yards of impacted soil from the east side of the road between the Separator 7 Area and SWMU-28 and consolidating the material on the west side of the road;
- Approximately 24,400 cubic yards of additional waste and impacted soil from west of the cap area;

[7] Based on an estimate of 250,000 cy of soil and waste material, off-site hauling would require approximately 17,860 truck loads.

- The former sludge pit located in the southeast portion of the Separator 7 Area of approximately 150,000 cubic yards of waste material. This material would be solidified and neutralized in place to depth prior to placing the cap. This would be done by mixing a reagent into the soft sludge using an excavator with appropriate attachment or other applicable technology;
- Other soils and wastes from other OUs, including:
    - 30,000 cubic yards from the Tank Farm/MPA
    - 2,236 cubic yards from the Floodplain Forest.

The final height and footprint of the cap is dependent on the alternatives selected for other remedial areas and OUs. Final remedial boundaries will be determined with additional delineation sampling and/or confirmation sampling. *Figure 21* shows the conceptual location and extent of the containment cell. The uppermost foot of waste/impacted soil would be graded consistent with the final design slopes and then covered with, from bottom to top either (1) 18 inches of low permeability clay meeting engineer-provided specifications (to be defined during remedial design) to minimize water infiltration and six inches of vegetated topsoil or with (2) a geomembrane, 18 inches of soil, and 6 inches of vegetated topsoil. The soil and vegetation would protect the underlying liner (clay or geomembrane) from erosion, UV exposure, etc. An updated flood impact study would be conducted. With use of appropriate armoring/seeding using flood resistant grasses, erosion of the proposed cap during a 100-year flood is not expected. Routine inspection of the containment cell cap with required maintenance, repair, and monitoring as needed will be addressed in Remedial Design and Long Term Stewardship.

Estimated Capital Cost:	$ 17,129,290
Estimated O&M Cost:	$ 884,853
Estimated Present Worth Cost:	$ 18,014,000
Estimated Construction Time:	1 year
Time to Achieve RAOs:	1 year; 25 years for MNA if needed

OU-3: Land Treatment Unit

The following Alternatives were evaluated for the Land Treatment Unit:

- Alternative LTU-1: No Action
- Alternative LTU-2: Soil Cover, Combined Institutional Controls
- Alternative LTU-3A: Soil Excavation and On-Site Consolidation, Combined Institutional Controls
- Alternative LTU-3B: Soil Excavation and Off-Site Disposal, Combined Institutional Controls
- Alternative LTU-4: Vegetation Management, Combined Institutional Controls

Illinois EPA recommends Alternative LTU-2: Soil Cover, Combined Institutional Controls for the LTU.

Alternatives LTU-3B and LTU-4 were eliminated from further analysis. LTU-3B was eliminated because off-site disposal would be more difficult to implement than the other alternatives and would be substantially more costly compared to on-site alternatives for not much additional reduction in on-site risk. Off-site disposal would involve thousands of truck trips from the Site[8], through residential and business areas of Lawrenceville, increasing traffic and risking accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site would limit or extend the timeframe for full implementation. Alternative LTU-4 was eliminated due to potential remaining potential risk to mammalian receptors.

Common elements for all remaining OU-3 alternatives include:

- Additional delineation sampling to refine the boundary of remedial action.
- Restoration of vegetative cover in permitted areas of the LTU to ensure compliance with the RCRA closure plan.
- Groundwater monitoring network (associated with OU-5) to monitor any changes in groundwater status from the LTU.
- Notification to potential future property owners regarding a deposit of asphaltic material in the subsurface.

Alternative LTU-2: Soil Cover, Combined Institutional Controls

This alternative would involve installation of a 1-foot soil cover to limit direct contact and exposure to human and ecological receptors, with the implementation of ICs to limit exposure during any future development. The extent of the cover is based on protection of ecological receptors and construction workers and is estimated to cover approximately 33.6 acres. See *Figure 21* for the estimated extent of the cover. The cover would be seeded with grass and the area maintained as it is now, as a maintained lawn. Ongoing monitoring would include inspections for erosion, vegetation growth and any needed repairs.

Estimated Capital Cost:	$ 1,922,788
Estimated O&M Cost:	$ 1,915,324
Estimated Present Worth Cost:	$ 3,838,000
Estimated Construction Time:	1 year
Time to Achieve RAOs:	1 year

Alternative LTU-3A: Soil Excavation and On-Site Consolidation, Combined Institutional Controls

This alternative involves excavation of approximately 81,300 cubic yards over 33.6 acres to a depth of 1.5 feet to remove soil that exceeds ecological and human health SROs. Soils would be

[8] Based on an estimate of 81,300 cubic yards of contaminated soil, off-site hauling would require approximately 5,800 truck loads.

transported to an on-site containment cell in OU-2 for management. *Figure 22* shows the proposed extent of excavation.

Estimated Capital Cost:	$ 8,680,529
Estimated O&M Cost:	$ 287,299
Estimated Present Worth Cost:	$ 8,968,000
Estimated Construction Time:	1-2 years
Time to Achieve RAOs:	1-2 years

OU-4: Floodplain Forest

The following Alternatives were evaluated for the Floodplain Forest:

- Alternative FF-1: No Action
- Alternative FF-2A: Targeted Excavation of Soil with On-Site Consolidation and Institutional Controls
- Alternative FF-2B: Targeted Excavation of Soil with Off-Site Disposal and Institutional Controls
- Alternative FF-3: Targeted Soil Cover and Institutional Controls

Illinois EPA recommends Alternative FF-2A, Targeted Excavation of Soil with On-Site Consolidation and Institutional Controls as the Preferred Alternative for the Floodplain Forest.

Alternative FF-2B was eliminated from further analysis. The alternative was eliminated because off-site disposal would be more difficult to implement than the other alternatives and would be substantially more costly compared to on-site alternatives for not much additional reduction in on-site risk. Off-site disposal would involve a manageable number of truck trips from the Site[9], but there would be an increase in traffic and risk of accidents and potential releases on public roads. Weight limit restrictions on roads adjacent to the Site could limit or extend the timeframe for full implementation.

Common elements for all remaining alternatives include those described above as well as:

- Backfill or cover soil would be taken from an on-site stockpile from the west bank of the Embarras River. This stockpile has been sampled and meets appropriate backfill criteria and ecological SROs.
- Restoration to original grade and revegetation with appropriate plants for the habitat will be conducted. Short-term monitoring to ensure the success of the restoration effort will be included.
- The need for updated species surveys will be evaluated during Remedial Design to determine the timing of remedial action activities and/or the need for an **incidental take** authorization.

[9] Based on an estimate of 2230 cubic yards, off-site hauling would require approximately 160 truck loads.

- If sensitive locations are identified (e.g., presence of endangered plant species, bat maternity tree, etc.) the location will be left undisturbed and re-evaluated for remedial action. The Illinois Department of Natural Resources would be consulted to determine the best course of action and timing.

Alternative FF-2A: Targeted Excavation of Soil with On-Site Consolidation and Institutional Controls

This alternative would involve excavation of soil contaminated with lead, chromium, and zinc above the SROs for ecological receptors. Excavations would vary from one to three feet depending on contaminant concentrations and the receptor at risk. *Figure 23* shows the extent of excavation required. Deforestation and removal of vegetation would occur in these areas. Approximately 2,236 cubic yards would be excavated. Excavated soil would be transported to an on-site containment cell in the Separator 7 area for management. Excavated areas would be backfilled, regraded, and restored. Short-term monitoring would occur to ensure success of re-vegetation.

Estimated Capital Cost:	$ 395,746
Estimated O&M Cost:	$ 7,900
Estimated Present Worth Cost:	$ 404,000
Estimated Construction Time:	1 year
Time to Achieve RAOs:	1 year

Alternative FF-3: Targeted Soil Cover and Institutional Controls

This alternative involves placement of a soil cover over metals-contaminated soil to protect ecological receptors from exposure. The thickness of the cover would vary depending on the receptor of concern. *Figure 23* shows the extent of soil cover. Minor deforestation would occur in these areas to accommodate heavy equipment. Short-term monitoring would occur to ensure success of re-vegetation. Monitoring of the cover annually and after significant precipitation events would be conducted longer-term, with repairs completed as needed.

Estimated Capital Cost:	$ 189,492
Estimated O&M Cost:	$ 25,335
Estimated Present Worth Cost:	$ 214,827
Estimated Construction Time:	1 year
Time to Achieve RAOs:	1 year

OU-5: LNAPL Management Area and Groundwater Management Area

LNAPL Management Area

The following alternatives were evaluated for the LNAPL Management Area:

- Alternative LNAPL-1: No action
- Alternative LNAPL-2: Compositional Changes (by Passive Bioventing, Air Sparging, Sulfate Land Application, and/or NSZD), Monitored Natural Stability, and Combined Institutional Controls

Illinois EPA recommends Alternative LNAPL-2, Compositional Changes (by Passive Bioventing, Air Sparging, Sulfate Land Application, and/or NSZD), Monitored Natural Stability, and Combined Institutional Controls for Site-wide LNAPL.

Other technologies were screened in the FS, such as several different methods of hydraulic recovery, excavation, vitrification, and in-situ stabilization. Some of the hydraulic recovery methods had been previously conducted and/or tested at the Site, and it was determined that all recoverable LNAPL had either been removed or was stable and not migrating. Given the non-recoverable nature of the LNAPL, many technologies were eliminated primarily due to implementability and/or costs. Additional details may be found in the FS.

The groundwater monitoring data indicate that benzene concentrations in many wells comply with the GROs. At other wells, the benzene concentrations in groundwater, and **effective solubilities** for LNAPL, are projected to reach GROs within 50 years. For some areas, the estimated timeframe is longer, and the expectation is that compliance would be reached in an approximate 60 to 100-year timeframe using natural attenuation alone without other active measures.

Areas of high benzene concentrations or where benzene naturally decreases at a slower rate represent areas of LNAPL that can be addressed by specific technologies. Technologies that can address mass transfer of COCs such as benzene from LNAPL to groundwater are termed “compositional changes” because they remove the more soluble and volatile hydrocarbons from the LNAPL. Over time, these compositional changes also decrease the LNAPL mass in the subsurface. Various methods may be used to accomplish compositional changes, and these methods have been compiled into one Site-wide alternative to be deployed as conditions warrant. Thus, only one LNAPL alternative has been presented. Additional details of the technology evaluation are included in the FS.

Alternative LNAPL-2, Compositional Changes, Monitored Natural Stability, and Combined Institutional Controls

Areas of high benzene or a slow rate of decrease in benzene concentrations are used to represent areas of LNAPL which can be more readily addressed by specific techniques to change the composition of the LNAPL. These techniques include:

- *Bioventing:* Involves the injection of air into the **vadose zone** under low pressure and affecting larger areas;
- *Air Sparging:* Involves the injection of air into the **saturated zone** under relatively lower pressures and affecting smaller areas;
- *Sulfate Land Application*: Applying sulfate and using natural precipitation or irrigation to transfer the sulfate to the underlying vadose zone or smear zone to enhance **anaerobic biodegradation**;
- *Natural Source Zone Depletion* (NSZD): Monitoring concentrations and other field indicators over time to track the rate of degradation. Used to monitor progress and develop contingency plans, if needed.

These technologies or combinations of technologies will be used at specific areas and Site-wide as indicated in the table, below. Sampling will be conducted on varying frequencies as warranted (e.g., annually in actively treated areas for the first five years), but will be conducted at least every five years. Enhancements to the LNAPL remedy will be evaluated should the NSZD results indicate aquifer restoration will not be achieved within a reasonable amount of time.

ICs as described above will be implemented for OU-5 as warranted. In addition, ICs will also:

- Prevent disturbance of recovery/remediation systems;
- Ensure long-term on-going access as needed for purposes of monitoring and remediation.
- Prohibit potable groundwater use until beneficial use is restored.

The following areas will be targeted for active remediation:

Area	Location	Characteristics	Technology	Contingent Technology
U2-MW-25 US-MW-06	Northwest portion of MPA	Elevated benzene Slow rate of decrease	Passive bioventing in vadose zone	Low pressure air sparging
U2-MW-04 TANKB-MW-02	Southern area of MPA/northern area of Tank Farm B	High benzene, minimal indication of decreasing trend	Air sparging, targeting saturated zone	Low pressure bioventing
TANKB-MW-03 TANKC-MW-05	Northern portions of Tank Farms B and C	Benzene effective solubilities greater than 1 mg/L; LNAPL present in wells as of 2019	Air sparging	Low pressure bioventing
TANKB-MW-07, TANKD-MW-02, TANKE-MW-03,	Throughout tank farm	Benzene effective solubilities greater than 1 mg/L ; Low **CO2 effluxes**	Sulfate land application	Low pressure bioventing, low pressure air sparging, NSZD

TANKE-MW-06, TANKF-MW-01				
All other areas	Throughout Tank Farm and MPA	Benzene effective solubilities below 1 mg/L	NSZD	

Evaluation of more recent data from routine groundwater monitoring and pilot study results will be conducted to support Remedial Design. See *Figure 24* for the extent of the LNAPL area and the locations of areas targeted for treatment.

Estimated Capital Cost:	$ 2,389,750
Estimated O&M Cost:	$ 2,018,200
Estimated Present Worth Cost:	$ 4,408,000
Estimated Construction Time:	Two years or less
Time to Achieve RAOs:	Within 50 years

Groundwater Management Area

The following Alternatives were evaluated for the Groundwater Management Area:

- Alternative GW-1: No Action
- Alternative GW-2: Monitored Natural Attenuation, Combined Institutional Controls, And Performance Monitoring at the Consolidation Cells and LTU

Illinois EPA recommends Alternative GW-2, Monitored Natural Attenuation, Combined Institutional Controls, And Performance Monitoring at the Consolidation Cells and LTU for Site-wide groundwater.

Other technologies were screened in the FS, such as several different methods of containment (i.e., hydraulic, vertical barriers, permeable reactive barriers), removal (e.g., extraction and evapotranspiration), in-situ treatment, and extraction with off-site discharge. Many technologies were eliminated primarily due to site-specific implementability issues. While MNA will be the primary technology used, various other technologies, mostly in-situ, have been retained as potential contingency technologies to be deployed as conditions warrant. Thus, only one groundwater alternative has been presented. Additional details of the technology evaluation are included in the FS.

Alternative GW-2, Monitored Natural Attenuation, Combined Institutional Controls, and Performance Monitoring at the Containment Cells and LTU.

This alternative involves monitoring groundwater throughout the Site by using monitoring well networks established for the containment cells and around the LTU as well as the existing Site-wide network. Groundwater within the LNAPL smear zone will benefit from treatment of the

LNAPL. The Site-wide monitoring network will be evaluated for continued use and the wells associated with the containment cells of OU-2, the LTU, and Site boundary will be incorporated into the Site-wide monitoring network as appropriate. Wells will continue to be monitored to ensure groundwater contamination does not cross boundaries to off-site property. Interior monitoring will occur in areas where needed, and the LNAPL remediation monitoring will be coordinated with groundwater monitoring to avoid duplication. Groundwater management zones (GMZs) would be established consistent with State regulations. Monitoring will occur annually and include the COCs and other constituents used to evaluate the progress of MNA. ICs will be established to prohibit the use of groundwater until restored and to ensure the integrity of the monitoring network.

Contingency remedies would be evaluated for possible implementation if ongoing monitoring reveals MNA is not proceeding on the expected timeframe or if contaminant migration is observed.

Estimated Capital Cost:	$ 647,993
Estimated O&M Cost:	$ 2,008,310
Estimated Present Worth Cost:	$ 2,922,000
Estimated Construction Time:	1-2 years; groundwater network is largely in place. Additional wells, if needed, may be installed as part of remedial action for other OUs, or as needed.
Time to Achieve RAOs:	Within 50 years

Evaluation of Alternatives and Preferred Alternatives

Section 121(b)(1) of CERCLA presents several factors that the Illinois EPA is required to consider in its assessment of alternatives. The NCP lists nine evaluation criteria to be used in assessing the individual remedial alternatives (§300.430(e)(9)). The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving Site cleanup goals. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state requirements, standards, criteria, and limitations (threshold criteria); consider technical or economic merits (primary balancing criteria); or involve the evaluation of non-Illinois EPA reviewers that may influence an Illinois EPA decision (modifying criteria).

The detailed analysis of alternatives consists of an assessment of individual alternatives against each of nine evaluation criteria, as well as a comparative analysis that focuses on the relative performance of each alternative against the other alternatives. Except the No Action alternative, all alternatives considered in the comparative analysis meet the two threshold remedy selection criteria of protection of human health and the environment and compliance

with ARARs. Each of the nine evaluation criteria is described below, followed by a discussion of how each alternative meets or does not meet each criterion. More details regarding the evaluation and comparison of the cleanup alternatives against the nine criteria can be found in the FS.

Explanation of the Nine Evaluation Criteria

Threshold Criteria

The two threshold criteria are statutory requirements that must be met. If either of the threshold criteria is not met by an alternative, that alternative cannot be selected as the remedy.

- **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the site are eliminated, reduced, or controlled through treatment, engineering, or ICs.

- **Compliance with ARARs** addresses whether a remedy will meet the applicable or relevant and appropriate federal and state requirements, known as ARARs. Other advisories, criteria, or guidance may be identified as "to be considered" (TBC) for a particular situation.

Balancing Criteria

The five primary balancing criteria weigh major tradeoffs among alternatives.

- **Long Term Effectiveness** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met and the permanence of the remedy.

- **Reduction of Toxicity, Mobility, or Volume through Treatment** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

- **Short Term Effectiveness** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction of the remedy until cleanup levels are achieved.

- **Implementability** addresses the technical and administrative ease of implementing a remedy from design through construction, including the reliability of the technology, availability of services and materials and ease of coordination with other governmental entities.

- **Cost** includes an estimate of capital costs, annual operating and maintenance (O&M) costs, including long-term monitoring, and total present worth. Estimated costs are expected to have an accuracy of +50 percent to -30 percent.

Modifying Criteria

The two modifying criteria can be evaluated to the extent such information is available, but will be fully evaluated following the public comment period on this Proposed Plan and will be addressed in the ROD.

- **Support Agency Acceptance** considers whether the support agency, in this case the US EPA, supports the preferred alternative presented in the Proposed Plan and concurs with the selected remedy.

- **Community Acceptance** addresses the public's general response to the remedial alternatives and the preferred alternative presented in the Proposed Plan. Comments received on the Proposed Plan are an important indicator of the community's views.

A detailed evaluation of each of the nine criteria for each alternative is included in the FS. The discussion below includes a comparison of the alternatives to each other within the context of the nine criteria.

Comparison of OU-1 Alternatives

Tank Farm/MPA Alternatives

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All OU-1 Tank Farm/MPA alternatives, except the no-action alternative, will achieve overall protection by removing soil that exceeds SROs (TF/MPA-2A) or by covering these soils and preventing exposure (TF/MPA-3A and 3B). Because the no-action alternative does not meet this criterion, it will not be discussed further.

All Tank Farm/MPA alternatives will comply with ARARs and/or TBCs. Alternative TF/MPA-2A invokes the Area of Contamination (AOC) policy as TBC that allows for consolidation of similar wastes within contiguous areas of a site without triggering land disposal restrictions. Similar state regulation, 35 IAC 740.535, also TBC, allows for movement, placement, and consolidation of wastes within a contaminated area without triggering solid waste disposal regulations.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

The excavation alternative (TF/MPA-2A) will permanently remove contaminated soil from the Tank Farm and MPA areas. Risk from PAHs and metals would be permanently reduced from these sources of contamination in these areas. The alternatives involving a cover (TF/MPA-3A and 3B) would prevent further exposure, but their effectiveness relies on compliance with ICs and long term maintenance of the covers. Attenuation of VOCs under each alternative would be permanent and achieved on similar time frames among all alternatives.

None of the alternatives achieve reduction in toxicity, mobility, or volume through treatment. Should ongoing monitoring indicate that VOC attenuation is not occurring at the anticipated rate, more active measures, such as bioventing or sulfate application could be employed. Such measures would meet the statutory preference for treatment. All alternatives would be subject to these treatment options.

Excavated soils (TF/MPA-2A) could generate dust from excavation and transport of soils, and release VOCs during excavation. The soil cover alternatives (TF/MPA-3A and 3B) could also generate dust through handling and placement of cover soils. Soil covers could be placed in approximately six months; excavation and transportation of soils to the on-site containment cell could take 1-2 years. Short-term risks to the community from dust and vapor generation would likely be higher with the excavation alternative, but risks could still be present on an on-going basis with the cover alternatives if ICs are not complied with. Short-term risks to the community or site workers can be controlled by dust control techniques commonly used.

All alternatives are implementable, using readily available equipment. For the excavation alternative, long-term monitoring is limited to tracking attenuation progress of VOCs. For the cover alternatives, in addition to monitoring VOCs in soil, the soil cover would require long term monitoring and possible ongoing maintenance.

Alternative TF/MPA-2A would cost approximately $4.7 million with excavation and transportation of soils driving much of the cost. Alternatives TF/MPA-3A and 3B would cost approximately $2.8 million and $2.2 million respectively. The costs are lower due to a lesser degree of soil handling and because cover soils are readily available on-site.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

ROW and CSSI Alternatives

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

Alternative ROW-2 meets the requirement of overall protection through control of exposure. The no-action alternative does not achieve overall protection; and therefore, is not discussed further.

No specific ARARs are associated with Alternative ROW-2, though there are State regulations to be considered (35 IAC 742) relating to mechanisms for establishing and implementing ICs and government controls as well as the Illinois Uniform Environmental Covenants Act to be considered when establishing ICs on CERCLA-regulated sites.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

Alternative ROW-2 remains effective as long as all relevant parties are aware of and comply with the ICs and health and safety plan. Alternative ROW-2 does not achieve reduction of toxicity, mobility, or volume through treatment. Risks to the community and workers are negligible since no field activities are involved with Alternative ROW-2 and exposure to these areas is rare for all potential receptors. Implementing the ICs and developing the contingency plans could take 1-2 years. Alternative ROW-2 is implementable and similar efforts have been completed elsewhere throughout the State. Coordination with the other governmental authorities such as the State, County, and City that have jurisdiction over the roads and city property is required. The estimated cost of Alternative ROW-2 is $220,000.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Preferred OU1 Alternative

Tank Farm and MPA Areas

For the Tank Farm and MPA areas, Alternative TF/MPA-2A, Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative TF/MPA-2A are:

- Excavation of approximately 30,000 cubic yards of metals- and PAH-impacted soil above the SROs from approximately 18.6 acres in the Tank Farm and Main Process Areas to depths of 0-3 ft bgs;
- Additional delineation sampling or confirmation sampling to determine final extent of excavation;
- Transport of excavated soil to OU-2 (Separator 7) for permanent containment or for use in stabilization at the OU-2 Lime Sludge Ponds containment cell;
- Soils impacted by VOCs to be addressed via natural attenuation;

- Excavated areas would be backfilled with soil approved by Illinois EPA for use as backfill and vegetated. Topsoil will also be tested for agricultural parameters to ensure it can sustain vegetation;
- Management of any stormwater during remedial action to be handled by the on-site treatment plant and existing or updated NPDES permit;
- Appropriate grading of backfilled areas to control stormwater;
- Soil sampling at five-year intervals to track natural attenuation progress;
- Implementation of ICs and Long Term Stewardship;
- Implementation of contingency remedies for VOCs in deeper soils, if needed, via appropriate technology;
- Current and future land use will be restricted by use of environmental covenants that run with the land. Restrictions include:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Conditions on the handling and management of impacted soils via a soil management plan;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs.

The time to complete construction would be approximately 1-2 years, at an estimated total present net worth cost of $4.7 million. VOCs are expected to reach SROs within 25 years.

Alternative TF/MPA-2A is the preferred alternative because it achieves overall protection of human health and the environment, meets ARARs, and provides more permanent risk reduction through excavation of contaminated soils and removing them to a managed and engineered containment cell. This would also facilitate potential future land use since there would be no long term maintenance or potential interference with soil covers. Even though Alternative TF/MPA-2A is the more expensive alternative, it remains cost effective due to the more permanent risk reduction, greater long term effectiveness and facilitation of TF/MPA land reuse.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-1. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Road Rights-of-Ways and CSSI Area

For the Rights of Ways and CSSI Area, Alternative ROW-2, Layered Government Controls, Proprietary Controls and Monitoring is the Preferred Alternative. The main elements of Alternative ROW-2 are:

- Implementation of ICs and Long Term Stewardship which would;
    - Prohibit future development and/or construction in an area of approximately 1.5 acres associated with State Highway 1, two acres associated with County Road 950N, 1.5 acres associated with 1160E, and five acres of the CSSI;
    - Require a contingency plan that provides protection to workers in the cases that intrusive work is required in these areas;
    - Implement Highway Authority Agreements or environmental covenants pursuant to the Uniform Environmental Covenant Act;
    - Monitoring to ensure the controls are being complied with.

The time to complete construction would be approximately six months, at an estimated total present net worth cost of $220,000.

Alternative ROW-2 is the preferred alternative because it achieves overall protection of human health and the environment, meets ARARs, and provides cost-effective long-term risk reduction through control of potential exposures in areas where more active remediation would be difficult to implement or ineffective in addressing potential risks.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-1. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4)

utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Evaluation of OU2 Alternatives

Oily Soil Areas Alternatives

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All OSA alternatives, except the No Action alternative will achieve overall protection by removing soils above the SROs in the drainage ditch and containing these soils and Lime Sludge Ponds soils and sludge in such a manner as to prevent their release or exposure to receptors. Because the no-action alternative does not meet this criterion, it will not be discussed further. Alternative OSA-2A will contain drainage ditch soils and Lime Sludge Ponds materials within a containment cell in OU-2, while OSA-4 will contain these same soils and materials at the Lime Sludge ponds with an engineered clay cap.

Both OSA alternatives would comply with ARARs. As with the TF/MPA OU-1 alternatives, both alternatives would make use of the AOC policy and State Soil Management Zone (SMZ) regulations (35 IAC Part 740) to facilitate contaminated soil management within the Site. The relevant and appropriate regulations governing Corrective Action Management Units (CAMU, 35 IAC 724, Subpart S) will be used for design of the Lime Sludge Ponds cap and performance monitoring.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

Both alternatives permanently remove contaminated soil above the SROs from the SWMU 9N Drainage Ditch. Excavating the Lime Sludge Ponds (Alternative OSA-2A) would remove impacted material and place it in the Separator 7 containment cell, thereby helping to achieve a goal of shrinking the Site-wide footprint of environmental contamination. Alternative OSA-4 would cap these materials in place. Both alternatives would be effective, though Alternative OSA-4 relies on ongoing monitoring and maintenance to ensure protectiveness. Neither alternative involves reduction of toxicity, mobility, or volume through treatment. Both alternatives would be effective in the short term with the proper controls in place for workers conducting the remedial activities; however, Alternative OSA-4 would present a lesser degree of risk to workers, since the oily soils beneath the Lime Sludge Ponds would be left in place and would not require transport to the OU-2 containment cell.

Both alternatives are equally implementable. No specialized services, capabilities, technologies, or equipment would be required for either of the alternatives, although OSA-4 may require coordination with USACE and other agencies regarding construction within the floodplain.

Alternative OSA-2A is approximately $9.8 million and OSA-4 is approximately $3.0 million. The cost savings for OSA-4 is due to capping, rather than excavating the Lime Sludge Ponds, and by using the SWMU 9N Drainage Ditch soils for backfill to bring the Lime Sludge Ponds to grade before capping.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Indian Acres Alternatives

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All IA alternatives, except the No Action alternative will achieve overall protection by either removing wastes and soils above the SROs from Indian Acres or by consolidating those wastes at Indian Acres and containing them in an engineered cell that will prevent exposure. Because the no-action alternative does not meet this criterion, it will not be discussed further.

All IA alternatives would comply with ARARs. All alternatives would make use of the AOC policy and State SMZ regulations (35 IAC Part 740) to facilitate contaminated soil and waste management within the Site. The relevant and appropriate regulations governing Corrective Action Management Units (CAMU, 35 IAC 724, Subpart S) will be used for design of the IA containment cell cap and performance monitoring.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

All alternatives remove wastes and contaminated soil from portions of Indian Acres, though they differ in degree of removal and location of waste consolidation. Alternative IA-2A would remove wastes and contaminated soil from all areas of Indian Acres, to be managed in the containment cell at Separator 7. Alternative IA-3 would remove wastes and soil from IA North and Pump House Road and contain these materials at Indian Acres South, while Alternative 4 would remove wastes and soil from IA North, IA East, and Pump House Road and contain these materials at IA West. IA-3 would excavate 51,500 cubic yards, compared to IA-4's 101,500 cubic yards. The areas to be capped would be 809,429 square feet for IA-3 and 453,329 square feet for IA-4. The elevation of the capped area at IA-3 would be about 5-10 feet, while the elevation of the cap at IA-4 would be approximately 20 feet above grade. IA-4 places the containment cell further from the river, though still within the floodplain.

All alternatives would meet the statutory preference for treatment to some degree. All alternatives use neutralization and solidification as needed for the acidic material in Indian Acres to reduce toxicity and increase compressive strength.

Sulfurous gasses may be produced when acidic material within Indian Acres is disturbed presenting short-term risks to workers; therefore, all alternatives would require workers to use Level B PPE for some site activities. These materials could also create a risk within the community due to transportation through residential areas as described for Alternative IA-2A. Alternative IA-3 would solidify and neutralize the acidic material in place thereby eliminating the risk of moving or transporting the material. Alternative IA-4 similarly would neutralize material in place, but a larger area would be excavated.

Alternative IA-2A would require the excavation of the largest volume of material (approximately 225,000 cubic yards) and transportation of that material through a residential area to an on-site consolidation cell. Alternative IA-3 would involve the least amount of excavation compared to other alternatives (approximately 52,000 cubic yards), but would require the construction of a cap with a larger footprint (approximately 19 acres; 5 to 10 feet high). Alternative IA-4 would involve excavation of all the material in Indian Acres with the exception of the material located in Indian Acres West (former Spray Pond is located within Indian Acres West), with an anticipated total of approximately 100,000 cubic yards to be excavated. The IA-4 cap would have a smaller footprint (approximately 10 acres) thereby achieving a goal of shrinking the area of contamination, and would be located farther from the river, but would have a taller profile.

Alternative IA-2A is approximately $51.9 million, IA-3 is approximately $31.2 million, and IA-4 is approximately $28.6 million. The differences in IA-3 and IA-4 are due to the overall footprint of the caps. IA-2A's elevated cost is due to the excavation and transportation of excavated materials to another area of the Site.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Separator 7 Area

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

The No Action alternative will not achieve overall protection; therefore, it is not discussed further. The other alternative subject to a detailed analysis, Alternative Sep7-2 will provide overall protection by solidifying and neutralizing wastes from the former sludge pit,

consolidating soils and wastes from the larger Separator 7 Area and other OUs, and installing an engineered cap over all wastes and contaminated soil.

Alternative Sep7-2 would comply with ARARs. The alternative would make use of the AOC policy and State SMZ regulations (35 IAC Part 740) to facilitate contaminated soil management and waste consolidation for permanent containment within the Site. The relevant and appropriate regulations governing Corrective Action Management Units (CAMU, 35 IAC 724, Subpart S) will be used for design of the Separator 7 cap and performance monitoring.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

As long as the cap is properly monitored and maintained, long term effectiveness will be achieved by controlling exposure and potential releases from wastes and contaminated soil consolidated from throughout the Site. Permanent reduction in risk would be achieved on those outlying areas of the Separator 7 Area which will be excavated and consolidated beneath the cap.

Alternative Sep7-2 would meet the statutory preference for treatment because the material in the former sludge pit will be neutralized. Solidification may also have the affect of reducing mobility for these wastes.

The alternative will be effective in the short term. Much of the material will be capped in place, reducing any risks from handling of wastes and contaminated soil. With transportation of contaminated media confined to within the Site, risks inherent in transporting waste will be reduced.

Alternative Sep7-2 is approximately $18.0 million.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Preferred OU2 Alternative

Oily Soil Areas

Alternative OSA-4, Excavation of SWMU 9N Drainage Ditch with On-Site consolidation at the Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative OSA-4 are:

- Excavation of approximately 15,000 cubic yards of soil from the SWMU 9N Drainage Ditch to be used as backfill for the Lime Sludge Ponds;
- Regrading the excavated drainage ditch and contouring it to serve as a drainage ditch. The ditch would also be covered with three to six inches of topsoil and re-vegetated;
- Solidification of wet materials in the Lime Sludge Ponds as needed, and backfilling with SWMU 9N Drainage Ditch soils and/or TF/MPA soils;
- Capping of the Lime Sludge Ponds in place with an engineered and armored clay cap, topsoil, and vegetation, thus restoring the Lime Sludge Ponds to surrounding grade;
- Soil sampling would be conducted at five-year intervals to track attenuation progress of VOCs in near surface soils;
- Routine inspection of the cap to ensure long term integrity. Monitoring of the drainage ditch and Lime Sludge Ponds would be conducted to ensure vegetative restoration is successful;
- Flood Impact Study to update the findings of the 2011 study to reflect current conditions after riverbank stabilization;
- Current and future land use will be restricted by use of environmental covenants that run with the land. Restrictions include:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Conditions on the handling and management of impacted soils via a soil management plan;
    - Preventing access to and disturbance of waste containment areas or capped/covered areas;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
- ICs will also be implemented to control exposure to deeper soils at the B&O Pond;
- O&M as warranted of any engineered components;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs.

The time to complete construction would be approximately 1-2 years, at an estimated total present net worth cost of $3.0 million. VOCs are expected to reach SROs within 25 years.

Alternative OSA-4 is the preferred alternative because it provides risk reduction and long-term effectiveness, is more easily implemented and presents less short-term risk for workers for significantly less cost than the other alternative.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-2. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the

preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Indian Acres

Alternative IA-4, Excavation of Indian Acres North, Indian Acres East, and Pump House Road, Consolidation at Indian Acres West (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative IA-4 are:

- Excavation of 100,000 cubic yards of soil and waste from the eastern portion of Indian Acres South, Indian Acres North and Pump House Road;
- Solidification of Indian Acres North and Pump House Road;
- Neutralization of the Spray Pond and Indian Acres South;
- Soils and waste consolidated at Indian Acres West;
- Approximately 10-acre engineered cap at Indian Acres West containment cell of either 2-foot of low permeability clay and vegetated topsoil, or geomembrane with 18-inches of soil and 6-inches of vegetated topsoil, graded, and sloped for water management, and armored to protect against erosion;
- An updated access agreement with the City of Lawrenceville, allowing ingress/egress to Indian Acres via City-owned property (i.e., the east end of Cedar Street).
- ICs, including:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Conditions on the handling and management of impacted soils via a soil management plan;
    - Preventing access to and disturbance of waste containment areas or capped/covered areas;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
- O&M as warranted of any engineered components;

- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of Institutional Controls.

The time to complete construction would be approximately 2-3 years, at an estimated total present net worth cost of $31.2 million. VOCs beyond the footprint of the cap are expected to reach SROs within 25 years.

Alternative IA-4 is the preferred alternative because it provides risk reduction and long-term effectiveness, will require less capping material, achieves the smallest footprint for waste remaining in place, and is located further from the Embarras River than the other alternatives.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-2. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Separator 7 Area

Alternative Sep7-2, Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative Sep7-2 are:

- Excavation of 9,000 cubic yards of impacted soil from the east side of the road between the Separator 7 Area and SWMU-28 and consolidating the material on the west side of the road;
- Excavation of approximately 24,400 cubic yards of additional waste and impacted soil from west of the cap area;
- Consolidation within the Separator 7 Area of excavated soils and waste, including from the Tank Farm/MPA and Floodplain Forest;
- Neutralization and solidification of the former sludge pit (150,000 cubic yards) located in the southeast portion of the Separator 7 Area;

- Placing an approximately 15-20 acre engineered low permeability cap over the consolidated materials, to consist of from bottom to top either (1) 18 inches of low permeability clay meeting engineer-provided specifications (to be defined during remedial design) to minimize water infiltration and six inches of vegetated topsoil or with (2) a geomembrane, 18 inches of soil, and 6 inches of vegetated topsoil;
- Current and future land use will be restricted by use of environmental covenants that run with the land. Restrictions include:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Conditions on the handling and management of impacted soils via a soil management plan;
    - Preventing access to and disturbance of waste containment areas or capped/covered areas;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
- O&M as warranted of any engineered components;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs.

The time to complete construction would be approximately one year, at an estimated total present net worth cost of $18.0 million. VOCs beyond the cap footprint are expected to reach SROs within 25 years.

Alternative Sep7-2 is the preferred alternative because it provides risk reduction and long-term effectiveness in a cost-effective manner. Managing wastes on-site shrinks the overall footprint of wastes located in other areas and is less disruptive to the surrounding community than off-site disposal. On-site containment will require treatment of some wastes which also provides a benefit of rendering the wastes immobile and decreasing any potential threat to groundwater as well as increasing the strength of the material to support the cap.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-2. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be

protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Evaluation of OU-3 Alternatives

Land Treatment Unit

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All LTU alternatives, except the no-action alternative, will achieve overall protection by covering soil that exceeds SROs (LTU-2) or by removing these soils permanently from the area (LTU-3A). Because the no-action alternative does not meet this criterion, it will not be discussed further.

Both remaining LTU alternatives would comply with their respective ARARs. Since the LTU is a formerly permitted RCRA land treatment unit that did not undergo full closure, the closure regulations for land treatment units apply to this action (35 IAC 724.380). Post-closure care regulations for this unit are considered relevant and appropriate (35 IAC 724.380). Alternative LTU-2 would comply with these ARARs by meeting the closure and post-closure performance standards and by meeting the TBC approach as outlined in the CERCLA Compliance with Other Laws Manual. Alternative LTU-3A would not comply with these closure and post-closure regulations, but would comply with other ARARs and Area of Contamination policy associated with movement and consolidation of waste.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

Both alternatives are effective in the long term, though LTU-3A would provide more permanent effectiveness because contaminated soil would be permanently removed from the OU, though transferred to another OU. The effectiveness of Alternative LTU-2 relies on appropriate monitoring and maintenance of the soil cover. Active treatment is not associated with either alternative. Both alternatives would achieve short-term effectiveness, though alternative LTU-3A may take 1-2 years to implement compared to LTU-2's one year. Due to increased soil handling from excavation, transportation, and consolidation in OU-2, Alternative LTU-3A may present some additional short-term risks to workers or the community, but such risks can be controlled. Both alternatives are implementable, with no specialized services, capabilities, technologies, or equipment required. A degree of long-term monitoring is required for both alternatives; for LTU-2's soil cover and for LTU-3A's compliance with RCRA post-closure care.

Alternative LTU-2 would cost approximately $3.8 million, and LTU-3A would cost approximately $9.0 million. The higher costs for LTU-3A are associated with soil excavation, transportation, and management in OU-2.

Modifying Criteria: *Support Agency Acceptance, Community Acceptance*

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Preferred OU-3 Alternative

For the Land Treatment Unit, Alternative LTU-2, Soil Cover, Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative LTU-2 are:

- Installation of a 1-foot soil cover to limit direct contact and exposure to ecological and human receptors. Cover soils will be derived from on-Site sources to the extent possible, and approved by Illinois EPA for use;
- Site grading and surface water control to appropriately manage storm water; to be developed during Remedial Design;
- Restoration of vegetative cover in permitted areas of the LTU to ensure compliance with the RCRA closure plan;
- Re-vegetation of soil cover with ongoing maintenance as mown open space; Topsoil will also be tested for agricultural parameters to ensure it can sustain vegetation;
- Ongoing monitoring and inspections for erosion, vegetation growth and any needed repairs;
- Current and future land use will be restricted by use of environmental covenants that run with the land. Restrictions include:
    - Prevention of residential development;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers by requiring health and safety precautions;
    - Notification to potential future property owners regarding a deposit of asphaltic material in the subsurface;
    - Conditions on the handling and management of impacted soils via a soil management plan;
    - Preventing access to and disturbance of waste containment areas or capped/covered areas;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs.

Alternative LTU-2 is the preferred alternative because it provides risk reduction and long-term effectiveness, is more easily implemented and presents less short-term risk for workers and the

community for significantly less cost than the other alternative. While additional monitoring will be required over the long term, this is still significantly less cost than soil excavation, transportation, and management included in LTU-3A.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-3. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Evaluation of OU4 Alternatives

Floodplain Forest
Threshold Criteria: Overall Protection of Human Health and the Environment & Compliance with ARARs

All OU4 alternatives, except the no-action alternative, will achieve overall protection by controlling exposure to ecological receptors from soil that exceeds the SROs. This control is achieved either by removing contaminated soil (Alternative FF-2A) from the floodplain or covering it (Alternative FF-3). Because the no-action alternative does not meet this criterion, it will not be discussed further.

Both alternatives will comply with ARARs. The Floodplain Forest areas are within the 100-year floodplain and are jurisdictional wetlands. Actions will conform to the substantive provisions of federal nation-wide permits, State permits, and Clean Water Act provisions governing floodplain construction and management. Considerations for State endangered or threatened species consistent with Illinois Endangered Species Act regulations, including incidental take authorization (17 IAC 1080) and any protection measures will be detailed in the Remedial Design.

Balancing Criteria: Long-Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

The excavation alternative (FF-2A) will permanently remove contaminated soil as an ecological stressor from the Floodplain Forest. Risk from metals would be permanently reduced. The cover alternative (FF-3) would reduce risk by preventing further exposure, but would require ongoing monitoring to ensure protectiveness in the long term and could potentially require repair or maintenance. None of the alternatives achieve reduction in toxicity, mobility, or volume through treatment. Both alternatives would cause some impact to the habitat through soil compaction and impacts due to use of heavy equipment. The excavation alternative (FF-2A) would likely have a larger short-term impact on the habitat due to complete vegetation removal while the cover (FF-3) could be placed in a manner such that trees are not removed. Both excavation and placement of soil covers would result in dust and particulate generation, though any impacts to the community would be negligible due to the remoteness of the location.

Construction for both alternatives would be completed in one year. Both alternatives are easily implementable, though restrictions on timing will need to be considered to prevent impacts to wildlife species. Approval and coordination with US Army Corps of Engineers and IDNR may be required due to the Site's location and presence of wetlands. IDNR has a proven track record of cooperation at this Site and any consulting or coordination should not hinder implementing the remedy. Remedial action for either alternative could not occur under flooded conditions. Specialized clearing and dewatering equipment may be needed for working within a floodplain.

Alternative FF-2A would cost approximately $403,000 but would not have any annual monitoring costs. Monitoring to verify that vegetation is reestablished in disturbed areas would be a short-term cost. Alternative FF-3 would cost approximately $203,000; however, the covered areas would require ongoing inspections and possible repairs due to erosion and breaches by wildlife following completion of the work.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD. The Illinois Department of Natural Resources supports Alternative FF-2A as the preferred alternative.

Preferred OU-4 Alternative

For the Floodplain Forest, Alternative FF-2A, Targeted Soil Excavation with On-Site Consolidation and Institutional Controls is the Preferred Alternative. The main elements of Alternative FF-2A are:

- Excavation of lead, chromium, and/or zinc-contaminated soil that poses a risk to ecological receptors to depths of 1-3 feet necessary to meet the appropriate SROs;
- Containment of excavated soil at Separator 7 Area in OU2;
- Surveys for sensitive species with mitigation of potential impacts, as needed;
- Restoration of the excavated areas, including backfill, grading, and re-vegetation;

- Shorter term monitoring to ensure the success of the habitat restoration;
- ICs:
    - To prevent residential, commercial/industrial exposure, if needed;
    - To prevent access to and use from contaminated groundwater;
    - To require health and safety measures for construction workers, if needed;
    - Implementation of an O&M plan;
    - Inclusion in Site-wide Long Term Stewardship Plan.

Alternative FF-2A is the preferred alternative because it provides permanent risk reduction and greater long-term effectiveness in an area of higher ecological quality and potential sensitive species habitat. Short term effectiveness and short-term risks, including habitat impact are about the same, though Alternative FF-2A will result in greater short-term vegetation impact. While costs are greater in the short term due to soil handling, FF-3 includes significant costs for O&M for the long term that FF-2A does not have. There are likely fewer ICs that may need to be implemented for FF-2A, and likely none that are not already Site-wide. FF-2A also helps achieve a Site-wide goal of shrinking the footprint of environmental contamination.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-4. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Evaluation of OU5 Alternatives

LNAPL Management Area

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All OU-5 alternatives, except the no-action alternative, will achieve overall protection by controlling exposure to contaminated subsurface soil and LNAPL above the SROs and GROs. This control is achieved by treating LNAPL or monitoring LNAPL and controlling exposure

through ICs. Because the no-action alternative does not meet this criterion, it will not be discussed further.

The alternatives will meet ARARs. Groundwater within the LNAPL smear zone will need to meet the GROs, which are based on State and Federal regulation (35 IAC 620 and 40 CFR 141). The State regulations for indoor air (35 IAC 742) will be considered if new buildings are constructed before remediation is complete.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

Compositional changes in LNAPL would permanently reduce any risks from ongoing degradation of groundwater. NSZD would document permanent degradation of groundwater and associated lower risks, but on a longer time frame than the active components of the alternative. Areas of active remediation employ treatment technologies thus satisfying the statutory preference for treatment, while the areas subject to NSZD do not. The alternative would be effective in the short term since access to LNAPL, groundwater, and any associated risks are controlled through appropriate ICs. No implementability issues are anticipated. The cost of the alternative is estimated at $4.4 million, with a little less than half the cost due to O&M and monitoring.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Groundwater Management Area

Threshold Criteria: Overall Protection of Human Health and the Environment, Compliance with ARARs

All OU-5 alternatives, except the no-action alternative, will achieve overall protection by controlling exposure to contaminated groundwater above the GROs. This control is achieved by controlling exposure through ICs. Because the no-action alternative does not meet this criterion, it will not be discussed further.

The alternative will meet ARARs. Groundwater will need to meet the GROs, which are based on State and Federal regulation (35 IAC 620 and 40 CFR 141). The State regulations for indoor air (35 IAC 742) will be considered if new buildings are constructed before the aquifer is restored to beneficial use.

Balancing Criteria: Long Term Effectiveness, Reduction of Toxicity, Mobility, or Volume through Treatment, Short Term Effectiveness, Implementability, Cost

Long term effectiveness is achieved once groundwater is remediated and results in permanent risk reduction and restoration of groundwater. MNA does not satisfy the statutory preference for treatment, though some contingency remedies may, if used. The alternative would be effective in the short term since access to groundwater, and any associated risks are controlled through appropriate ICs and there is no risk to workers or the community from the monitoring program. No implementability issues are anticipated. The cost of the alternative is estimated at $2.9 million.

Modifying Criteria: Support Agency Acceptance, Community Acceptance

Modifying criteria are fully evaluated following the comment period on the Proposed Plan and will be addressed in the ROD.

Preferred OU5 Alternative

For the LNAPL Management Area, Alternative LNAPL-2, Compositional Changes (by Passive Bioventing, Air Sparging, Sulfate Land Application, and/or NSZD), Monitored Natural Stability, and Combined Institutional Controls is the Preferred Alternative. The main elements of Alternative LNAPL-2 are:

- Achieve GROs within 50 years;
- Monitoring of NSZD in areas where existing rates of compositional change appear to be sufficient to achieve RAOs within 50 years;
- Implementation of process options to enhance compositional changes in areas of LNAPL with higher benzene concentrations or where NSZD appears to be inadequate to reach the RAOs within 50 years. These process options include bioventing, air sparging, sulfate application or combinations of these;
- On-going sampling to monitor effectiveness of compositional changes and NSZD and compliance with the RAOs;
- O&M as warranted of any engineered components;
- ICs, including:
    - Current and future land use will be restricted by use of environmental covenants that run with the land;
    - Prevention of access to and use of contaminated groundwater;
    - Managing exposure to construction workers from soil impacted with VOCs, LNAPL, and contaminated groundwater by requiring health and safety precautions;
    - Additional evaluation of the indoor air pathway for any new buildings, which may require mitigation systems to address any potential risks;
    - Prevent disturbance of recovery/remediation systems;
    - Ensure long-term on-going access as needed for purposes of monitoring and remediation;

- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of ICs.

For the Groundwater Management Area, Alternative GW-2, Monitored Natural Attenuation, Combined Institutional Controls, and Performance Monitoring at the Consolidation Cells and LTU is the Preferred Alternative. The main elements of Alternative GW-2 are:

- Establish groundwater monitoring networks in association with the containment cells, the LTU, and the LNAPL smear zone to monitor potential releases, contaminant migration, and contaminant reduction;
- On-going sampling to monitor the progress of MNA and compliance with the RAOs;
- Implementation of active process options if MNA is not proceeding within the expected time frame;
- O&M as warranted of any engineered components;
- Institutional Controls as described for Alternative LNAPL-2;
- Development of a Site-Wide Long Term Stewardship Plan that will describe requirements for implementation, monitoring, maintenance, reporting, and enforcement of Institutional Controls.

These alternatives are recommended because they will achieve substantial risk reduction and restoration of groundwater by both treating the source materials and providing safe management of remaining material.

Under the terms of the SMOA, US EPA was provided an opportunity to comment on the FS including the proposed Preferred Alternative for OU-5. Since US EPA is not the lead agency and this Site is not receiving Federal funds for remediation, US EPA has declined to comment on the preferred alternative and no comments were received. Support Agency position will be further evaluated after the public comment period.

Based on the information currently available, the lead agency believes the Preferred Alternatives meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Illinois EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

Illinois EPA's Preferred Alternatives

In summary, the Preferred Alternatives for each OU are:

- OU-1, Tank Farm and MPA Areas: Alternative TF/MPA-2A: Targeted Excavation with On-Site Consolidation, Monitored Natural Attenuation, and Combined Institutional Controls
- OU-1, Road Rights-of-Way and CSSI Area: Alternative ROW-2: Layered Government Controls, Proprietary Controls, and Monitoring
- OU-2, Oily Soil Areas: Alternative OSA-4: Excavation of SWMU 9N Drainage Ditch with On-Site Consolidation at the Lime Sludge Ponds, Backfilling and Capping of Lime Sludge Ponds (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-2, Indian Acres: Alternative IA-4: Excavation of Indian Acres North, Indian Acres East and Pump House Road, Consolidation at Indian Acres West (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-2, Separator 7 Area: Alternative Sep 7-2: Consolidation and Cap with Solidification and Neutralization of Former Sludge Pit (with engineered cap), Monitored Natural Attenuation, and Combined Institutional Controls
- OU-3, Land Treatment Unit: Alternative LTU-2: Soil Cover, Combined Institutional Controls
- OU-4, Floodplain Forest: Alternative FF-2A: Targeted Excavation of Soil with On-Site Consolidation and Institutional Controls
- OU-5, LNAPL Management Area: Alternative LNAPL-2: LNAPL Compositional Changes (by Passive Bioventing, Air Sparging, Sulfate Land Application, and /or Natural Source Zone Depletion (NSZD), Monitored Natural Stability, and Combined Institutional Controls
- OU-5, Groundwater Management Area: Alternative GW-2: Monitored Natural Attenuation, Combined Institutional Controls, and Performance Monitoring at the Consolidation Cells and LTU

Next Steps

Illinois EPA, and USEPA in accordance with the SMOA, will evaluate public reaction and public comments to the Preferred Alternatives before selecting the final remedy for portions of the Indian Refinery Site addressed by this Proposed Plan. Based on new information or public comments, Illinois EPA may modify its Preferred Alternatives or choose another alternative(s). Illinois EPA encourages the public to review and comment on this Proposed Plan and the cleanup alternatives that were evaluated.

Illinois EPA will select a remedial alternative for each OU and announce the selected cleanup alternatives in a Record of Decision (ROD). Illinois EPA will respond in writing to all significant comments in a Responsiveness Summary, which will be included with the ROD. Illinois EPA will announce the selected cleanup alternative for each OU in local newspapers and will place a

copy of the ROD in the local information repository at the Lawrence Public Library in Lawrenceville.

Community Participation

The public is invited to provide comments on this Proposed Plan, the alternatives evaluated, and Illinois EPA's Preferred Alternative for each OU. The comment period will run from January 15, 2025 through February 13, 2025. During the comment period, an availability session will be held January 29, 2025 at the Lawrenceville High School from 3:30 pm to 5:00 pm. A public meeting will also be held during the public comment period, on January 29, 2025 from 6:00 pm to 8:00 pm at the Lawrenceville High School during which Illinois EPA will discuss the Preferred Alternatives, answer questions about this Proposed Plan, and accept written and oral comments.

Public comments may be submitted in written form using the comment form attached to this Proposed Plan or on a copy of this form, or electronically at Epa.publichearingcom@illinois.gov. Written comments may be sent to Illinois EPA, Office of Community Relations, Mail Code #5, PO Box 19276, Springfield, IL 62794-9276.

Public comments received on this Proposed Plan will be considered before selecting a final remedy and documentation of that remedy will occur in a ROD. The public's comments and Illinois EPA responses will be provided in a Responsiveness Summary included with the ROD.

The Preferred Alternative for each OU has been selected based on information presented in various other documents available to the public for review. Illinois EPA encourages the public to review the supporting technical documentation available at Lawrence Public Library in Lawrenceville, Illinois, and the Illinois EPA office in Springfield, Illinois.

For more information on the Site or this Proposed Plan, contact:

Community Relations Coordinator
Rodolfo Alanis
312-832-2160
Rodolfo.Alanis@illinois.gov

Project Manager
Charlene Falco
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Tables

Figures

Glossary

***Administrative Record (AR)*:** As required by CERCLA, the AR includes records used to support decision-making for remedy selection, including guidance, correspondence, and site-specific documents.

Anaerobic biodegradation: The breakdown of organic chemicals (such as petroleum hydrocarbons) in the absence of oxygen, usually by bacteria that do not require oxygen to live.

Applicable or Relevant and Appropriate Requirements or ARARs: Any Federal or State environmental laws or regulations that a selected remedy must meet. These requirements will vary among sites and alternatives.

Aquiclude: A layer of impermeable rock or soil that confines water in an aquifer.

Artifact: Contamination due to field sampling procedures or laboratory procedures and not directly from the site.

Baseline Ecological Risk Assessment or BERA: An evaluation of health risks from exposure or potential exposure to contaminants at a site to ecological receptors, including plants and different types of animals.

Baseline Human Health Risk Assessment or BHHRA: An evaluation of health risks from exposure or potential exposure to contaminants at a site to humans.

Biocells: A technology that uses naturally occurring microbes to degrade fuels and related chemical contaminants.

Capital Costs: Capital costs include those related to construction, labor, equipment and materials, professional and technical services, disposal, institutional controls, etc.

Characteristically hazardous: A waste designated as hazardous because it exhibits certain characteristics of wastes that are considered hazardous. These wastes can include those that are ignitable, corrosive, or highly toxic, for instance.

Cm/s: centimeters per second; a unit used to describe the rate at which water moves through pore space of soil and/or rock.

Comprehensive Environmental Response, Compensation, and Liability Act or CERCLA: The federal Act also known as "Superfund". A Federal law that addresses the removal or cleanup of hazardous substances at hazardous waste sites listed on the National Priorities List.

Conceptual Site Model: A graphic representation or flow diagram showing the source of contaminants and how people may ultimately be exposed to those contaminants, through what type of environmental media and who the receptors may be.

Contaminants of Concern or COCs: Chemicals identified during in-depth site studies (Remedial Investigation/Feasibility Study) that need to be addressed by a cleanup action because they pose a potential threat to human health or the environment.

CO2 Efflux: The flow of carbon dioxide from the surface and shallow subsurface soil to the atmosphere.

Effective solubilities: the maximum concentration of an LNAPL component expected in the dissolved phase.

Exposure units: A geographic area used in risk assessment to represent an area where someone may be exposed to contamination.

Feasibility Study: A report which describes various options for remediating a site, including an evaluation of those alternatives against nine criteria included in the NCP and against each other.
F037: One of the listed wastes included in RCRA. Wastes with this designation are petroleum refinery primary oil/water/solids separation sludge, or any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries.
Groundwater Remediation Objectives or GROs: The GROs are initial cleanup goals that are based on the protection of human health and regulatory standards. The GROs become final remedial objectives in the ROD.
Hydraulic conductivity: The rate at which water moves through porous materials such as soil or rock. This is an important factor in determining the rate at which contamination in groundwater moves.
Hydrocarbons: A class of chemicals that are organic compounds containing carbon and hydrogen atoms in different structural configurations.
Hydrogeologic: Hydrogeology is the study of where water occurs below the earth's surface and how it moves in soil and rocks. The local hydrogeologic system describes the way groundwater moves and how it is distributed based on the local occurrence of aquifers.
Incidental Take: A "taking" includes several types of actions that may harm a protected species (for example, harm, hunt, shoot, pursue, wound, kill, harass, etc.). An incidental take occurs when the taking is associated with an otherwise lawful activity, such as a construction project. Authorization for incidental take is granted by the Illinois Department of Natural Resources through a permitting process.
Inorganic compounds: A class of compounds that does not include both carbon and hydrogen. In environmental investigations, these compounds usually include metals such as arsenic, lead, manganese, and zinc.
Institutional Controls: Administrative, legal controls, proprietary, and informational controls such as deed restrictions, signage, etc. that can help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy.
K049: One of the listed wastes included in RCRA. Wastes with this designation are slop oil emulsion solids from the petroleum refining industry.
K051: One of the listed wastes included in RCRA. Wastes with this designation are API separator sludges from the petroleum refining industry.
Level B PPE: A level of personal protective equipment that provides a high degree of respiratory protection. Level B includes full-face self-contained breathing apparatus with positive pressure, chemical-resistant clothing (i.e., coveralls or splash suit), chemical-resistant gloves, chemical-resistant and steel-toed boots.
Light Non-Aqueous Phase Liquid or LNAPL: Organic liquids such as gasoline, diesel, and other petroleum hydrocarbon products that do not mix well with water and are less dense than water.
Listed Hazardous Waste: A waste designated as hazardous because it is included in RCRA's various lists of wastes that are considered hazardous. These are usually wastes generated by certain industrial processes.

mg/kg: milligram per kilogram, also known as "parts per million," used to describe the concentration of a chemical in soil. One ppm is one milligram of a chemical in one kilogram of soil.

Monitoring Wells: Wells installed to monitor groundwater which occurs beneath the earth's surface in the spaces between soil particles.

National Oil and Hazardous Substances Pollution Contingency Plan or NCP:, Code of Federal Regulations, Title 40, Volume 19, Part 300. A set of federal regulations that, in part, describes requirements for investigating and selecting remedies for Superfund sites, including requirements for public involvement. These regulations support CERCLA.

National Pollution Discharge Elimination System or NPDES: A federal permit program that addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created in 1972 by the Clean Water Act, the NPDES permit program is carried out by state governments with oversight by EPA.

National Priorities List: US EPA's priority Superfund hazardous substance sites for cleanup.

Natural attenuation: The use of natural processes to achieve site-specific cleanup goals within a time frame that is reasonable compared to that offered by other more active or engineered methods. These natural processes, such as biological degradation, dispersion, sorption and others, act to reduce the mass, toxicity, mobility, volume or concentration of contaminants in soil or groundwater.

Natural resources damages: A means of restoring the natural environment and compensating the public for injuries to habitat, plants, and animals due to releases from a site.

Neutralization: A technology used to adjust the (usually) acidic nature of a waste to a more neutral character by adding amendments and mixing with the waste, resulting in a waste that is easier and safer to manage and less likely to leach contaminants into the environment. Some commonly used amendments include lime, cement kiln dust, fly ash or similar materials.

Operable Unit: Operable Units are portions of larger sites that are managed separately from the site overall. Operable Units may include a geographic area or areas with similar types of contamination.

Perched groundwater: Perched groundwater is a type of groundwater that's separated from the main body of groundwater by an unsaturated zone.

Polynuclear Aromatic Hydrocarbons or PAHs: A type of petroleum hydrocarbon and SVOC with two or more benzene rings. There are generally 16 PAHs that are commonly associated with environmental investigations.

Proposed Plan: a document issued for public comment as required by federal law that presents remedial alternatives for cleanup of a Site or Operable Unit.

Record of Decision: Also known as a ROD. A ROD is a technical, legal, and public document that describes the selected remedial action and includes the facts, analyses of facts and site-specific policy determinations to support the selection. The ROD will also include a response to public comments on the Proposed Plan.

Remedial Investigation and Feasibility Study or RI/FS: The RI/FS includes two stages of the CERCLA process: an investigation to characterize site conditions, determine the type of waste or contamination and where it is located, and assess risk to human health and the environment; and a study that evaluates several alternatives to address remediation of a contaminated site.

Resource Conservation and Recovery Act or RCRA: A Federal law that addresses the identification, storage, transportation, treatment, and disposal of hazardous and solid waste.
Responsiveness Summary: A portion of the ROD that provides responses to public comments received on the Proposed Plan.
Saturated zone: An area below ground where all the pores and fractures in soil or rock are filled with water. This area is immediately beneath the vadose zone.
Screening: As used in this Proposed Plan, refers to testing techniques used in the field (as opposed to laboratory testing) to gain real-time data to guide more rigorous sampling efforts.
Semi-volatile Organic Compounds or SVOCs: Similar to VOCs, but are more likely to be liquids or solids at lower temperatures. SVOCs are usually found in oil-based products. These chemicals are less-likely to be dispersed in air than VOCs.
Soil Remediation Objectives or SROs: The SROs are initial cleanup goals that are based on the protection of human health. The SROs become final remedial objectives in the ROD.
Solid Waste Management Unit or SWMU: Under the RCRA regulations, a SWMU is any discernible unit or location at which solid wastes have been placed at any time, regardless of whether the unit was intended for the management of solid or hazardous waste.
Solidification and/or Stabilization: A technology that involves mixing a waste with a binding agent and water to prevent leaching of chemicals and/or to impart strength. Binding agents may include cement, fly ash, lime, or other similar materials.
Superfund: an alternate name for the Comprehensive Environmental Response, Compensation, and Liability Act Federal law.
Superfund Memorandum of Agreement: an agreement between the Illinois Environmental Protection Agency and the United States Environmental Protection Agency, Region 5 regarding the roles and responsibilities of each agency during different stages of the CERCLA process.
Treatability: Treatability studies are laboratory or field tests designed to show how technologies may work under different conditions.
Trophic levels: The place in the food web or food chain an organism occupies due to an its feeding habits, such as decomposer, producer (i.e., plants), herbivore (i.e., plant-eater), carnivore (i.e., meat-eater), or omnivore (i.e, plant and meat eater).
Vadose zone: An area below ground that extends from the surface to the groundwater table. Also referred to as the “unsaturated zone.”
Volatile Organic Compounds or VOCs: Volatile organic compounds are compounds that have a high vapor pressure and low water solubility. Many VOCs are human-made chemicals that are used and produced in the manufacturing and industry. VOCs are typically solvents, fuel oxygenates or by-products of chlorination. VOCs are components of petroleum fuels, hydraulic fluids, paint thinners, dry cleaning agents, and other chemicals. These chemicals may be emitted as gases from certain solids or liquids.

Proposed Plan for Operable Units 1, 2, 3, 4, and 5
Indian Refinery – Texaco Lawrenceville National Priorities List Site
Lawrenceville, Illinois

COMMENT FORM

Your input on the Proposed Plan for OUs 1, 2, 3, 4, and 5 is important to Illinois EPA. Comments provided by the public are valuable in helping Illinois EPA select a final remedy for the portions of this Site addressed by the Proposed Plan.

You may use the space below to write your comments. All written comments must be postmarked no later than **February 13, 2025.**

Please send this form to:

Illinois Environmental Protection Agency
Mr. Rodolfo Alanis
Office of Community Relations
Mail Code #5
PO Box 19276
Springfield, IL 62794-9276

You may also e-mail comments to:
Epa.publichearingcom@illinois.gov

Please include your name and address with your comments sent by e-mail.

Name: _____

Address: _____

Affiliation (optional): _____

Phone number (optional): _____

Comments: (Please feel free to attach additional sheets of paper.)

_____

_____

_____

_____

_____

Your comments are considered public records and, if requested, may be subject to release.

References

2024, September, Chevron Environmental Management Company, Feasibility Study Addendum – Technical Memorandum: Updated Soil Remediation Objectives (SROs) for Lead.

2008, September, SECOR International Incorporated, ENTRIX Environmental Consultants, Trihydro Corporation, ARCADIS US, Inc. Remedial Investigation Report. Former Indian Refinery, Lawrenceville, Illinois.

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U.S. Environmental Protection Agency, December 1989, Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part B), Development of Risk-Based Preliminary Remediation Goals.

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TABLE 1a
OU-1 REMEDIAL ACTION OBJECTIVES
Tank Farm/Main Process Area

Medium	Remedial Action Objectives	Tank Farms and Main Process Area[8]	Road Rights-of-Way and City Storm Sewer Investigation Area
Soil	**Soil RAO 1:** Protection of human health: minimize exposure to soil with concentrations of COCs associated with unacceptable levels of risk to human workers by attaining SROs.	SROs based on 95UCL for exposure area. Commercial Industrial applicable from 0-3 ft-bgs: arsenic: 12.1 mg/kg; benzene: 4.4 mg/kg BAP: 5.8 mg/kg; ethylbenzene: 22 mg/kg lead: 525 mg/kg naphthalene: 14 mg/kg Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs[5]: arsenic: 125 mg/kg; benzene: 230 mg/kg BAP: 59 mg/kg; ethylbenzene: 350 mg/kg lead: 945 mg/kg naphthalene: 344 mg/kg	TACO Tier 1 SROs for construction workers and residential receptors unless specific HHRA(s) are performed. Limited non-worker exposure anticipated since area is rights-of-way along roads[4].
	Soil RAO 2A (Avian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (meadowlark)[7] for the following ecological COCs: lead: 763 mg/kg; chromium: 405 mg/kg; zinc: 666 mg/kg; mercury: 3 mg/kg[1,2]	NA[3]
	Soil RAO 2B (Mammalian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew) for the following ecological COCs: lead: 2783 mg/kg; chromium: 938 mg/kg; zinc: 1110 mg/kg; mercury: 14 mg/kg[1]	NA[3]
Groundwater	**Groundwater RAO 1:** Restore groundwater to beneficial uses within a reasonable timeframe by attaining the applicable State of Illinois Class 1 groundwater quality standards (henceforth referenced as GROs).	NA[5]	NA[5]
	Groundwater RAO 2: Mitigate exposure above the GROs to off-Site receptors from migration of COCs and COECs contained in on-Site groundwater.	NA[5]	NA[5]
LNAPL	**LNAPL RAO 1:** Reduce the mass transfer of COCs from the LNAPL plume to groundwater so that groundwater within the footprint of the LNAPL plume and smear zone reaches beneficial use within a reasonable timeframe by attaining the GRO.	NA[5]	NA[5]
Indoor Air	**Indoor Air RAO 1**: Mitigate levels of COCs above health-based objectives premised on vapor intrusion assessments for future buildings or structures on the Site.	Achieve health-based objectives for indoor air quality if required[9]	Achieve health-based objectives for indoor air quality if required[6,9]

Notes:

RAO Applies to this Remediation Area

The term "human workers" includes industrial/commercial workers, maintenance workers, and construction workers.

The Commercial/Industrial SROs are protective of Maintenance Workers.

The Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser.

Volatile organic compounds (VOCs) in deeper soils (3-10 ft-bgs) are being addressed as part of the LNAPL remedy (see FS Volume 6).

[1] Compliance with avian SRO based on 95 UCL of mean for surface soil based on large home ranges of representative receptors (meadowlark, woodcock). Compliance with mammalian SRO based on individual samples based on small home range of representative receptor (shrew).

[2] BERA Addendum evaluated avian exposure based on exposure to the top 0.5 ft-bgs. As a protective measure, the avian SROs are applied to a depth of 1 ft-bgs.

[3] Area consists of paved roads and the immediate vicinity (rights-of-way) and a utility (storm sewer) corridor/open area adjacent to paved roads; ecological receptors would not be exposed to soil beneath the pavement and are assumed to spend minimal time in the rights-of-way and the CSSI Area.

[4] Human Health SROs would only be applicable where exposure is not restricted with engineering and/or institutional controls.

[5] RAOs for Groundwater and LNAPL are presented in the portion of the FS Report specific to OU-5 (Volume 6); smear zone (3-10 ft-bgs) impact to be addressed via the Volume 6 remedy.

[6] Future construction of buildings is possible in the CSSI Area, but not Road Rights-of-Way; therefore, the indoor air RAO applies only to the CSSI Area.

[7] Within the Eco EU-3 portion of OU-1 the SROs for the Woodcock (rather than Meadowlark) will apply (see Table 2).

[8] The ecological SROs also apply to OU-1 floodplain area east of the Tank Farms and MPA (i.e., the Ecological EU-3 portion of OU-1).

[9] Indoor Air quality will be achieved by compliance with 35 IAC 742.

BAP - Total benzo(a)pyrene equivalents based on similarly acting polynuclear aromatic hydrocarbons

COCs - Constituents of Concern - COCs for soil and corresponding SROs are listed in the Soil RAOs above. COCs for groundwater will be presented in FS Volume 6.

COECs - Constituents of Ecological Concern

CSSI - City Storm Sewer Investigation Area

ft-bgs - feet below ground surface

GRO - Groundwater Remediation Objectives (State of Illinois Class 1 groundwater quality standards)

HHRA - human health risk assessment

NA - Not applicable

SRO - Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

TACO - Tiered Approach to Corrective Action: 35 IAC 742.

TABLE 1b
OU-2 REMEDIAL ACTION OBJECTIVES
Oily Soil Areas, Indian Acres, and Separator 7 Area

Operable Unit		OU-2		
Remedial Action Objectives		**Oily Soil Areas**	**Indian Acres**	**Separator 7 Area**
Soil Remedial Action Objectives	**Soil RAO 1:** Protection of human health: minimize exposure to soil with concentrations of COCs associated with unacceptable levels of risk to human workers by attaining SROs.	SROs based on 95UCL for exposure area.[1] Commercial Industrial applicable from 0-3 ft-bgs: arsenic: 12.1 mg/kg benzene: 4.4 mg/kg BAP: 5.8 mg/kg ethylbenzene: 22 mg/kg lead: 1,120 mg/kg naphthalene: 14 mg/kg Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs: arsenic: 125 mg/kg benzene: 230 mg/kg BAP: 59 mg/kg ethylbenzene: 350 mg/kg lead: 2,016 mg/kg naphthalene: 344 mg/kg	SROs based on 95UCL for exposure area.[1] Commercial Industrial applicable from 0-3 ft-bgs: arsenic: 12.1 mg/kg benzene: 4.4 mg/kg BAP: 5.8 mg/kg ethylbenzene: 22 mg/kg lead: 1,120 mg/kg naphthalene: 14 mg/kg Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs: arsenic: 125 mg/kg benzene: 230 mg/kg BAP: 59 mg/kg ethylbenzene: 350 mg/kg lead: 2,016 mg/kg naphthalene: 344 mg/kg	SROs based on 95UCL for exposure area.[1] Commercial Industrial applicable from 0-3 ft-bgs: arsenic: 12.1 mg/kg benzene: 4.4 mg/kg BAP: 5.8 mg/kg ethylbenzene: 22 mg/kg lead: 1,120 mg/kg naphthalene: 14 mg/kg Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs: arsenic: 125 mg/kg benzene: 230 mg/kg BAP: 59 mg/kg ethylbenzene: 350 mg/kg lead: 2,016 mg/kg naphthalene: 344 mg/kg
	Soil RAO 2A (Avian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (meadowlark): lead: 763 mg/kg chromium: 405 mg/kg zinc: 666 mg/kg mercury: 3 mg/kg.[2,3]	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (meadowlark): lead: 763 mg/kg chromium: 405 mg/kg zinc: 666 mg/kg mercury: 3 mg/kg.[2,3]	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (meadowlark): lead: 763 mg/kg chromium: 405 mg/kg zinc: 666 mg/kg mercury 3 mg/kg.[2,3]
	Soil RAO 2B (Mammalian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew): lead: 2783 mg/kg chromium: 938 mg/kg zinc: 1110 mg/kg mercury 14 mg/kg.[2]	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew): lead: 2783 mg/kg chromium: 938 mg/kg zinc: 1110 mg/kg mercury 14 mg/kg.[2]	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew): lead: 2783 mg/kg chromium: 938 mg/kg zinc: 1110 mg/kg mercury 14 mg/kg.[2]
Groundwater Remedial Action Objectives	**Groundwater RAO 1:** Restore groundwater to beneficial uses within a reasonable timeframe by attaining the applicable State of Illinois Class 1 groundwater quality standards (henceforth referenced as GROs).	NA[4]	NA[4]	NA[4]
	Groundwater RAO 2: Mitigate exposure above the GROs to off-Site receptors from migration of COCs and COECs contained in on-Site groundwater.	NA[4]	NA[4]	NA[4]
LNAPL Remedial Action Objective	**LNAPL RAO 1:** Reduce the mass transfer of COCs from the LNAPL plume to groundwater so that groundwater within the footprint of the LNAPL plume and smear zone reaches beneficial use within a reasonable timeframe by attaining the GRO.	NA[4]	NA[4]	NA[4]
Indoor Air Remedial Action Objective	**Indoor Air RAO 1**: Mitigate levels of COCs above health-based objectives premised on vapor intrusion assessments for future buildings or structures on the Site.	Achieve health-based objectives for indoor air quality if required.[5]	Achieve health-based objectives for indoor air quality if required.[5]	Achieve health-based objectives for indoor air quality if required.[5]

Notes:

RAO Applies to this Remediation Area

The term "human workers" includes industrial/commercial workers, maintenance workers, and construction workers.

The Commercial/Industrial SROs are protective of Maintenance Workers.

The Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser.

Volatile organic compounds (VOCs) in deeper soils (3-10 ft-bgs) are being addressed as part of the LNAPL remedy (see FS Volume 6).

[1] Human Health SROs would only be applicable where exposure is not restricted with engineering and/or institutional controls.

[2] Compliance with avian SRO based on 95 UCL of mean for surface soil based on large home ranges of representative receptors (meadowlark, woodcock). Compliance with mammalian SRO based on individual samples based on small home range of representative receptor (shrew).

[3] BERA Addendum evaluated avian exposure based on exposure to the top 0.5 ft-bgs. As a protective measure, the avian SROs are applied to a depth of 1 ft-bgs.

[4] RAOs for Groundwater and LNAPL are presented in the portion of the FS Report specific to OU-5 (Volume 6 of this FS); COCs for groundwater will be provided within FS Volume 6.

[5] Indoor Air quality will be achieved by compliance with 35 IAC 742.

BAP - Total benzo(a)pyrene equivalents based on similarly acting polynuclear aromatic hydrocarbons

COCs - Constituents of Concern - COCs for Soil and corresponding SROs are listed in the Soil RAOs above.

COECs - Constituents of Ecological Concern

ft-bgs - feet below ground surface

GRO - Groundwater Remediation Objectives (State of Illinois Class 1 groundwater quality standards)

HHRA - human health risk assessment

NA - Not applicable

SRO - Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

TABLE 1c
OU-3 REMEDIAL ACTION OBJECTIVES
Land Treatment Unit

Operable Unit		OU-3
Remedial Action Objectives		Land Treatment Unit
Soil Remedial Action Objectives (SROs)	**Soil RAO 1:** Protection of human health: minimize exposure to soil with concentrations of COCs associated with unacceptable levels of risk to human workers by attaining SROs.	SROs based on 95UCL for exposure area. Commercial Industrial SROs applicable from 0-3 ft-bgs: arsenic: 12.1 mg/kg lead: 525 mg/kg Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs:[1] arsenic: 125 mg/kg lead: 945 mg/kg
	Soil RAO 2A (Avian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (meadowlark): chromium: 405 mg/kg lead: 763 mg/kg mercury 3 mg/kg zinc: 666 mg/kg[2,3]
	Soil RAO 2B (Mammalian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COECs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew): chromium: 938 mg/kg lead: 2783 mg/kg mercury 14 mg/kg zinc: 1110 mg/kg[2]
Groundwater Remedial Action Objectives (GROs)	**Groundwater RAO 1:** Restore groundwater to beneficial uses within a reasonable timeframe by attaining the applicable State of Illinois Class 1 groundwater quality standards (henceforth referenced as groundwater remediation objectives [GROs]).	NA
	Groundwater RAO 2: Mitigate exposure above the GROs to off-Site receptors from migration of COCs and COECs contained in on-Site groundwater.	NA
LNAPL Remedial Action Objective	**LNAPL RAO 1:** Reduce the mass transfer of COCs from the LNAPL plume to groundwater so that groundwater within the footprint of the LNAPL plume and smear zone reaches beneficial use within a reasonable timeframe by attaining the GROs.	NA
Indoor Air Remedial Action Objective	**Indoor Air RAO 1**: Mitigate levels of COCs above health-based objectives premised on vapor intrusion assessments for future buildings or structures on the Site.	NA

Notes:

RAO Applies to this Remediation Area

Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser; Commercial/Industrial SROs are protective of Maintenance Workers.

[1] Human Health SROs would only be applicable where exposure is not restricted with engineering and/or institutional controls.

[2] Compliance with avian SRO based on 95 UCL of mean for surface soil based on large home ranges of representative receptors (meadowlark, woodcock). Compliance with mammalian SRO based on individual samples based on small home range of representative receptor (shrew)

[3] BERA Addendum evaluated avian exposure based on exposure to the top 0.5 ft-bgs. As a protective measure, the avian SROs are applied to a depth of 1 ft-bgs.

COCs - Constituents of Concern; COCs for Soil and corresponding SROs are listed in the Soil RAOs above. Groundwater COCs will be provided in FS Volume 6.

COEC - Constituents of Ecological Concern

ft-bgs - feet below ground surface

GRO - Groundwater Remediation Objectives which are the State of Illinois Class 1 groundwater quality standards

HHRA - human health risk assessment

mg/kg - milligrams per kilogram

NA - Not applicable

SRO - Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

TACO - Tiered Approach to Corrective Action: 35 IAC 742

95UCL - Upper confidence level (calculated at a certainty of 95 percent)

TABLE 1d
OU-4 REMEDIAL ACTION OBJECTIVES
Floodplain Forest Area

Operable Unit		OU-4
Remedial Action Objectives		Floodplain Forest Area
Soil Remedial Action Objectives	**Soil RAO 1:** Protection of human health: minimize exposure to soil with concentrations of COCs associated with unacceptable levels of risk to human workers by attaining SROs.	NA[3]
	Soil RAO 2A (Avian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COCs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on 95 UCL for surface soil samples (0-1 ft-bgs) in exposure area on avian insectivore receptor group (woodcock) for the following ecological COCs: lead: 652 mg/kg chromium: 471 mg/kg zinc: 768 mg/kg[1,2].
	Soil RAO 2B (Mammalian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of COCs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.	SROs based on individual samples in surface soil (0-3 ft-bgs) for mammalian insectivore receptor group (shrew) for the following ecological COCs: lead: 2783 mg/kg chromium: 938 mg/kg zinc: 1110 mg/kg[1,4].
Groundwater Remedial Action Objectives	**Groundwater RAO 1:** Restore groundwater to beneficial uses within a reasonable timeframe by attaining the applicable State of Illinois Class 1 groundwater quality standards (henceforth referenced as GROs).	NA
	Groundwater RAO 2: Mitigate exposure above the GROs to off-Site receptors from migration of COCs contained in on-Site groundwater.	NA
LNAPL Remedial Action Objective	**LNAPL RAO 1:** Reduce the mass transfer of COPCs from the LNAPL plume to groundwater so that groundwater within the footprint of the LNAPL plume and smear zone reaches beneficial use within a reasonable timeframe by attaining the GRO.	NA
Indoor Air Remedial Action Objective	**Indoor Air RAO 1:** Mitigate levels of COPCs above health-based objectives premised on vapor intrusion assessments for future buildings or structures on the Site.	NA
	Notes:	
	RAO Applies to this Remediation Area	

[1] Compliance with avian SRO based on 95 UCL of mean for surface soil based on large home ranges of representative receptors (meadowlark, woodcock). Compliance with mammalian SRO based on individual samples based on small home range of representative receptor (shrew)

[2] BERA Addendum evaluated avian exposure based on exposure to the top 0.5 ft-bgs. As a protective measure, the avian SROs are applied to a depth of 1 ft-bgs.

[3] Hunter/Trespasser was the most sensitive receptor for the floodplain forest. There were no exceedances of cumulative cancer risk (1E-5) and hazard index (1) thresholds (Table 6b of BHHRA Addendum #2). Therefore, no human health SROs are applicable to this area.

[4] Ecological EU-1 (LTU) is the only EU in which mercury has a No Observable Adverse Effect Level (NOAEL) Hazard Quotient (HQ) greater than 1: mercury is not a COC for Ecological EU-3 (Floodplain Forest Area). Therefore, mercury has been removed from this Floodplain Forest-specific RAO table.

BERA - Baseline Ecological Risk Assessment

COCs - Constituents of Concern; Values for Soil and corresponding SROs are listed in the Soil RAOs above. Values for groundwater were provided on Table 4-10 of the 2008 Baseline Human Health Risk Assessment plus lead (see Appendix C of FS Volume 1; not applicable to this OU).

ft-bgs - feet below ground surface

GRO - Groundwater Remediation Objectives which are the State of Illinois Class 1 groundwater quality standards

HHRA - human health risk assessment

mg/kg - milligrams per kilogram

NA - not applicable

SRO - Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

TACO - Tiered Approach to Corrective Action: 35 IAC 742

TABLE 1e
OU-5 REMEDIAL ACTION OBJECTIVES
LNAPL Management Area and Site-wide Groundwater

Operable Unit		OU-5	
Remedial Action Objectives		**LNAPL Management Area**	**Groundwater Management Area**
Soil Remedial Action Objectives	**Soil RAO 1:** Protection of human health: minimize exposure to soil with concentrations of COCs associated with unacceptable levels of risk to human workers by attaining SROs.	SROs based on 95UCL for exposure area. Commercial Industrial applicable from 0-3 ft-bgs[3,4] Construction worker SROs applicable on individual sample basis from 0-10 ft-bgs[3]: benzene: 230 mg/kg; ethylbenzene: 350 mg/kg; naphthalene: 344 mg/kg	NA
	Soil RAO 2A (Avian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of ecological COCs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.[1,2]	NA[5]	NA
	Soil RAO 2B (Mammalian): Protection of ecological receptors: minimize food chain and/or direct soil ingestion exposure to soil with concentrations of ecological COCs associated with unacceptable (established for the most sensitive receptor group per eco risk assessment) levels of risk by attaining the SROs.[1]	NA[5]	NA
Groundwater Remedial Action Objectives	**Groundwater RAO 1:** Restore groundwater to beneficial uses within a reasonable timeframe by attaining the applicable State of Illinois Class I groundwater quality standards (or federal MCL, if lower) (henceforth referenced as GROs).	NA	Numeric objectives: The lower of Class I Groundwater Quality Standard or Federal Maximum Contaminant Level (MCL) for each COC: benzene: 0.005 mg/L; ethylbenzene: 0.7 mg/L; toluene: 1.0 mg/L; xylenes: 10 mg/L; naphthalene: 0.14 mg/L
	Groundwater RAO 2: Mitigate exposure above the GROs to off-Site receptors from migration of COCs and ecological COCs contained in on-Site groundwater.	NA	Numeric objectives: The lower of Illinois Class I Groundwater Quality Standards or Federal Maximum Contaminant Levels (MCL) for each COC: benzene: 0.005 mg/L; ethylbenzene: 0.7 mg/L; toluene: 1.0 mg/L; xylenes: 10 mg/L; naphthalene: 0.14 mg/L
LNAPL Remedial Action Objective	**LNAPL RAO 1:** Reduce the mass transfer of COCs from the LNAPL plume to groundwater so that groundwater within the footprint of the LNAPL plume and smear zone reaches beneficial use within a reasonable timeframe by attaining the GRO.	Decreasing trends in dissolved phase benzene concentrations will be the primary line of evidence of source depletion. Ultimately, the groundwater standards listed in 35 IAC 620 need to be met.	NA
Indoor Air Remedial Action Objective	**Indoor Air RAO 1:** Mitigate levels of COCs above health-based objectives premised on vapor intrusion assessments for future buildings or structures on the Site.	Achieve health-based objectives for indoor air quality if required.[9]	Achieve health-based objectives for indoor air quality if required.[9]

Notes:

RAO Applies to this Remediation Area

[1] Compliance with avian SRO based on 95 UCL of mean for surface soil based on large home ranges of representative receptors (meadowlark, woodcock). Compliance with mammalian SRO based on individual samples based on small home range of representative receptor (shrew).

[2] BERA Addendum (FS Vol. 1, App. C-5) evaluated avian exposure based on exposure to the top 0.5 ft-bgs. As a protective measure, the avian SROs are applied to a depth of 1 ft-bgs.

[3] Human Health SROs would only be applicable where exposure is not restricted with engineering and/or institutional controls; calculated values are protective of the Hunter/Trespasser and Maintenance Worker; inorganics and SVOCs are addressed via the alternatives for the soil-based OUs (OU-1 through OU-4) presented in FS Volumes 2-5.

[4] VOCs in shallow soils (0-3 ft-bgs) are addressed in the alternatives for the soil-based OUs where VOCs have been identified as COCs (OU-1 and OU-2) presented in FS Volumes 2-3.

[5] COCs for ecological receptors are limited to metals; those COCs are addressed in the alternatives for the soil-based OUs (OU-1 through OU-4) presented in FS Volumes 2-5.

[6] Indoor Air quality will be achieved by compliance with 35 IAC 742.

COCs - Constituents of Concern; COCs for groundwater: provided on Table 4-10 of the 2008 Baseline Human Health Risk Assessment (plus lead).

ft-bgs - feet below ground surface

GRO - Groundwater Remediation Objectives (lower of the State of Illinois Class I groundwater quality standards or the federal Maximum Contaminant Levels)

NA - Not applicable

SRO - Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

TACO - Tiered Approach to Corrective Action: 35 IAC 742

TABLE 2a
OU-1 SITE-SPECIFIC SOIL REMEDIATION OBJECTIVES (SROs)
Tank Farm and Main Process Area

COC	Construction Worker SROs[1]		Commercial/Industrial Worker SROs[1]		Ecological SROs (Avian)				Ecological SROs (Mammal)	
	To be applied to Individual Data Point/Polygon (0-10 ft-bgs) within OU-1		To be applied to CI Exposure Units (0-3 ft-bgs) within OU-1 Using Conservative Estimate of the Mean Concentration (95 UCL)		Eastern Meadowlark to be applied to EU-1 and EU-2; Woodcock to be applied to EU-3 (0-1 ft-bgs)				Short-tailed Shrew SRO to be applied to Individual Data Point/Polygon (0-3 ft-bgs) within OU-1	
	Lowest CW SRO (mg/kg)	Basis	Lowest CI SRO (mg/kg)	Basis	Meadowlark SRO (mg/kg)	Basis	Woodcock SRO (mg/kg)	Basis	Shrew SRO (mg/kg)	Basis
Arsenic, Total	125	HQ = 1; BHHRA Exposure Parameters	12.1	Site-specific Background Concentration. Risk-based SRO is 3.9 mg/kg	-	NC	-	NC	-	NC
Benzene[2]	230	HQ = 1; BHHRA Exposure Parameters	4.4	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Benzo(a)Pyrene (equivalents)[3]	59	HQ = 1; BHHRA Exposure Parameters	5.8	Cancer Risk of 1E-6 - Ingestion Pathway; BHHRA Exposure Parameters. Equivalent to TACO Tier 1 Objective	-	NC	-	NC	-	NC
Ethylbenzene[2]	350	Soil Saturation Limit (TACO Appendix A, Table A) Cancer Risk of 1E-6-based SRO is 3,097 mg/kg	22	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Naphthalene[2]	344	HQ = 1; BHHRA Exposure Parameters	14	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Lead	945	Pb(5) ALM; BHHRA Exposure Parameters	525	Pb(5) ALM Maintenance Worker	763	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	652	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	2783	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Polygon used as conservative surrogate for population
Mercury	-	NC	-	NC	3	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	-	NC	14	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Polygon used as conservative surrogate for population
Chromium	-	NC	-	NC	405	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	471	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	938	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Polygon used as conservative surrogate for population
Zinc	-	NC	-	NC	666	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	768	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	1110	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C in FS Volume 1. Polygon used as conservative surrogate for population

[1] The Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser. The Commercial/Industrial SROs are protective of Maintenance Workers.

[2] VOC impacts at depths of 0-3 ft-bgs to be addressed within OU-1; VOC impacts in the smear zone (3-10 ft-bgs) to be addressed as part of the LNAPL management area (OU-5).

[3] To be applied to the sum of the 7 benzo(a)pyrene equivalent carcinogenic polynuclear aromatic hydrocarbons (PAHs), weighted according to EPA Toxicity Equivalent Factors. The 7 carcinogenic PAHs are benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene.

COC = Constituent of Concern; NC = Not a COC for this receptor; TRV = Toxicity Reference Value; NOAEL = No Observed Adverse Effect; LOAEL = Lowest Observed Adverse Effect; 95UCL = 95th percent upper confidence level of the mean; SRO = Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

EU = Exposure Unit; BHHRA = Baseline Human Health Risk Assessment; HQ = Hazard Quotient; TACO = Illinois Environmental Protection Agency Tiered Approach to Cleanup Objectives; CI = Commercial/Industrial Worker; CW = Construction Worker; ALM = Adult Lead Model

SROs in this table do not apply to the Road Rights-of-Way and City Storm Sewer Investigation (CSSI) Area; see Table 3 for SROs for Road Rights-of-Way and CSSI Area SROs

TABLE 2b
OU - 2 SITE-SPECIFIC SOIL REMEDIATION OBJECTIVES (SROs)
OILY SOIL AREAS, INDIAN ACRES, AND SEPARATOR 7 AREA

COC	Construction Worker SROs[1]		Commercial/Industrial Worker SROs[1]		Ecological SROs (Avian)				Ecological SROs (Mammal)	
	To be applied to Individual Data Point/Polygon (0-10 ft-bgs) within OU-2		To be applied to CI Exposure Units (0-3 ft-bgs) within OU-2 Using Conservative Estimate of the Mean Concentration (95 UCL)		Eastern Meadowlark SRO to be applied to EU-2 Woodcock SRO to be applied to EU-3 (0-1 ft-bgs) within OU-2				Short-tailed Shrew SRO to be applied to Individual Data Point/Polygon (0-3 ft-bgs) within OU-2	
	Lowest CW SRO (mg/kg)	Basis	Lowest CI SRO (mg/kg)	Basis	Meadowlark SRO (mg/kg)	Basis	Woodcock SRO (mg/kg)	Basis	Shrew SRO (mg/kg)	Basis
Arsenic, Total	125	HQ = 1; BHHRA Exposure Parameters	12.1	Site-specific Background Concentration. Risk-based SRO is 3.9 mg/kg	-	NC	-	NC	-	NC
Benzene[2]	230	HQ = 1; BHHRA Exposure Parameters	4.4	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Benzo(a)Pyrene (equivalents)[3]	59	HQ = 1; BHHRA Exposure Parameters	5.8	Cancer Risk of 1E-6 - Ingestion Pathway; BHHRA Exposure Parameters. Equivalent to TACO Tier 1 Objective	-	NC	-	NC	-	NC
Ethylbenzene[2]	350	Soil Saturation Limit (TACO Appendix A, Table A) Cancer Risk of 1E-6-based SRO is 3,097 mg/kg	22	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Naphthalene[2]	344	HQ = 1; BHHRA Exposure Parameters	14	Cancer Risk of 1E-6; BHHRA Exposure Parameters	-	NC	-	NC	-	NC
Lead	945	Pb(5) ALM; BHHRA Exposure Parameters	525	Pb(5) ALM Maintenance Worker	763	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	652	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	2,783	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population.
Mercury	-	NC	-	NC	3	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	-	NC	14	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population.
Chromium	-	NC	-	NC	405	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	471	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	938	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population.
Zinc	-	NC	-	NC	666	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	768	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	1,110	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population.

Notes:
[1] The Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser. The Commercial/Industrial SROs are protective of Maintenance Workers.
[2] VOC impacts at depths of 0-3 ft-bgs to be addressed within OU-2; deeper VOC impacts (3-10 ft-bgs) to be addressed as part of the LNAPL management area (OU-5).
[3] To be applied to the sum of the 7 benzo(a)pyrene equivalent carcinogenic polynuclear aromatic hydrocarbons (PAHs), weighted according to EPA Toxicity Equivalent Factors. The 7 carcinogenic PAHs are benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and chrysene.
COC = Constituent of Concern; NC = Not a COC for this receptor; TRV = Toxicity Reference Value; NOAEL = No Observed Adverse Effect; LOAEL = Lowest Observed Adverse Effect; 95UCL = 95th percent upper confidence level of the mean; SRO = Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])
EU = Exposure Unit; BHHRA = Baseline Human Health Risk Assessment; HQ = Hazard Quotient; TACO = Illinois Environmental Protection Agency Tiered Approach to Cleanup Objectives; CI = Commercial/Industrial Worker; CW = Construction Worker; ALM = Adult Lead Model
SRO development is described in Appendix C of FS Volume 1.

TABLE 2c
OU-3 SITE-SPECIFIC SOIL REMEDIATION OBJECTIVES (SROs)
LAND TREATMENT UNIT

COC	Construction Worker SROs To be applied to Individual Data Point/Polygon (0-10 ft-bgs) within OU-3		Commercial/Industrial Worker SROs To be applied to CI Exposure Units (0-3 ft-bgs) within OU-3 Using Conservative Estimate of the Mean Concentration (95 UCL)		Ecological SROs (Avian) Eastern Meadowlark SRO to be applied to EU-1 and EU-2** (0-1 ft-bgs) (**OU-3 is generally coincident with EU-1)		Ecological SROs (Mammal) Short-tailed Shrew SRO to be applied to Individual Data Point/Polygon (0-3 ft-bgs)	
	Lowest CW SRO (mg/kg)	Basis	Lowest CI SRO (mg/kg)	Basis	Meadowlark SRO (mg/kg)	Basis	Shrew SRO (mg/kg)	Basis
Arsenic	125	HQ = 1; BHHRA Exposure Parameters	12.1	Site-specific Background Concentration. Risk-based SRO is 3.9 mg/kg	-	NC	-	NC
Lead	945	Pb(5) ALM; BHHRA Exposure Parameters	525	Pb(5) ALM Maintenance Worker	763	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	2,783	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population
Mercury	-	NC	-	NC	3	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	14	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population
Chromium	-	NC	-	NC	405	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	938	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population
Zinc	-	NC	-	NC	666	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Target is 95 UCL of exposure unit < SRO to be protective of population.	1110	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C of FS Volume 1. Polygon used as conservative surrogate for population

Notes:
Commercial/Industrial and Construction Worker SROs are protective of the Hunter/Trespasser; Commercial/Industrial SROs are protective of the Maintenance Worker.
95UCL = 95th percent upper confidence level of the mean
ALM = Adult Lead Model
BHHRA = Baseline Human Health Risk Assessment
CI = Commercial/Industrial Worker
COC = Constituent of Concern
CW = Construction Worker
EU = Exposure Unit
HQ = Hazard Quotient
LOAEL = Lowest Observed Adverse Effect
NC = Not a constituent of concern for this receptor
NOAEL = No Observed Adverse Effect
SRO = Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG]). SRO development is described in Appendix C of FS Volume 1.
TRV = Toxicity Reference Value

TABLE 2d
OU-4 SITE-SPECIFIC SOIL REMEDIATION OBJECTIVES (SROs) FLOODPLAIN FOREST AREA

COC	Ecological SROs (Avian)		Ecological SROs (Mammal)	
	Woodcock SRO (0-1 ft-bgs)		Short-tailed Shrew SRO to be applied to Individual Data Point/Polygon (0-3 ft-bgs)	
	Woodcock SRO (mg/kg)	Basis	Shrew SRO (mg/kg)	Basis
Lead	652	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Target is 95 UCL of exposure unit < SRO to be protective of population.	2783	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Polygon used as conservative surrogate for population
Chromium	471	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Target is 95 UCL of exposure unit < SRO to be protective of population.	938	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Polygon used as conservative surrogate for population
Zinc	768	Calculated using a conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Target is 95 UCL of exposure unit < SRO to be protective of population.	1110	Calculated using conservative mid-range TRV between NOAEL and LOAEL. See Appendix C. Polygon used as conservative surrogate for population

TRV = Toxicity Reference Value; NOAEL = No Observed Adverse Effect; LOAEL = Lowest Observed Adverse Effect; 95UCL = 95th percent upper confidence level of the mean; SRO = Soil Remediation Objective (equivalent to CERCLA site-specific Preliminary Remediation Goal [PRG])

EU = Exposure Unit; BHHRA = Baseline Human Health Risk Assessment; HQ = Hazard Quotient; TACO = Illinois Environmental Protection Agency Tiered Approach to Cleanup Objectives

Ecological EU-1 (LTU) is the only EU in which mercury has a NOAEL hazard quotiant greater than 1: mercury is not a COC for Ecological EU-3 (Floodplain Forest Area).

SRO development is described in Appendix C of Volume 1.

TABLE 3
CONTAMINANTS OF CONCERN AND
CONTAMINANTS OF POTENTIAL CONCERN FOR GROUNDWATER AND
GROUNDWATER REMEDIATION OBJECTIVES (GROs)

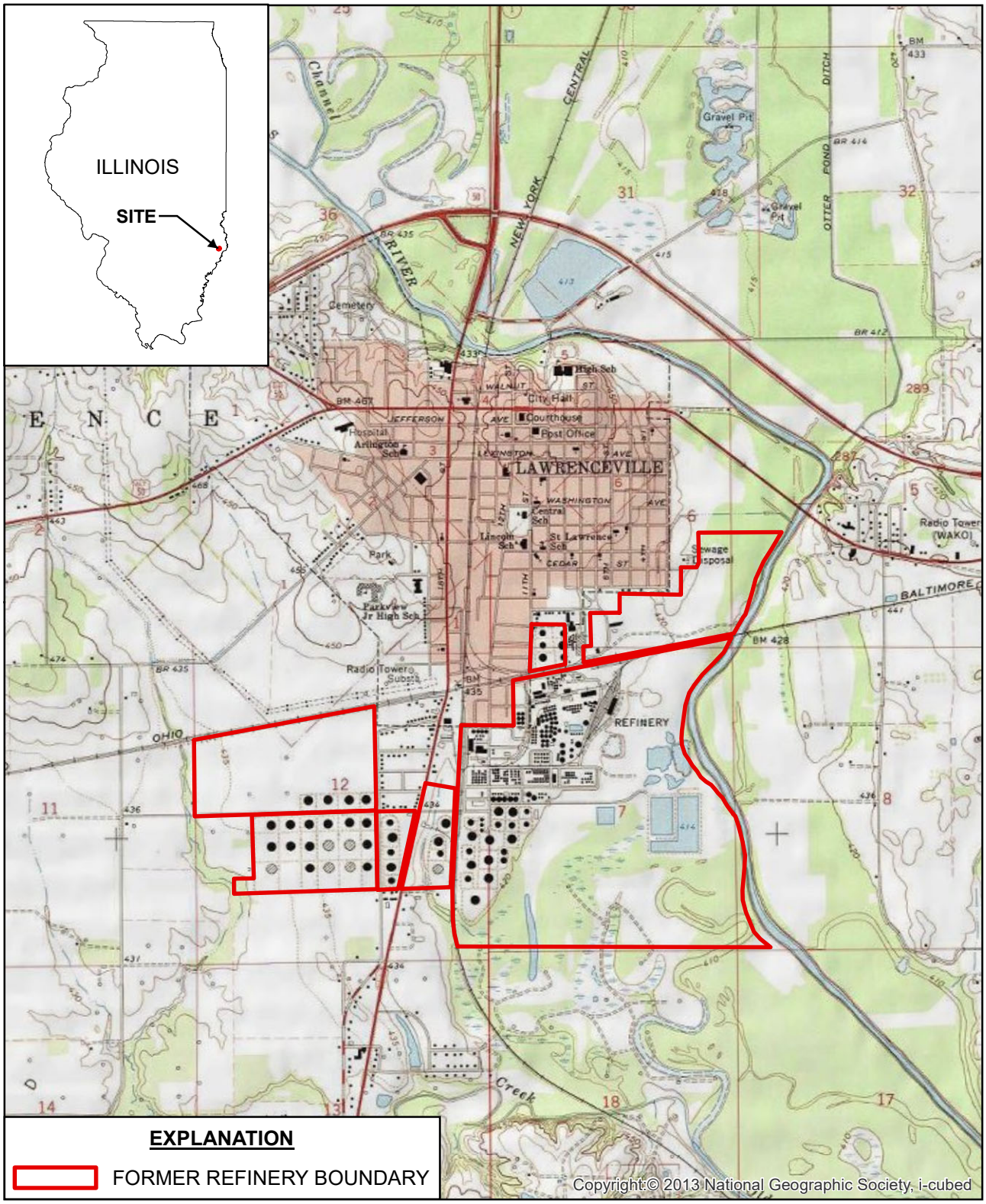
Contaminants of Potential Concern	GRO (mg/L)
1,1,1-Trichloroethane	0.20
1,1-Dichloroethylene	0.007
Benzene	**0.005**
Ethylbenzene	**0.7**
Methylene Chloride	0.005
Toluene	**1.0**
Vinyl Chloride	0.002
Xylenes	**10**
Benzo(a)anthracene	0.00013
Benzo(a)pyrene	0.0002
Benzo(b)fluoranthene	0.00018
Dibenz(a,h)anthracene	0.0003
Indeno(1,2,3-cd)pyrene	0.00043
Naphthalene	**0.14**
Pentachlorophenol	0.001
Phenol	0.1
Arsenic, Total	0.010
Beryllium, Total	0.004
Cadmium, Total	0.005
Chromium, Total	0.1
Iron, Total	5.0
Lead, Total	0.0075
Manganese, Total	0.15
Nickel, Total	0.1
Thallium, Total	0.002
Vanadium, Total	0.049

Contaminants of Concern
Benzene
Ethylbenzene
Toluene
Xylenes
Naphthalene

Notes:

Bolded constituents are also Contaminants of Concern

GRO - groundwater remediation objective (lower of Illinois 35 Ill. Adm. Code 620.410 Class I standard or federal Maximum Contaminant Level [MCL]).



N

0 0.5 Miles

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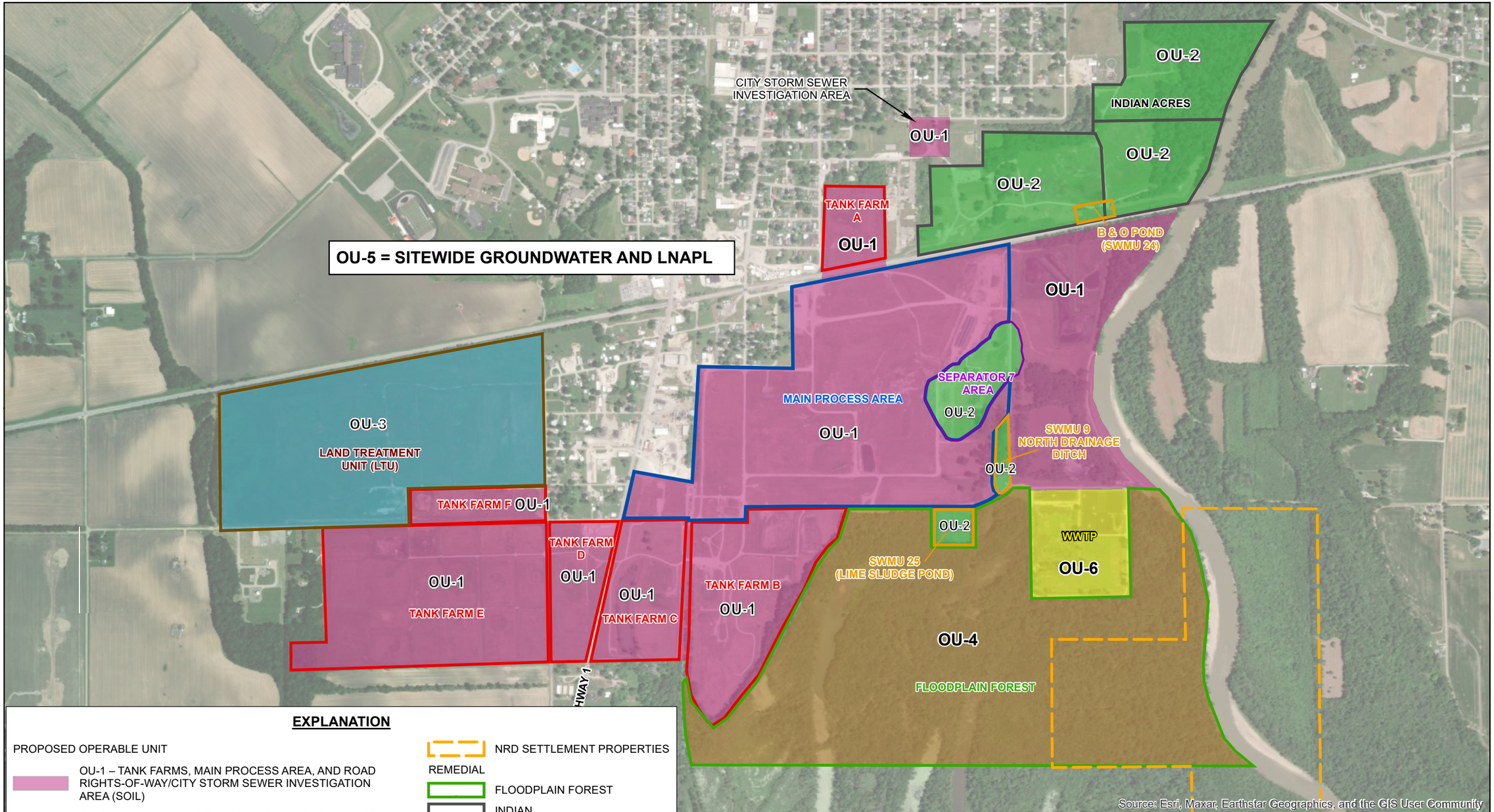
FIGURE 1

SITE LOCATION MAP

FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: MM	Scale:1 " = 0.5 Miles	Date: 12/2/21	File: Fig1-1_LvilleFS_SiteLoc.mxd

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2021 FS\FIG 1-1 LVILLEFS SITELOC.MXD



EXPLANATION

PROPOSED OPERABLE UNIT

- OU-1 – TANK FARMS, MAIN PROCESS AREA, AND ROAD RIGHTS-OF-WAY/CITY STORM SEWER INVESTIGATION AREA (SOIL)
- OU-2 – OILY SOIL AREAS, INDIAN ACRES, SEPARATOR 7 AREA (SOIL)
- OU-3 – LAND TREATMENT UNIT (SOIL)
- OU-4 – FLOODPLAIN FOREST (SOIL)
- OU-5 – LNAPL AND GROUNDWATER (SITE-WIDE, NO BOUNDARY SHOWN)
- OU-6 – WASTE WATER TREATMENT PONDS (REMAIN IN USE; TO BE ADDRESSED OUTSIDE OF THIS FS)

NRD SETTLEMENT PROPERTIES

REMEDIAL

- FLOODPLAIN FOREST
- INDIAN
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS
- OILY SOIL
- SEPARATOR 7
- TANK FARM

NRD = NATURAL RESOURCES DAMAGES
OU = OPERABLE UNIT
WWTP = WASTE WATER TREATMENT POND

N

0 1,000'

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FIGURE 2

PROPOSED OPERABLE UNITS

**FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS**

Drawn By: PH	Checked By: MM	Scale: 1 " = 1,000 '	Date: 5/25/23	File: Fig1_LvilleFS_RemAreasOUs.mxd

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2022_FS\VOL2_OU1_TMPA_OFFSITE\FIG1_LVILLEFS_REMAREASOUS.MXD

EXPLANATION

- INACCESSIBLE OR DESTROYED SAMPLE LOCATIONS (BORINGS NOT COMPLETED)
- VISUAL INSPECTION BORINGS
- DEEP SOIL BORINGS
- MONITORING WELLS
- REMEDIAL INVESTIGATION BORINGS
- REMEDIAL INVESTIGATION/RISK ASSESSMENT BORINGS
- REMEDIAL INVESTIGATION/GEOTECHNICAL BORINGS
- STREAM GAUGE
- TEST PITS
- SURFACE SOIL SAMPLES

N

0 250 500'

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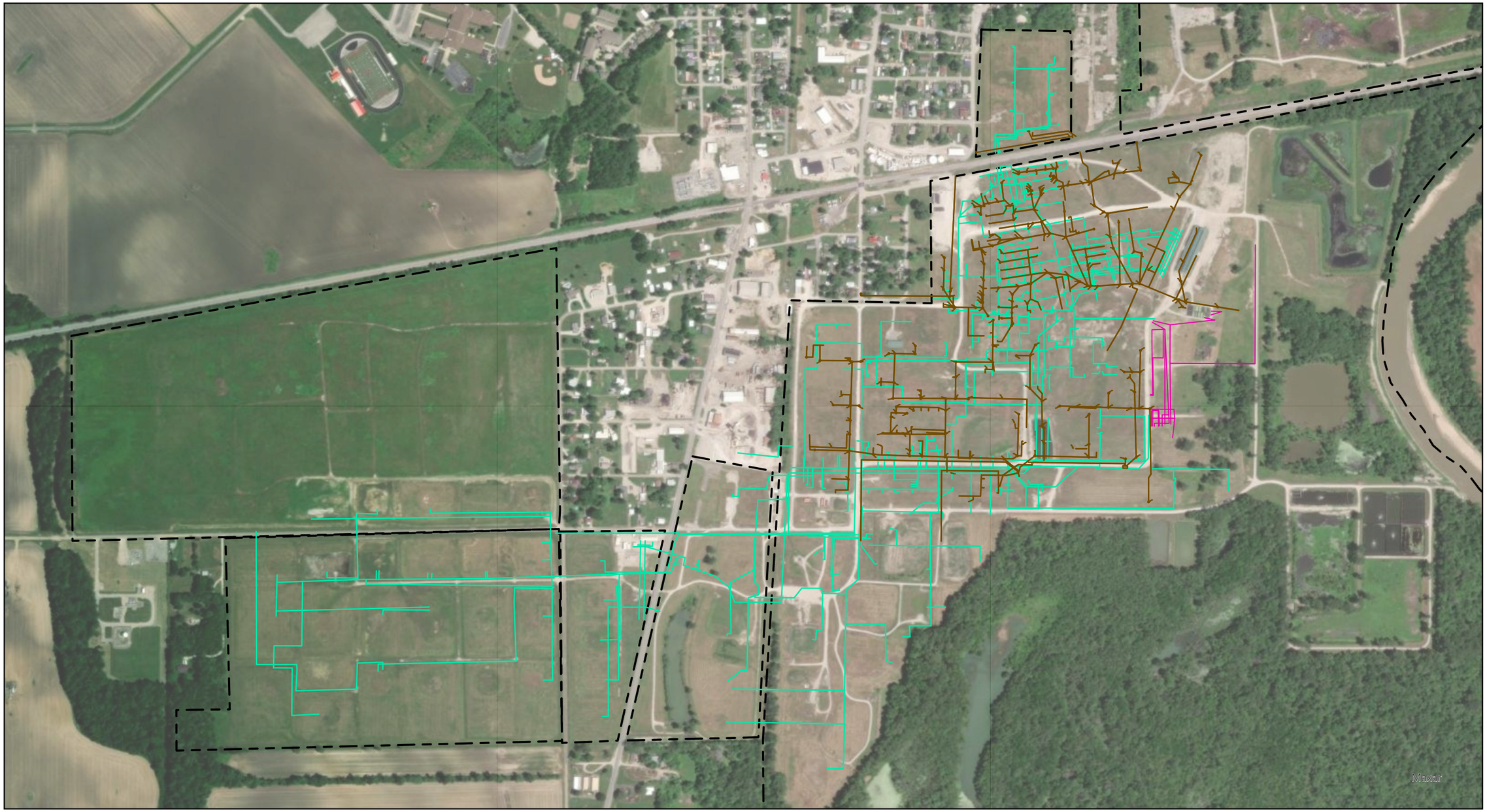
FIGURE 3

RI SAMPLE LOCATIONS

FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1 " = 250 '	Date: 12/15/23	File: Fig2-16_LvilleFS_RISamples.mxd



EXPLANATION

- SEWER LINES (2011 - 2013)
- UNDERGROUND PIPELINES/PIPE CORRIDORS (REMOVED 2022)
- UNDERGROUND PIPELINES/PIPE CORRIDORS (2008 - 2013)
- REFINERY BOUNDARY

N

0 850'

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FIGURE 4

SITE WIDE UNDERGROUND PIPING REMOVED DURING DECOMMISSIONING

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: CD	Scale: 1" = 850'	Date: 7/24/24	File: Fig1_SiteWidePiping

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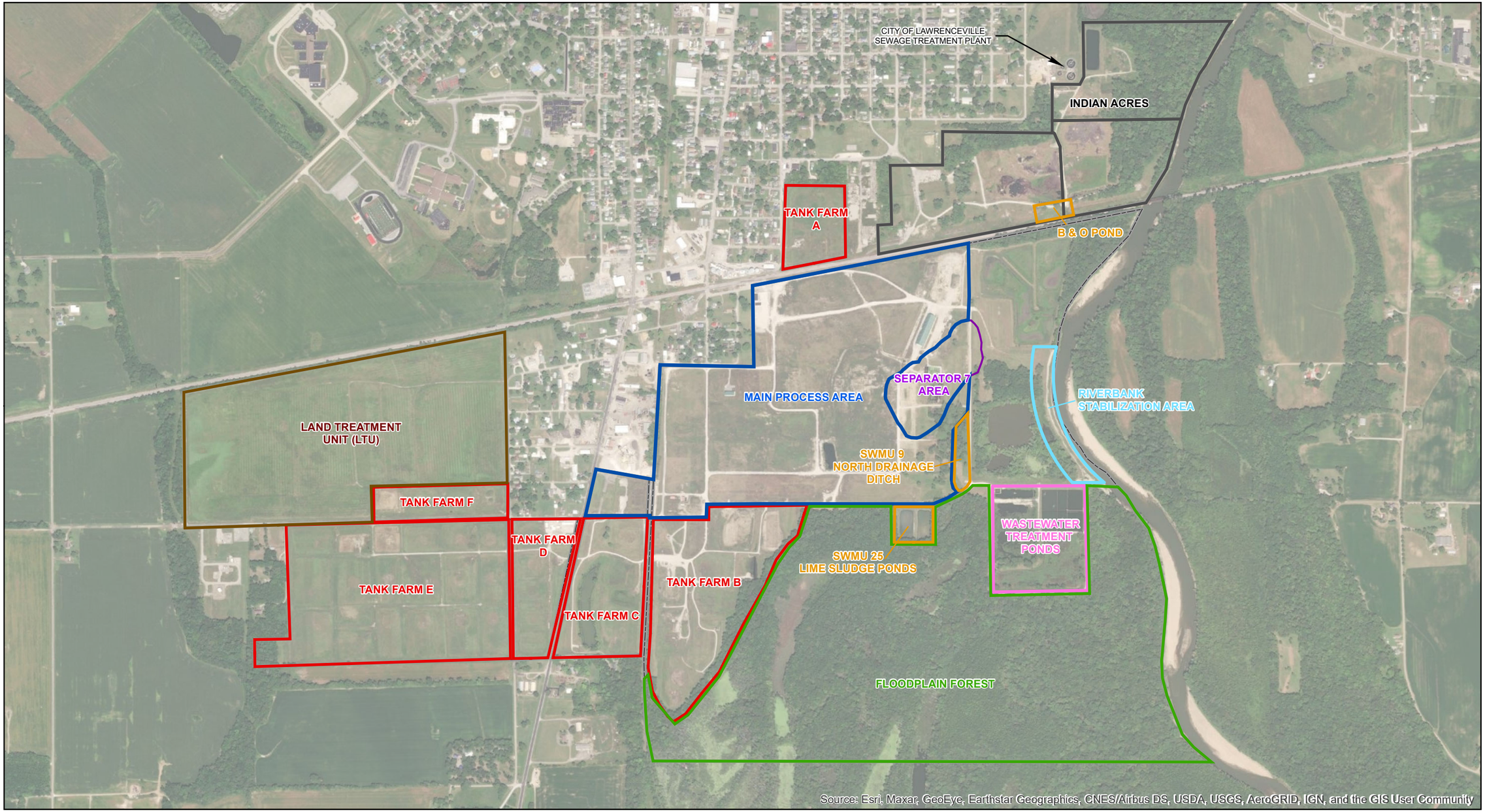

EXPLANATION

- FLOODPLAIN FOREST
- INDIAN ACRES
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS AREA
- OILY SOIL AREAS
- SEPARATOR 7 AREA
- TANK FARM
- WASTEWATER TREATMENT PONDS
- RIVERBANK STABILIZATION AREA
- FORMER REFINERY BOUNDARY

NOTE:

REMEDIAL AREA BOUNDARIES CORRECTED (3/2022)

N

0 1,000'

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FIGURE 5

MAJOR SITE FEATURES

**FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS**

Drawn By: PH	Checked By: MM	Scale: 1 " = 1,000 '	Date: 3/30/22	File: Fig1-2_LvilleFS_SiteFeat.mxd

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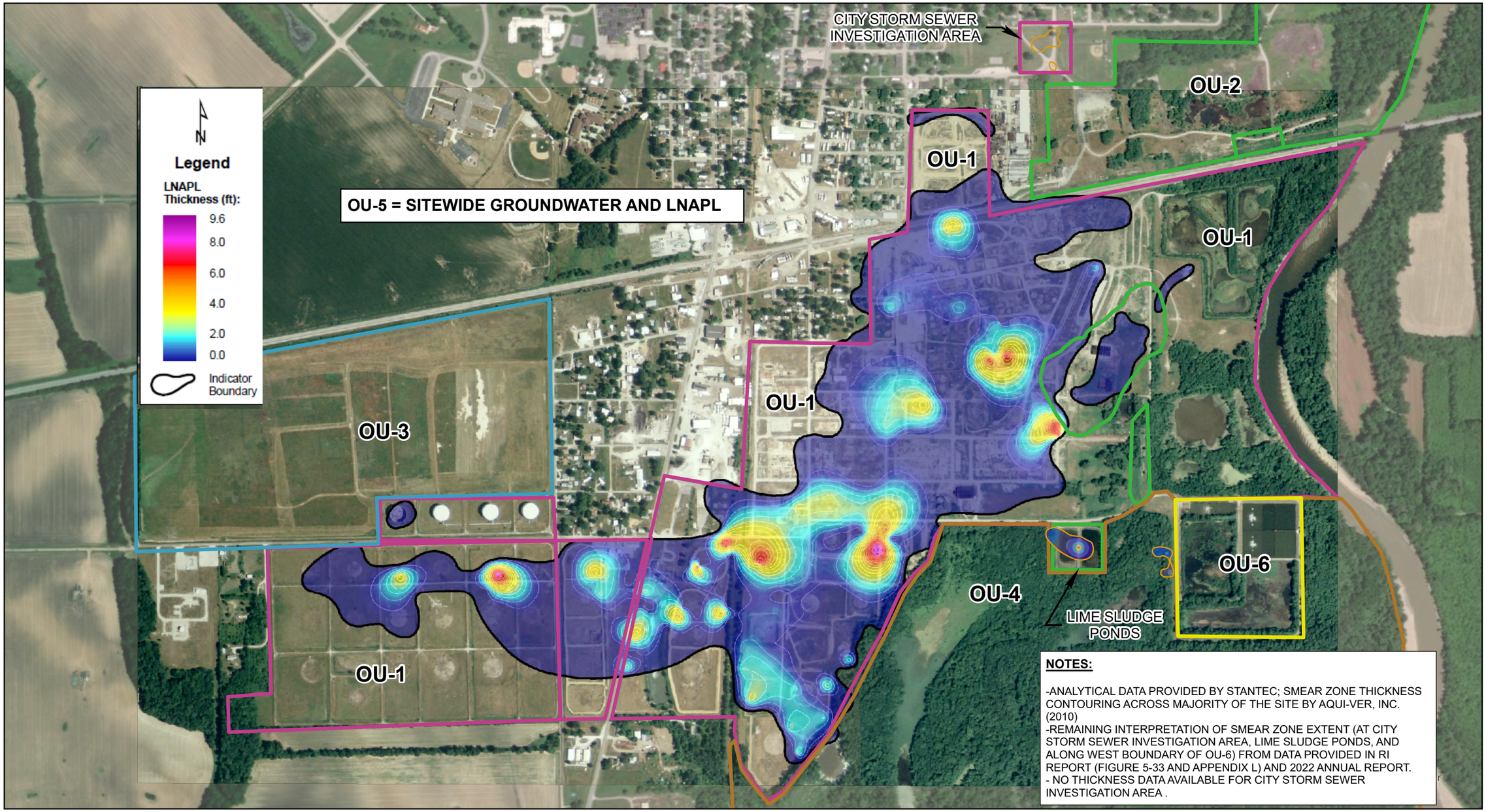

NOTES:

-ANALYTICAL DATA PROVIDED BY STANTEC; SMEAR ZONE THICKNESS CONTOURING ACROSS MAJORITY OF THE SITE BY AQUI-VER, INC. (2010)
-REMAINING INTERPRETATION OF SMEAR ZONE EXTENT (AT CITY STORM SEWER INVESTIGATION AREA, LIME SLUDGE PONDS, AND ALONG WEST BOUNDARY OF OU-6) FROM DATA PROVIDED IN RI REPORT (FIGURE 5-33 AND APPENDIX L) AND 2022 ANNUAL REPORT.
- NO THICKNESS DATA AVAILABLE FOR CITY STORM SEWER INVESTIGATION AREA .

EXPLANATION

- OU-1 – TANK FARMS, MAIN PROCESS AREA, AND ROAD RIGHTS-OF-WAY/CITY STORM SEWER INVESTIGATION AREA (SOIL)
- OU-2 – OILY SOIL AREAS, INDIAN ACRES, SEPARATOR 7 AREA (SOIL)
- OU-3 – LAND TREATMENT UNIT (SOIL)
- OU-4 – FLOODPLAIN FOREST (SOIL)
- OU-5 – LNAPL AND GROUNDWATER (SITE-WIDE, NO BOUNDARY SHOWN)
- OU-6 – WASTE WATER TREATMENT PONDS (REMAIN IN USE; TO BE ADDRESSED OUTSIDE OF THIS FS)
- ADDITIONAL PERIPHERAL SMEAR ZONE EXTENT PER 2023 EVALUATION OF RI DATA

N

0 775'

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FIGURE 6

MAXIMUM HISTORICAL IN-WELL LNAPL THICKNESS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1" = 775'	Date: 1/5/24	File: Figure2-35_LvilleFS_LNAPLThick

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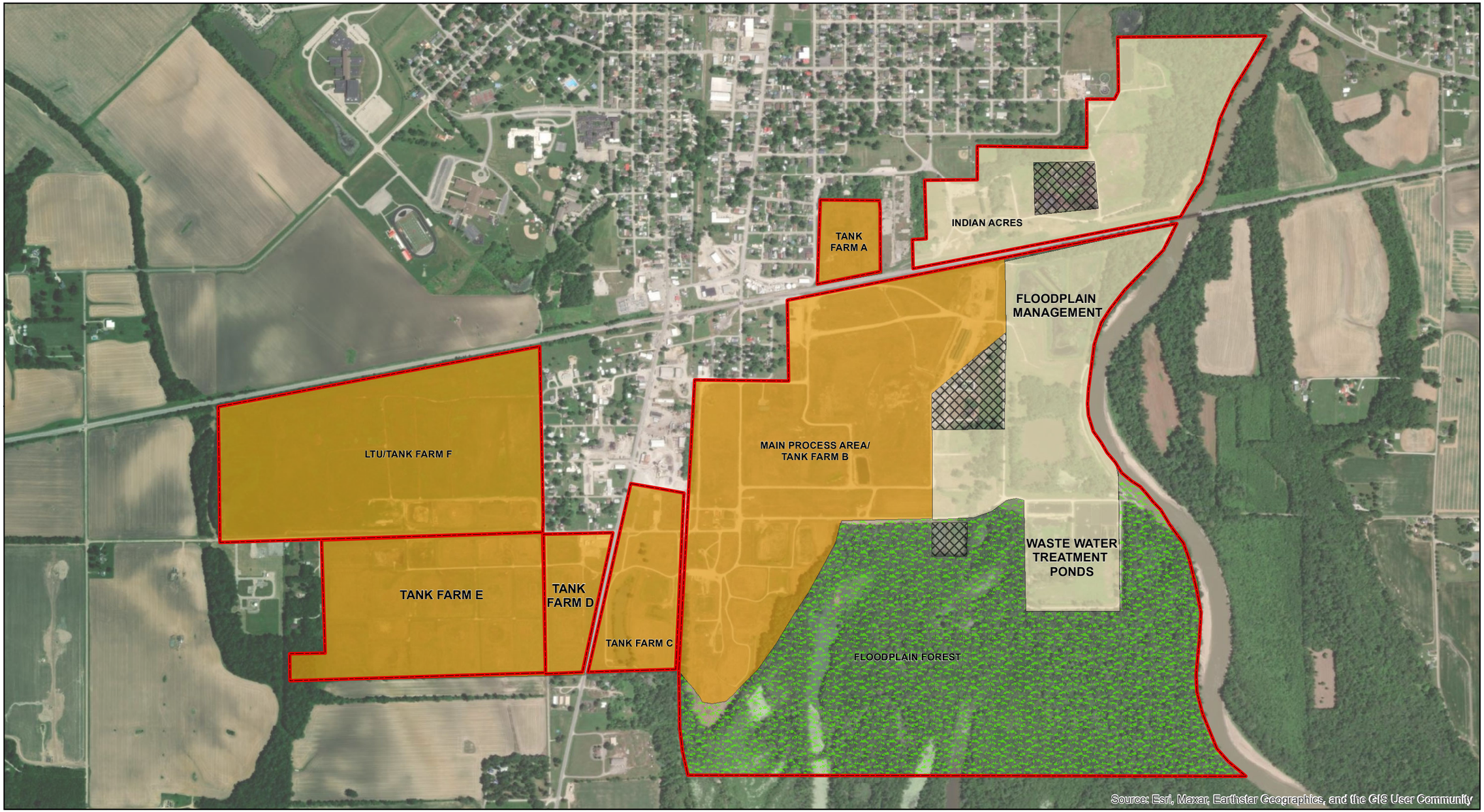

EXPLANATION

- FORMER REFINERY BOUNDARY
- IN PLACE WASTE MANAGEMENT
- LIGHT INDUSTRIAL - POTENTIAL RESALE
- LONG TERM FOREST MANAGEMENT
- LONG TERM MANAGEMENT

NOTE:

CURRENT END STATE VISION AS OF DECEMBER 2021.
SUBJECT TO CHANGE

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FIGURE 7

END STATE VISION

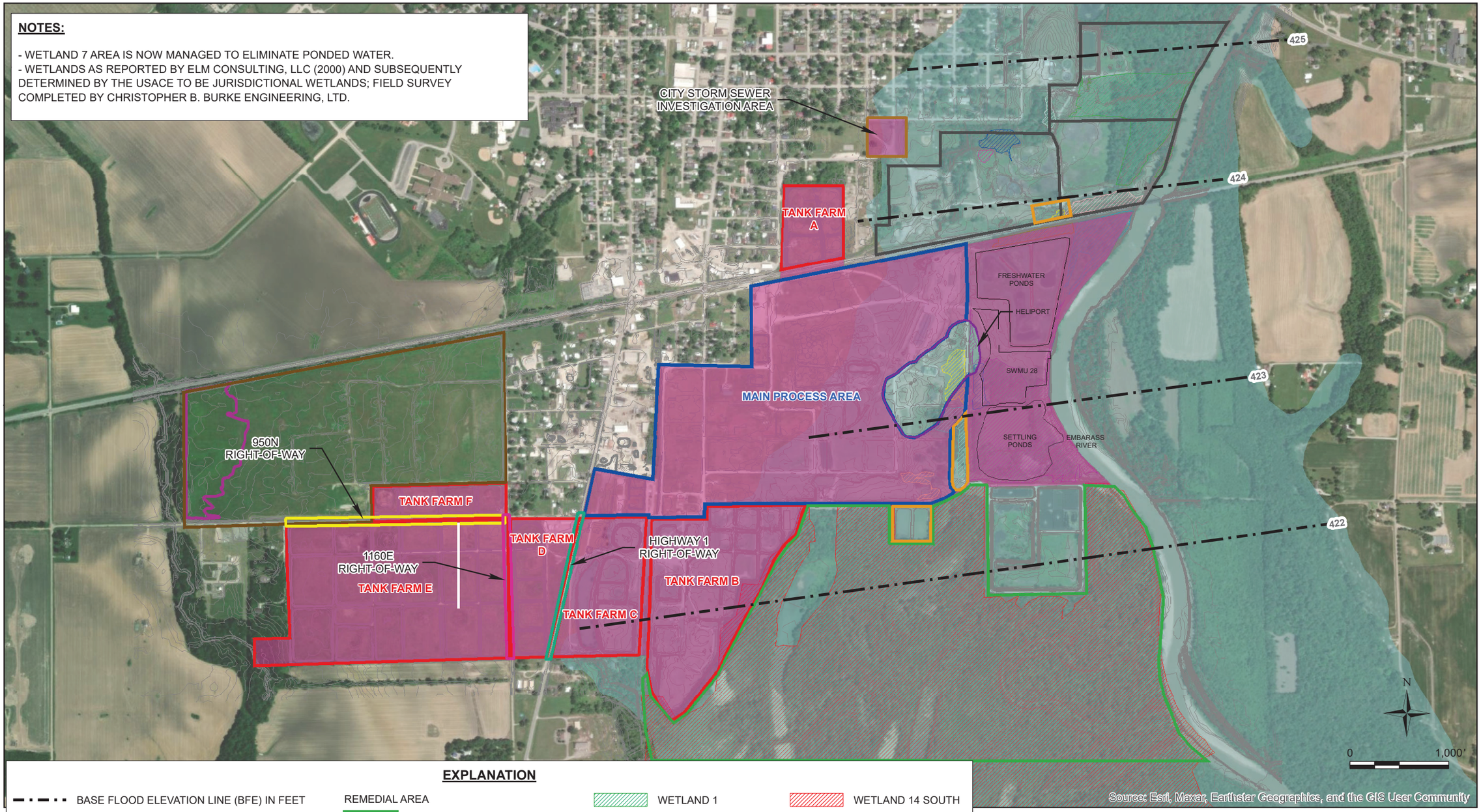
**FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS**

Drawn By: PH	Checked By: MM	Scale: 1 " = 1,000 '	Date: 11/16/23	File: Fig1-5_LvilleFS_EndStateVision.mxd

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2023_FS\2023_VOL1FIGURES\FIG1-5_LVILLEFS_ENDSTATEVISION.MXD

NOTES:

- WETLAND 7 AREA IS NOW MANAGED TO ELIMINATE PONDED WATER.
- WETLANDS AS REPORTED BY ELM CONSULTING, LLC (2000) AND SUBSEQUENTLY DETERMINED BY THE USACE TO BE JURISDICTIONAL WETLANDS; FIELD SURVEY COMPLETED BY CHRISTOPHER B. BURKE ENGINEERING, LTD.



EXPLANATION

- BASE FLOOD ELEVATION LINE (BFE) IN FEET
- 2003 GROUND SURFACE CONTOURS - 1 FT
- OU-1
- 950N RIGHT-OF-WAY
- 1160E RIGHT-OF-WAY
- CITY STORM SEWER INVESTIGATION AREA
- HIGHWAY 1 RIGHT-OF-WAY
- 100-YEAR FLOODPLAIN (FEMA, JULY 11, 2011)

REMEDIAL AREA

- FLOODPLAIN FOREST
- INDIAN ACRES
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS AREA
- SEPARATOR 7 AREA
- OILY SOIL AREA
- TANK FARM

- WETLAND 1
- WETLAND 2
- WETLAND 3
- WETLAND 4
- WETLAND 5
- WETLAND 6
- WETLAND 7
- WETLAND 14 EAST
- WETLAND 14 SOUTH
- WETLAND 14 UPLAND
- WETLAND 17
- WETLAND 18
- WETLAND 19
- WETLAND 20
- WETLAND 21

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2022_FS\VOL2_OU1_TPAPA_OFFSITE\FIG2_LVILLEFS_OU1FEATURES.MXD

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FIGURE 8

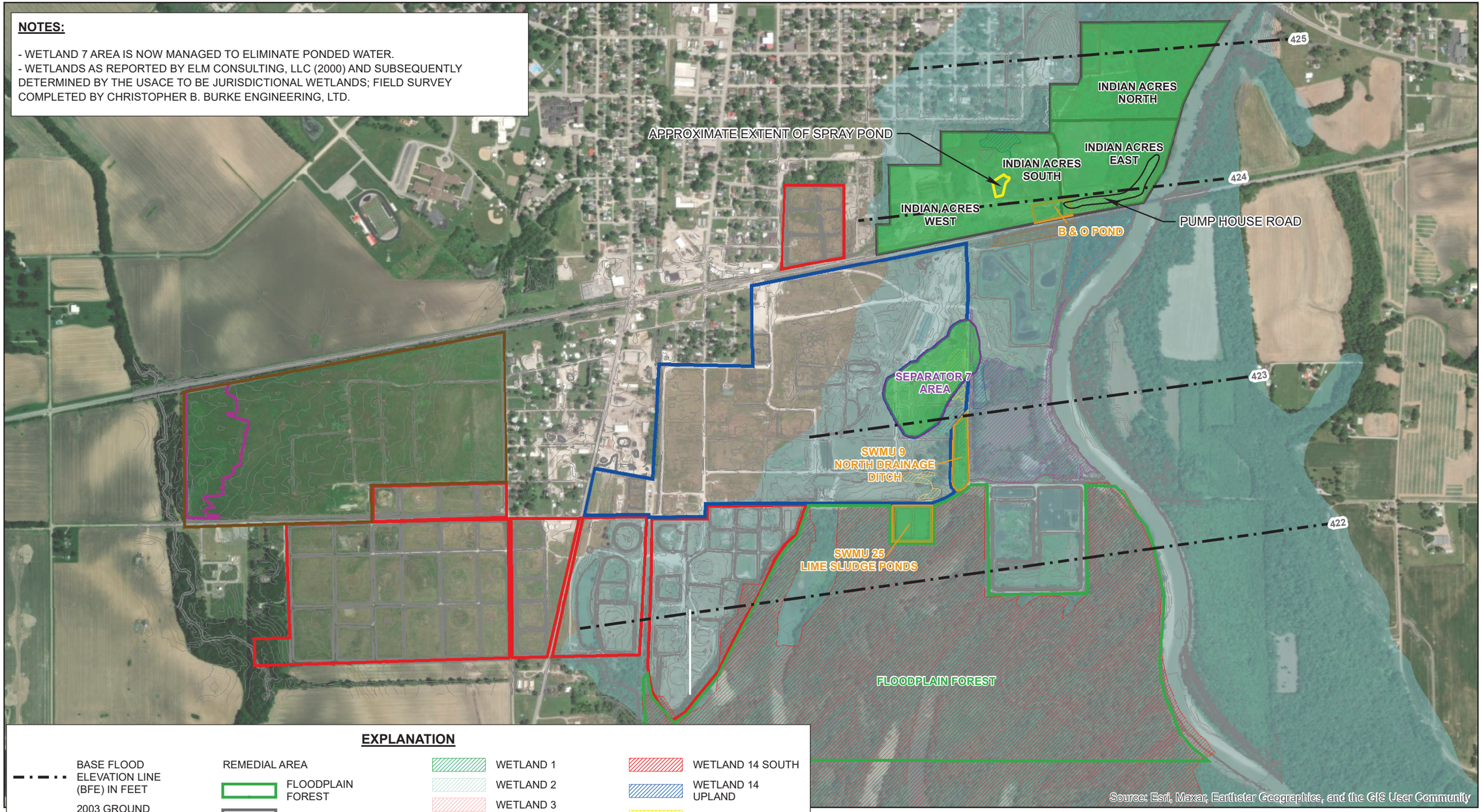
MAJOR OU-1 FEATURES

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JP	Scale: 1 " = 1,000 '	Date: 5/3/23	File: Fig2_LvilleFS_OU1Features.mxd

NOTES:

- WETLAND 7 AREA IS NOW MANAGED TO ELIMINATE PONDED WATER.
- WETLANDS AS REPORTED BY ELM CONSULTING, LLC (2000) AND SUBSEQUENTLY DETERMINED BY THE USACE TO BE JURISDICTIONAL WETLANDS; FIELD SURVEY COMPLETED BY CHRISTOPHER B. BURKE ENGINEERING, LTD.



EXPLANATION

- BASE FLOOD ELEVATION LINE (BFE) IN FEET
- 2003 GROUND SURFACE CONTOURS - 1 FT
- 100-YEAR FLOODPLAIN (FEMA, JULY 11, 2011)
- OU-2
- APPROXIMATE EXTENT OF SPRAY POND

REMEDIAL AREA

- FLOODPLAIN FOREST
- INDIAN ACRES
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS AREA
- SEPARATOR 7 AREA
- OILY SOIL AREA
- TANK FARM

- WETLAND 1
- WETLAND 2
- WETLAND 3
- WETLAND 4
- WETLAND 5
- WETLAND 6
- WETLAND 7
- WETLAND 14 EAST
- WETLAND 14 SOUTH
- WETLAND 14 UPLAND
- WETLAND 17
- WETLAND 18
- WETLAND 19
- WETLAND 20
- WETLAND 21

N

0 1,000'

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FIGURE 9

MAJOR OU-2 FEATURES

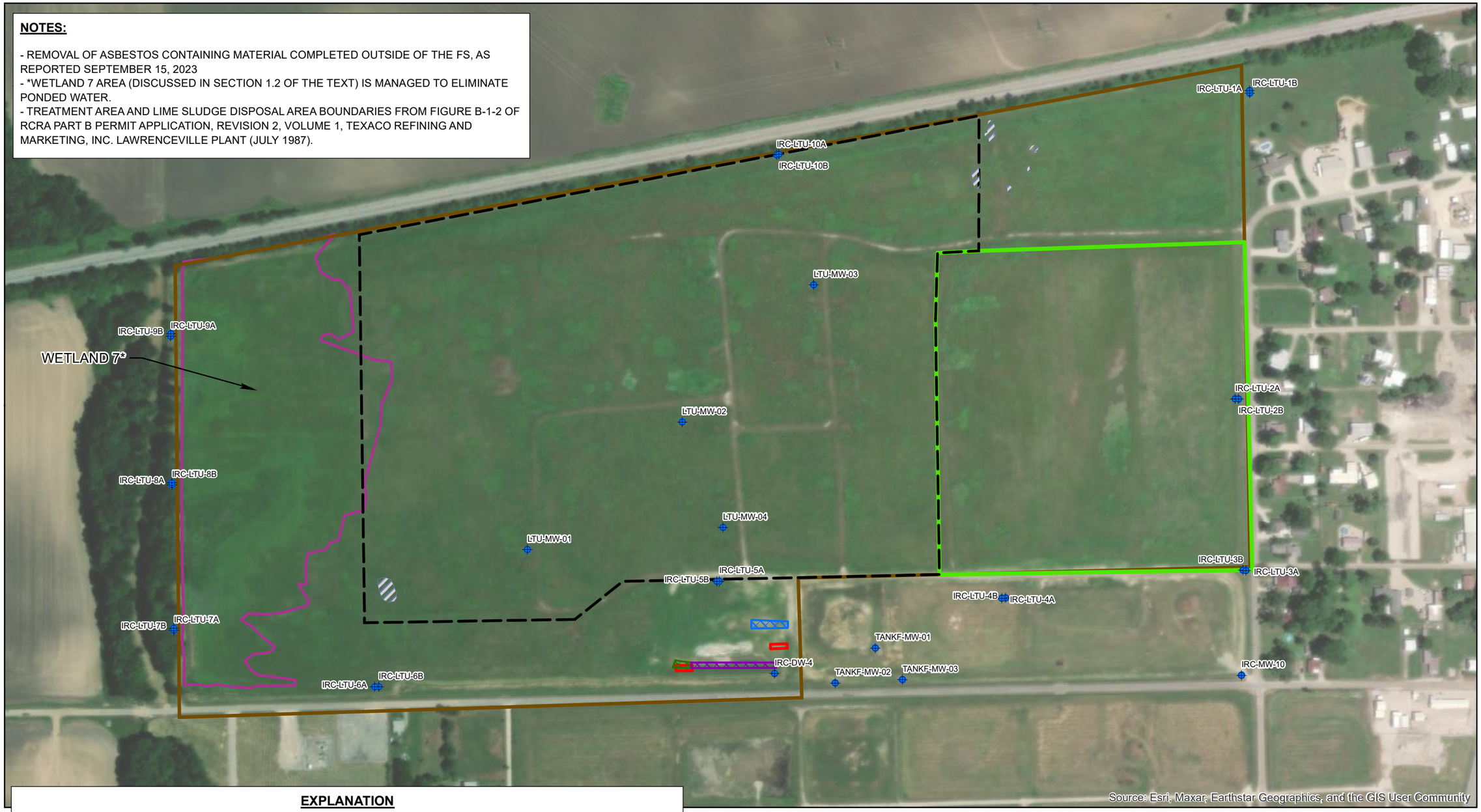
FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JP	Scale: 1 " = 1,000 '	Date: 10/24/23	File: Fig2_LvilleFS_OU2Features.mxd

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2023_FS\20210_REVISED_VOL3\FIG2_LVILLEFS_OU2FEATURES.MXD

NOTES:

- REMOVAL OF ASBESTOS CONTAINING MATERIAL COMPLETED OUTSIDE OF THE FS, AS REPORTED SEPTEMBER 15, 2023
- *WETLAND 7 AREA (DISCUSSED IN SECTION 1.2 OF THE TEXT) IS MANAGED TO ELIMINATE PONDED WATER.
- TREATMENT AREA AND LIME SLUDGE DISPOSAL AREA BOUNDARIES FROM FIGURE B-1-2 OF RCRA PART B PERMIT APPLICATION, REVISION 2, VOLUME 1, TEXACO REFINING AND MARKETING, INC. LAWRENCEVILLE PLANT (JULY 1987).



EXPLANATION

- MONITORING WELL
- OU-3 - LAND TREATMENT UNIT (LTU)
- LTU TREATMENT AREA
- LIME SLUDGE DISPOSAL AREA
- WETLAND 7
- ASPHALT DISPOSAL AREA

ASBESTOS CONTAINING MATERIAL REMOVAL PROJECT (COMPLETE)

- PIT 1
- PIT 2
- PIT 2 EXPANSION
- ESTIMATED PIT LOCATION (FROM HISTORICAL DOCUMENTS)

N

0 300'

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FIGURE 10

MAJOR OU-3 FEATURES

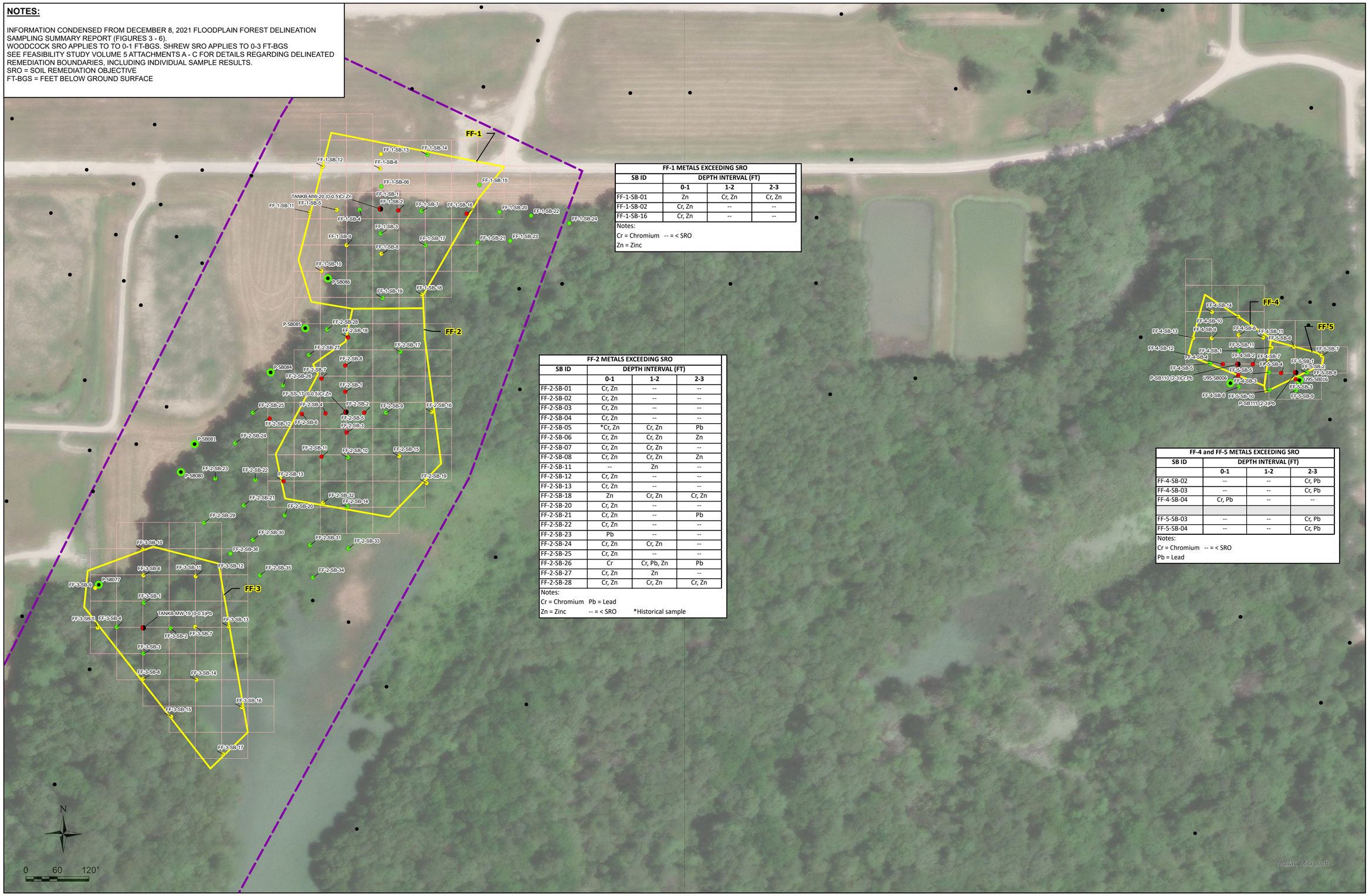
FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JP	Scale: 1 " = 300 '	Date: 12/12/23	File: Fig2_LvilleFS_OU2Features.mxd

M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2023_FS\202309_REV2_FS_V2\L4\FIG2_LVILLEFS_OU2FEATURES.MXD

NOTES:

INFORMATION CONDENSED FROM DECEMBER 8, 2021 FLOODPLAIN FOREST DELINEATION SAMPLING SUMMARY REPORT (FIGURES 3 - 6).
WOODCOCK SRO APPLIES TO TO 0-1 FT-BGS. SHREW SRO APPLIES TO 0-3 FT-BGS
SEE FEASIBILITY STUDY VOLUME 5 ATTACHMENTS A - C FOR DETAILS REGARDING DELINEATED REMEDIATION BOUNDARIES, INCLUDING INDIVIDUAL SAMPLE RESULTS.
SRO = SOIL REMEDIATION OBJECTIVE
FT-BGS = FEET BELOW GROUND SURFACE



FF-1 METALS EXCEEDING SRO

SB ID	DEPTH INTERVAL (FT)		
	0-1	1-2	2-3
FF-1-SB-01	Zn	Cr, Zn	Cr, Zn
FF-1-SB-02	Cr, Zn	--	--
FF-1-SB-16	Cr, Zn	--	--

Notes:
Cr = Chromium -- = < SRO
Zn = Zinc

FF-2 METALS EXCEEDING SRO

SB ID	DEPTH INTERVAL (FT)		
	0-1	1-2	2-3
FF-2-SB-01	Cr, Zn	--	--
FF-2-SB-02	Cr, Zn	--	--
FF-2-SB-03	Cr, Zn	--	--
FF-2-SB-04	Cr, Zn	--	--
FF-2-SB-05	*Cr, Zn	Cr, Zn	Pb
FF-2-SB-06	Cr, Zn	Cr, Zn	Zn
FF-2-SB-07	Cr, Zn	Cr, Zn	--
FF-2-SB-08	Cr, Zn	Cr, Zn	Zn
FF-2-SB-11	--	Zn	--
FF-2-SB-12	Cr, Zn	--	--
FF-2-SB-13	Cr, Zn	--	--
FF-2-SB-18	Zn	Cr, Zn	Cr, Zn
FF-2-SB-20	Cr, Zn	--	--
FF-2-SB-21	Cr, Zn	--	Pb
FF-2-SB-22	Cr, Zn	--	--
FF-2-SB-23	Pb	--	--
FF-2-SB-24	Cr, Zn	Cr, Zn	--
FF-2-SB-25	Cr, Zn	--	--
FF-2-SB-26	Cr	Cr, Pb, Zn	Pb
FF-2-SB-27	Cr, Zn	Zn	--
FF-2-SB-28	Cr, Zn	Cr, Zn	Cr, Zn

Notes:
Cr = Chromium Pb = Lead
Zn = Zinc -- = < SRO *Historical sample

FF-4 and FF-5 METALS EXCEEDING SRO

SB ID	DEPTH INTERVAL (FT)		
	0-1	1-2	2-3
FF-4-SB-02	--	--	Cr, Pb
FF-4-SB-03	--	--	Cr, Pb
FF-4-SB-04	Cr, Pb	--	--
FF-5-SB-03	--	--	Cr, Pb
FF-5-SB-04	--	--	Cr, Pb

Notes:
Cr = Chromium -- = < SRO
Pb = Lead

EXPLANATION

- BELOW SRO FOR ALL DEPTH INTERVALS
- EXCEEDED SRO FOR ONE OR MORE DEPTH INTERVALS
- NOT ANALYZED
- HISTORICAL RI SOIL BORING BELOW SRO
- HISTORICAL RI SOIL BORING BELOW SRO USED FOR DELINEATION
- HISTORICAL RI SOIL BORING LOCATION WITH DEPTH AND ANALYTE EXCEEDING SRO
- 50-FOOT DELINEATION GRID
- FOREST-GRASSLAND ECOTONE
- THIESSEN POLYGON BASED ON ORIGINAL REMEDIAL INVESTIGATION SAMPLING

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FIGURE 11

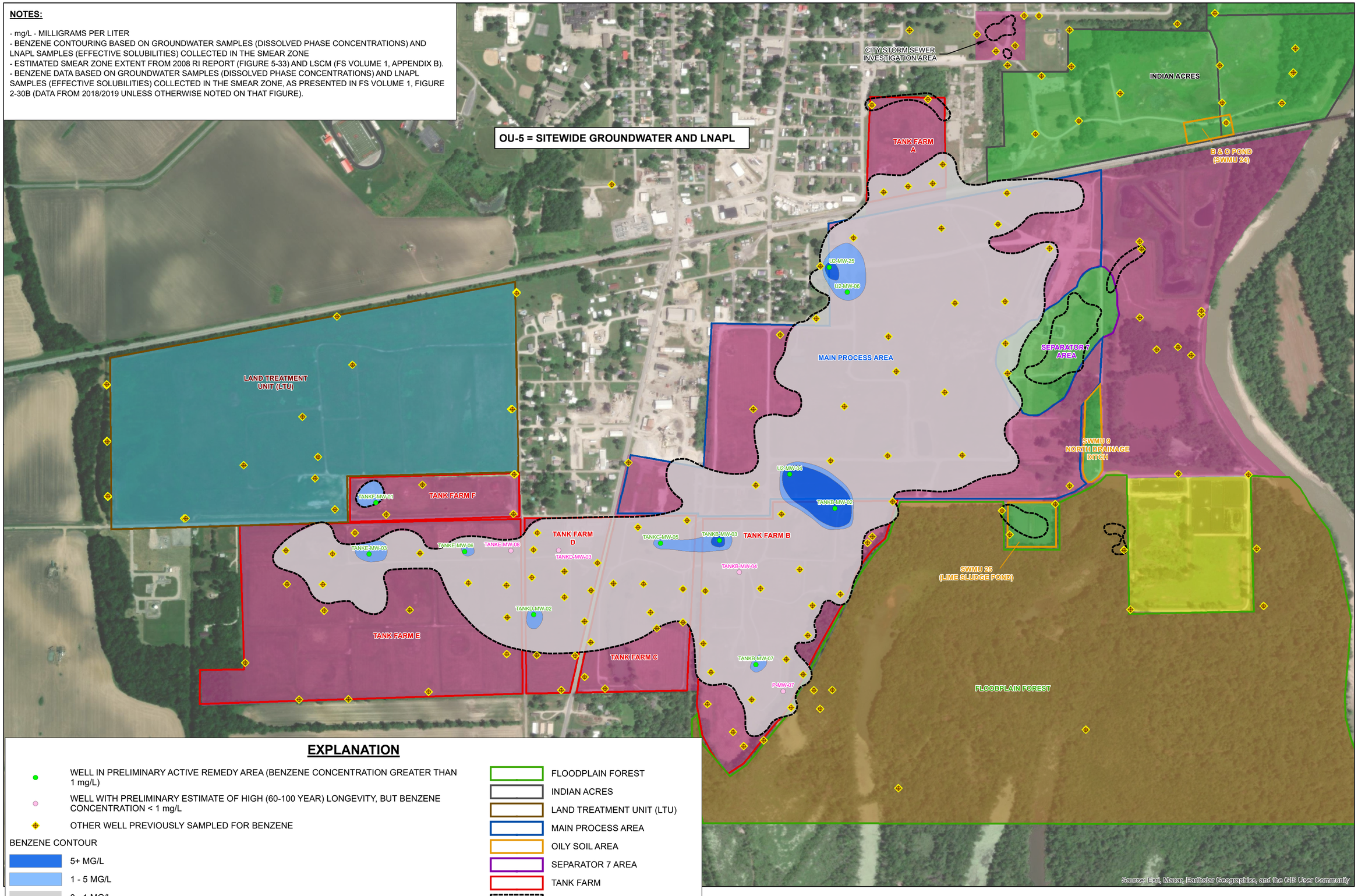
SOIL ASSESSMENT SAMPLE RESULTS OU-4 – FLOODPLAIN FOREST AREA

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By:	Checked By:	Scale:	Date:	File:
PH	KR	1" = 120'	8/29/23	2_SoilAssessment_SampleResults

NOTES:

- mg/L - MILLIGRAMS PER LITER
- BENZENE CONTOURING BASED ON GROUNDWATER SAMPLES (DISSOLVED PHASE CONCENTRATIONS) AND LNAPL SAMPLES (EFFECTIVE SOLUBILITIES) COLLECTED IN THE SMEAR ZONE
- ESTIMATED SMEAR ZONE EXTENT FROM 2008 RI REPORT (FIGURE 5-33) AND LSCM (FS VOLUME 1, APPENDIX B).
- BENZENE DATA BASED ON GROUNDWATER SAMPLES (DISSOLVED PHASE CONCENTRATIONS) AND LNAPL SAMPLES (EFFECTIVE SOLUBILITIES) COLLECTED IN THE SMEAR ZONE, AS PRESENTED IN FS VOLUME 1, FIGURE 2-30B (DATA FROM 2018/2019 UNLESS OTHERWISE NOTED ON THAT FIGURE).



EXPLANATION

- WELL IN PRELIMINARY ACTIVE REMEDY AREA (BENZENE CONCENTRATION GREATER THAN 1 mg/L)
- WELL WITH PRELIMINARY ESTIMATE OF HIGH (60-100 YEAR) LONGEVITY, BUT BENZENE CONCENTRATION < 1 mg/L
- OTHER WELL PREVIOUSLY SAMPLED FOR BENZENE

BENZENE CONTOUR

- 5+ MG/L
- 1 - 5 MG/L
- 0 - 1 MG/L
- OU-1 – TANK FARMS, MAIN PROCESS AREA, AND ROAD RIGHTS-OF-WAY/CITY STORM SEWER INVESTIGATION AREA (SOIL)
- OU-2 – OILY SOIL AREAS, INDIAN ACRES, SEPARATOR 7 AREA
- OU-3 – LAND TREATMENT UNIT (SOIL)
- OU-4 – FLOODPLAIN FOREST (SOIL)
- OU-5 – LNAPL AND GROUNDWATER (SITE-WIDE, NO BOUNDARY SHOWN)
- OU-6 – WASTE WATER TREATMENT PONDS (REMAIN IN USE; TO BE ADDRESSED OUTSIDE OF THIS FS)

- FLOODPLAIN FOREST
- INDIAN ACRES
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS AREA
- OILY SOIL AREA
- SEPARATOR 7 AREA
- TANK FARM
- ESTIMATED SMEAR ZONE EXTENT
- FORMER REFINERY BOUNDARY

N

0 250 500 '

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FIGURE 12

DISSOLVED-PHASE BENZENE CONCENTRATIONS AND PRELIMINARY LNAPL-2 ACTIVE REMEDY AREAS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: BLM	Checked By: KR	Scale: 1 " = 500 '	Date: 12/14/23	File: 4_LvilleFS_LNAPLRemAreas.mxd

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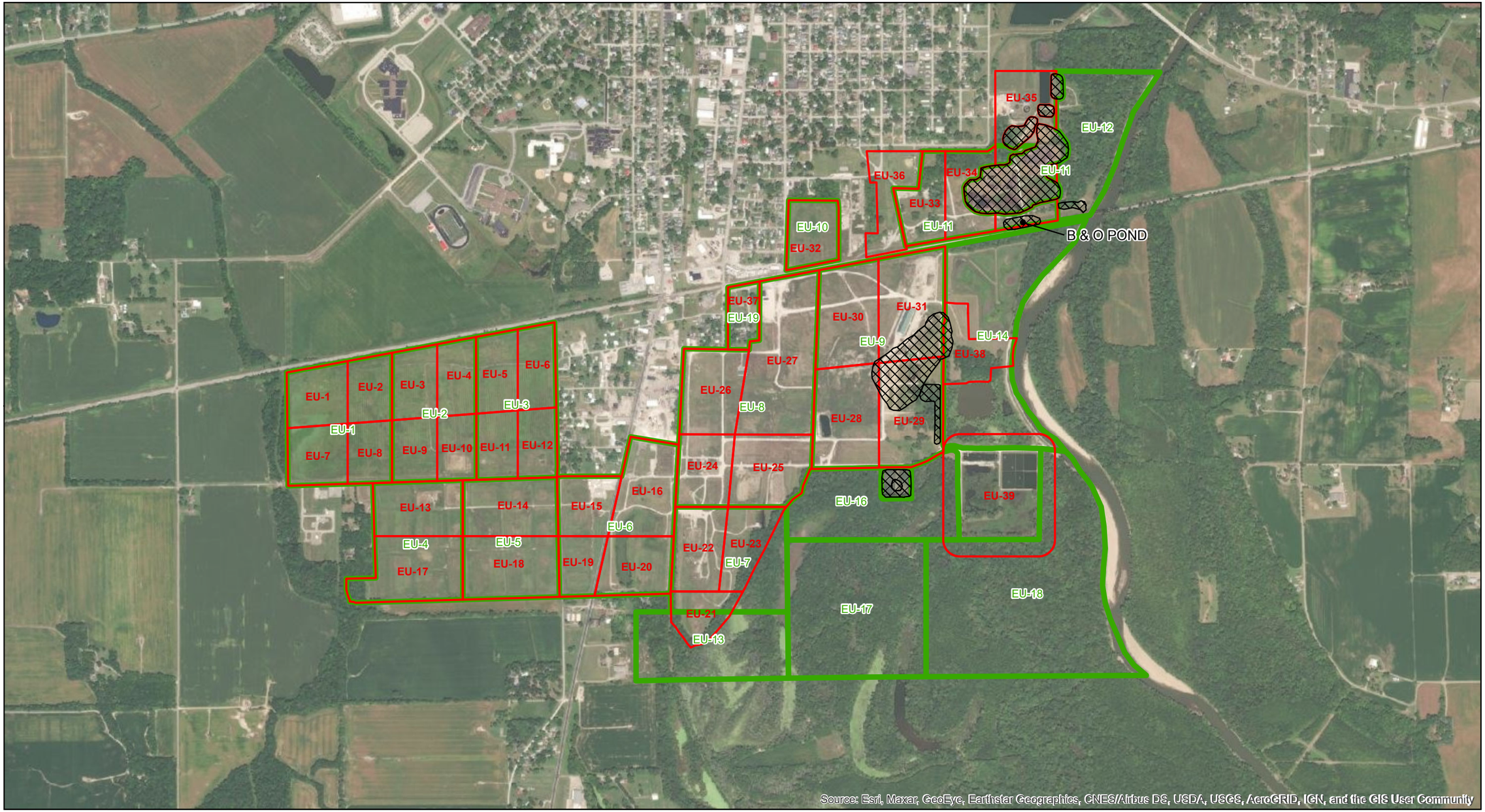

EXPLANATION

- ASSUMED REMEDIAL ACTION AREAS
- COMMERCIAL/INDUSTRIAL, MAINTENANCE, AND CONSTRUCTION WORKER EXPOSURE UNITS
- HUNTER/TRESPASSER EXPOSURE UNITS

N

0 1,200 '

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FIGURE 13

SITE MAP AND HUMAN HEALTH RISK ASSESSMENT EXPOSURE UNITS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JE	Scale: 1 " = 1,200 '	Date: 3/31/22	File: Fig3-2_LvilleFS_SiteEUs.mxd

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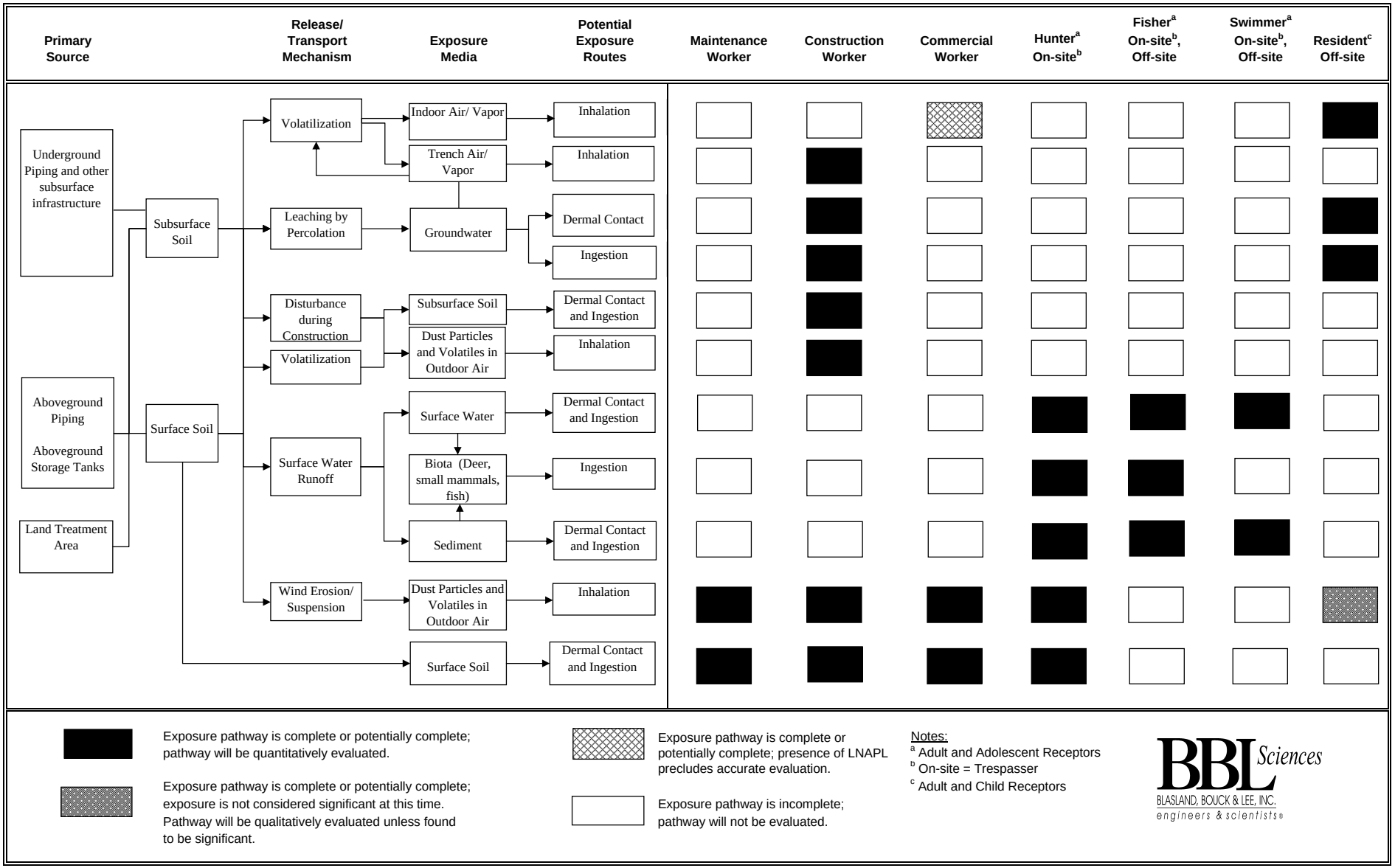
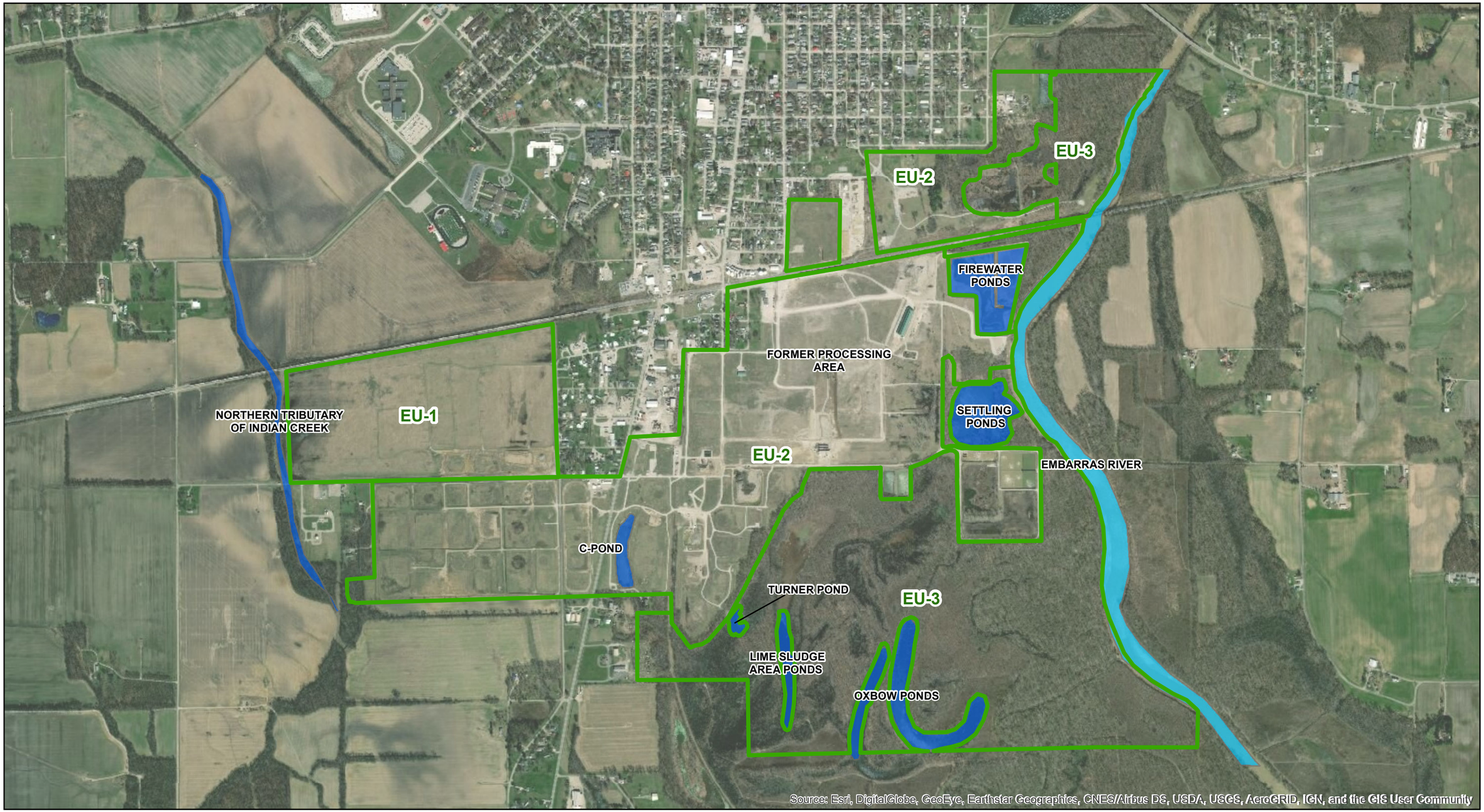
Figure **14**. Human Health Conceptual Site Model
Baseline Human Health Risk Assessment Former
Indian Refinery
Lawrenceville, Illinois





EXPLANATION

- EU-4
- EU-5
- ECOLOGICAL EXPOSURE UNIT (EU) BOUNDARY

N

0 1,200 '

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FIGURE 15

ECOLOGICAL RISK ASSESSMENT EXPOSURE UNITS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JE	Scale: 1 " = 1,200 '	Date: 9/12/19	File: Fig3-3_LvilleFS_SiteEUs.mxd

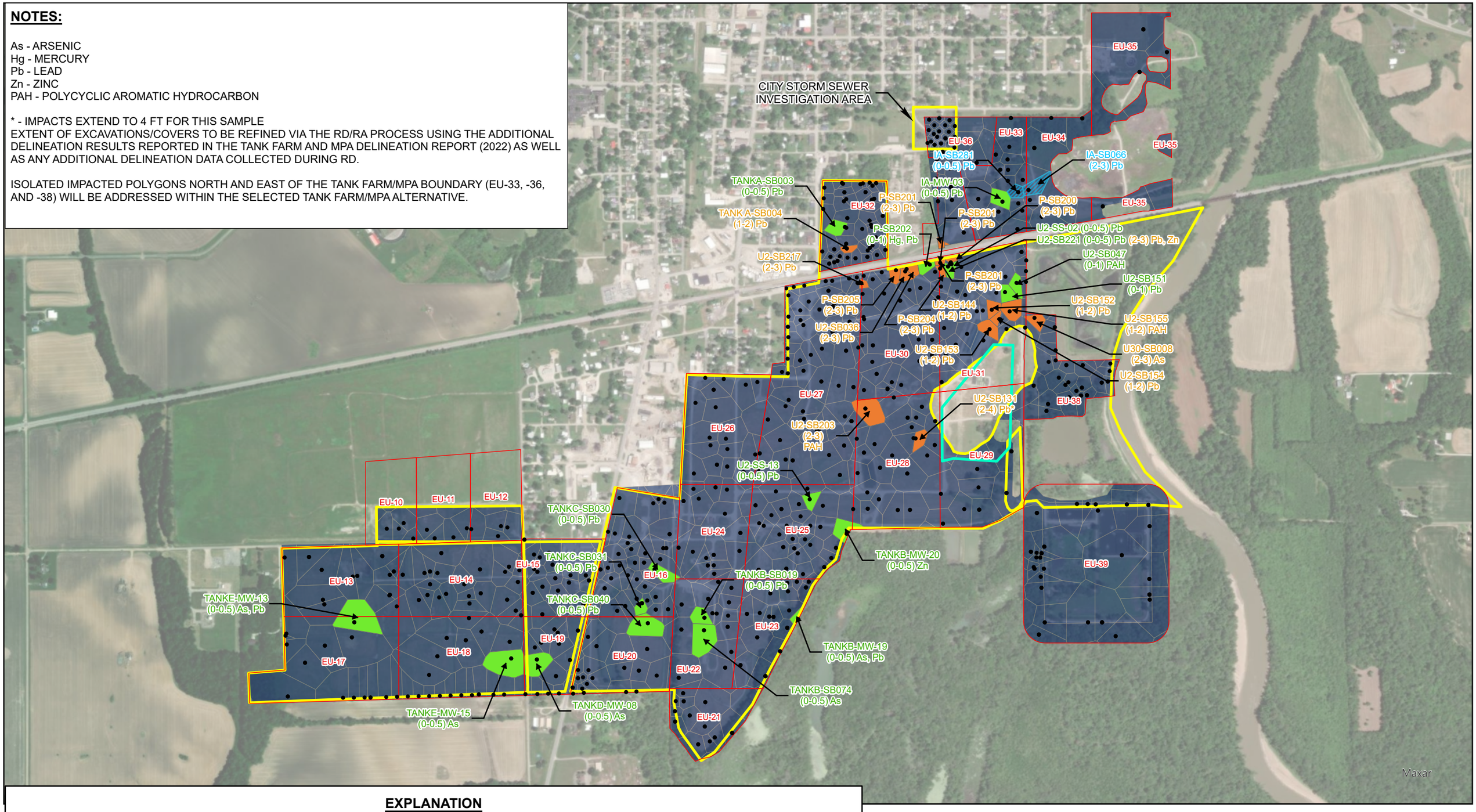
M:\CHEVRON\LAWRENCEVILLE\GIS\PROJECTS\2019_FS\FS_FINAL\FIG3-3_LVILLEFS_SITEEUS.MXD

NOTES:

As - ARSENIC
Hg - MERCURY
Pb - LEAD
Zn - ZINC
PAH - POLYCYCLIC AROMATIC HYDROCARBON

* - IMPACTS EXTEND TO 4 FT FOR THIS SAMPLE
EXTENT OF EXCAVATIONS/COVERS TO BE REFINED VIA THE RD/RA PROCESS USING THE ADDITIONAL DELINEATION RESULTS REPORTED IN THE TANK FARM AND MPA DELINEATION REPORT (2022) AS WELL AS ANY ADDITIONAL DELINEATION DATA COLLECTED DURING RD.

ISOLATED IMPACTED POLYGONS NORTH AND EAST OF THE TANK FARM/MPA BOUNDARY (EU-33, -36, AND -38) WILL BE ADDRESSED WITHIN THE SELECTED TANK FARM/MPA ALTERNATIVE.



EXPLANATION

- SAMPLE LOCATION
- HUMAN HEALTH EXPOSURE UNIT
- CONSOLIDATION CELL (OU-2)

PROPOSED OPERABLE UNIT

- OU-1
- NO EXCEEDANCE
- EXCEEDANCE IN 0-1 FT (TO BE EXCAVATED UNDER ALTERNATIVE 2A; TO BE COVERED/VEGETATED UNDER ALTERNATIVES 3A AND 3B)
- EXCEEDANCE IN 1-3 FT (TO BE EXCAVATED UNDER ALTERNATIVE 2A; TO BE COVERED/VEGETATED UNDER ALTERNATIVE 3A)
- EXCEEDANCE TO BE ADDRESSED AS PART OF INDIAN ACRES REMEDY

N

0 900'

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FIGURE 16

AREAS EXCEEDING PAH OR METALS SROs IN THE MAIN PROCESS AND TANK FARM AREAS AND APPROXIMATE PAH AND METALS REMEDY BOUNDARIES

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1" = 918'	Date: 8/14/24	File: Fig7A_LvilleFS_PAHMetalsRev

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NOTES:
CUMULATIVE RISK RATIO (CRR) BASED ON THE RATIO OF SOIL CONCENTRATION TO APPLICABLE SOIL REMEDIATION OBJECTIVE (SRO) SUMMED ACROSS DETECTED LNAPL COMPONENTS BENZENE, ETHYLBENZENE AND NAPHTHALENE. SEE SRO TABLE.

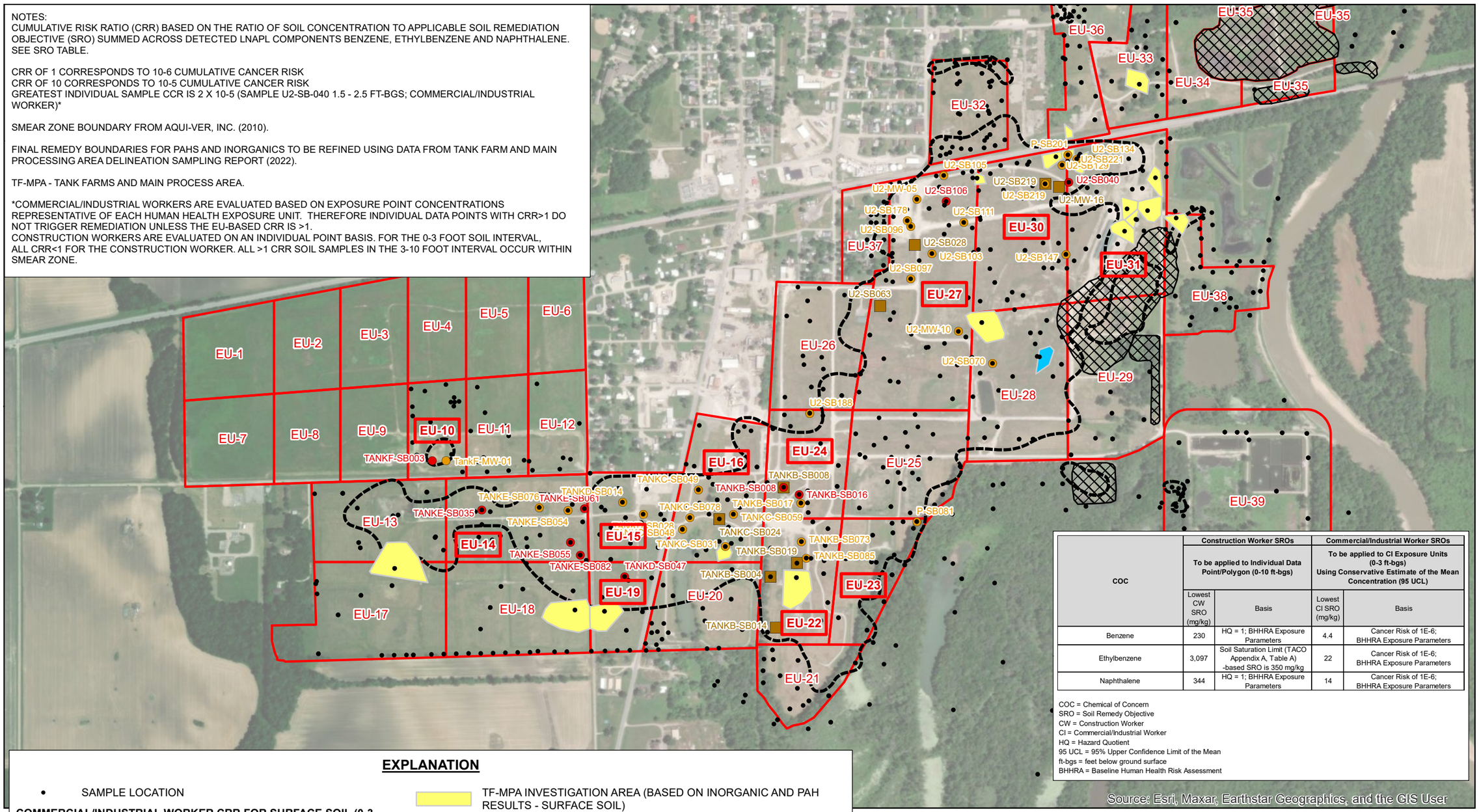
CRR OF 1 CORRESPONDS TO 10-6 CUMULATIVE CANCER RISK
CRR OF 10 CORRESPONDS TO 10-5 CUMULATIVE CANCER RISK
GREATEST INDIVIDUAL SAMPLE CCR IS 2 X 10-5 (SAMPLE U2-SB-040 1.5 - 2.5 FT-BGS; COMMERCIAL/INDUSTRIAL WORKER)*

SMEAR ZONE BOUNDARY FROM AQUI-VER, INC. (2010).

FINAL REMEDY BOUNDARIES FOR PAHS AND INORGANICS TO BE REFINED USING DATA FROM TANK FARM AND MAIN PROCESSING AREA DELINEATION SAMPLING REPORT (2022).

TF-MPA - TANK FARMS AND MAIN PROCESS AREA.

*COMMERCIAL/INDUSTRIAL WORKERS ARE EVALUATED BASED ON EXPOSURE POINT CONCENTRATIONS REPRESENTATIVE OF EACH HUMAN HEALTH EXPOSURE UNIT. THEREFORE INDIVIDUAL DATA POINTS WITH CRR>1 DO NOT TRIGGER REMEDIATION UNLESS THE EU-BASED CRR IS >1.
CONSTRUCTION WORKERS ARE EVALUATED ON AN INDIVIDUAL POINT BASIS. FOR THE 0-3 FOOT SOIL INTERVAL, ALL CRR<1 FOR THE CONSTRUCTION WORKER. ALL >1 CRR SOIL SAMPLES IN THE 3-10 FOOT INTERVAL OCCUR WITHIN SMEAR ZONE.



COC	Construction Worker SROs		Commercial/Industrial Worker SROs	
	To be applied to Individual Data Point/Polygon (0-10 ft-bgs)		To be applied to CI Exposure Units (0-3 ft-bgs) Using Conservative Estimate of the Mean Concentration (95 UCL)	
	Lowest CW SRO (mg/kg)	Basis	Lowest CI SRO (mg/kg)	Basis
Benzene	230	HQ = 1; BHHRA Exposure Parameters	4.4	Cancer Risk of 1E-6; BHHRA Exposure Parameters
Ethylbenzene	3,097	Soil Saturation Limit (TACO Appendix A, Table A) -based SRO is 350 mg/kg	22	Cancer Risk of 1E-6; BHHRA Exposure Parameters
Naphthalene	344	HQ = 1; BHHRA Exposure Parameters	14	Cancer Risk of 1E-6; BHHRA Exposure Parameters

COC = Chemical of Concern
SRO = Soil Remedy Objective
CW = Construction Worker
CI = Commercial/Industrial Worker
HQ = Hazard Quotient
95 UCL = 95% Upper Confidence Limit of the Mean
ft-bgs = feet below ground surface
BHHRA = Baseline Human Health Risk Assessment

Source: Esri, Maxar, Earthstar Geographics, and the GIS User

EXPLANATION

- SAMPLE LOCATION

COMMERCIAL/INDUSTRIAL WORKER CRR FOR SURFACE SOIL (0-3 FT-BGS)

- CRR > 1
- CRR > 10

CONSTRUCTION WORKER CRR FOR SUBSURFACE SOIL (DEEPER THAN 3 FT-FT BGS)

- CRR > 1

- TF-MPA INVESTIGATION AREA (BASED ON INORGANIC AND PAH RESULTS - SURFACE SOIL)
- TF-MPA INVESTIGATION AREA (BASED ON LEAD IMPACTS TO 4 FT-BGS [U2-SB131 (3-4)]; SEE FS VOLUME 1, APPENDIX C-1, TABLE 14)
- PRESUMPTIVE REMEDY AREA
- ESTIMATED SMEAR ZONE EXTENT
- HUMAN HEALTH EXPOSURE UNIT BOUNDARY (COMMERCIAL / INDUSTRIAL WORKER). BOXED AND BOLDED FOR EUs EXCEEDING CRR.

N

0 800'

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FIGURE 17

VOC CUMULATIVE RISK RATIOS IN THE MAIN PROCESS AND TANK FARM AREAS SHOWN WITH PAH AND METAL DELINEATION AREAS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1 " = 800 '	Date: 8/14/23	File: 8_LvilleFS_VOCLNAPL.mxd

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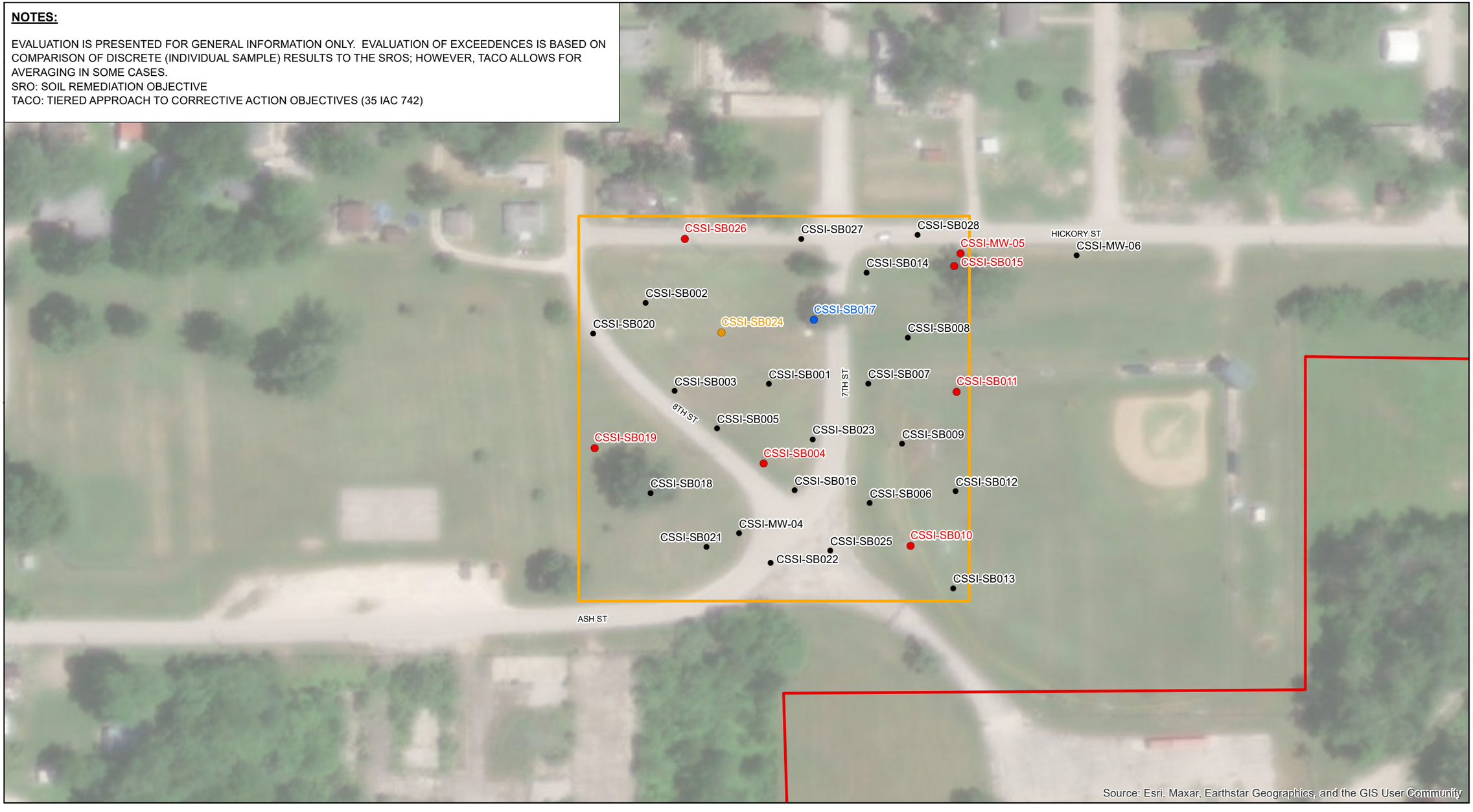
NOTES:

EVALUATION IS PRESENTED FOR GENERAL INFORMATION ONLY. EVALUATION OF EXCEEDENCES IS BASED ON COMPARISON OF DISCRETE (INDIVIDUAL SAMPLE) RESULTS TO THE SROS; HOWEVER, TACO ALLOWS FOR AVERAGING IN SOME CASES.
SRO: SOIL REMEDIATION OBJECTIVE
TACO: TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (35 IAC 742)



EXPLANATION

- SAMPLE LOCATION
- EXCEEDS CONSTRUCTION WORKER TACO TIER 1 SRO
- EXCEEDS RESIDENTIAL TACO TIER 1 SRO
- EXCEEDS BOTH CCONSTRUCTION WORKER AND RESIDENTIAL TACO TIER 1 SRO
- CITY STORM SEWER INVESTIGATION AREA
- FORMER REFINERY BOUNDARY

N

0 100'

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FIGURE 18

SOIL ASSESSMENT SUMMARY
CITY STORM SEWER INVESTIGATION AREA

FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JW	Scale: 1 " = 100 '	Date: 4/20/23	File: 11_LvilleFS_CitySAS.mxd

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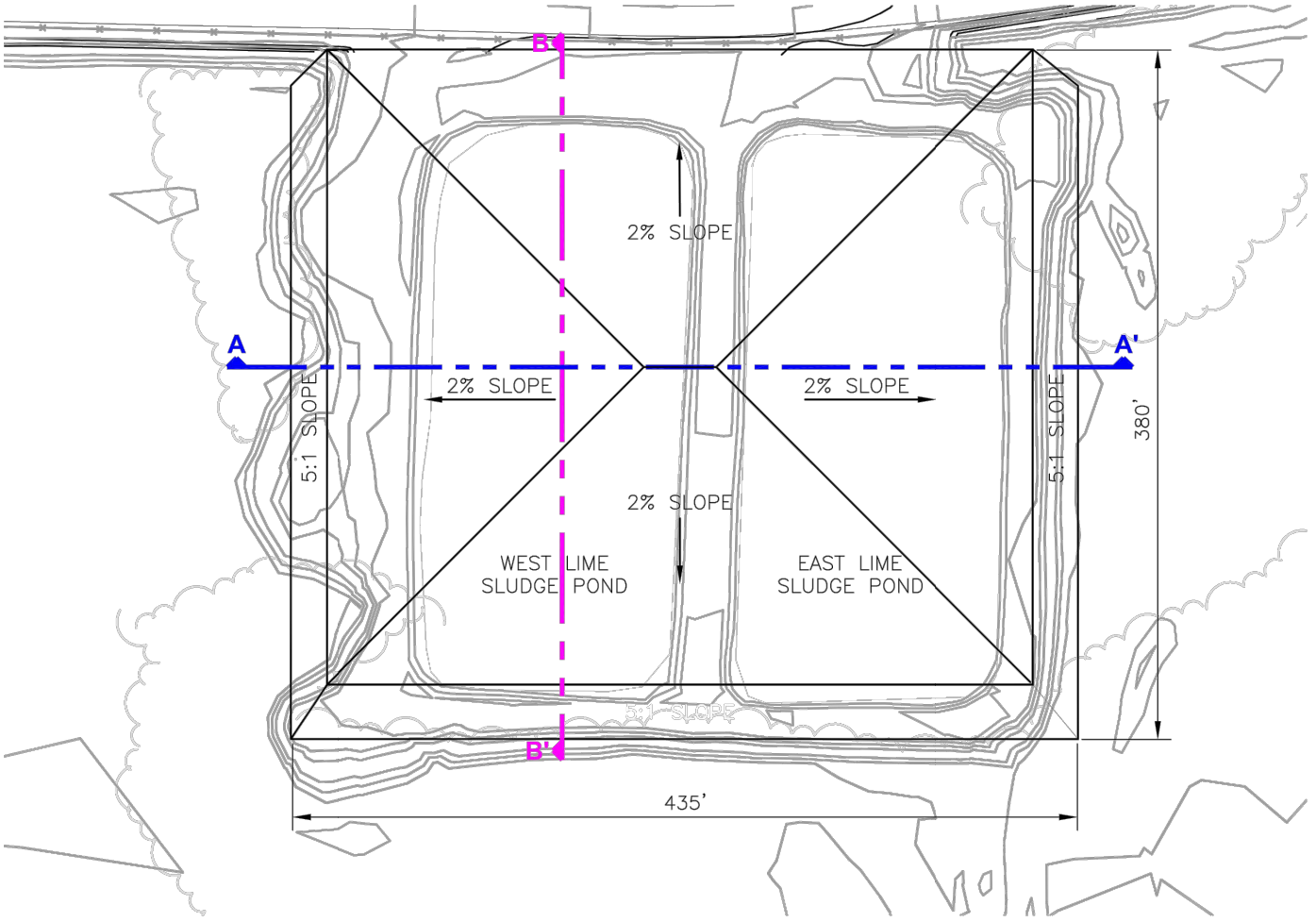

Source: Original drawing prepared by Stantec.

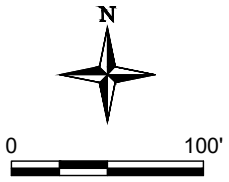

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FIGURE 19

OILY SOIL AREAS, ALTERNATIVE OSA-4 LIME SLUDGE POND CONCEPTUAL CAP PLAN VIEW

FORMER INDIAN REFINERY
LAWRENCE COUNTY, ILLINOIS

Drawn By: JLP	Checked By: KR	Scale: 1" = 100'	Date: 10/11/2023	File: 339_FS-LSPONDPLAN-202310

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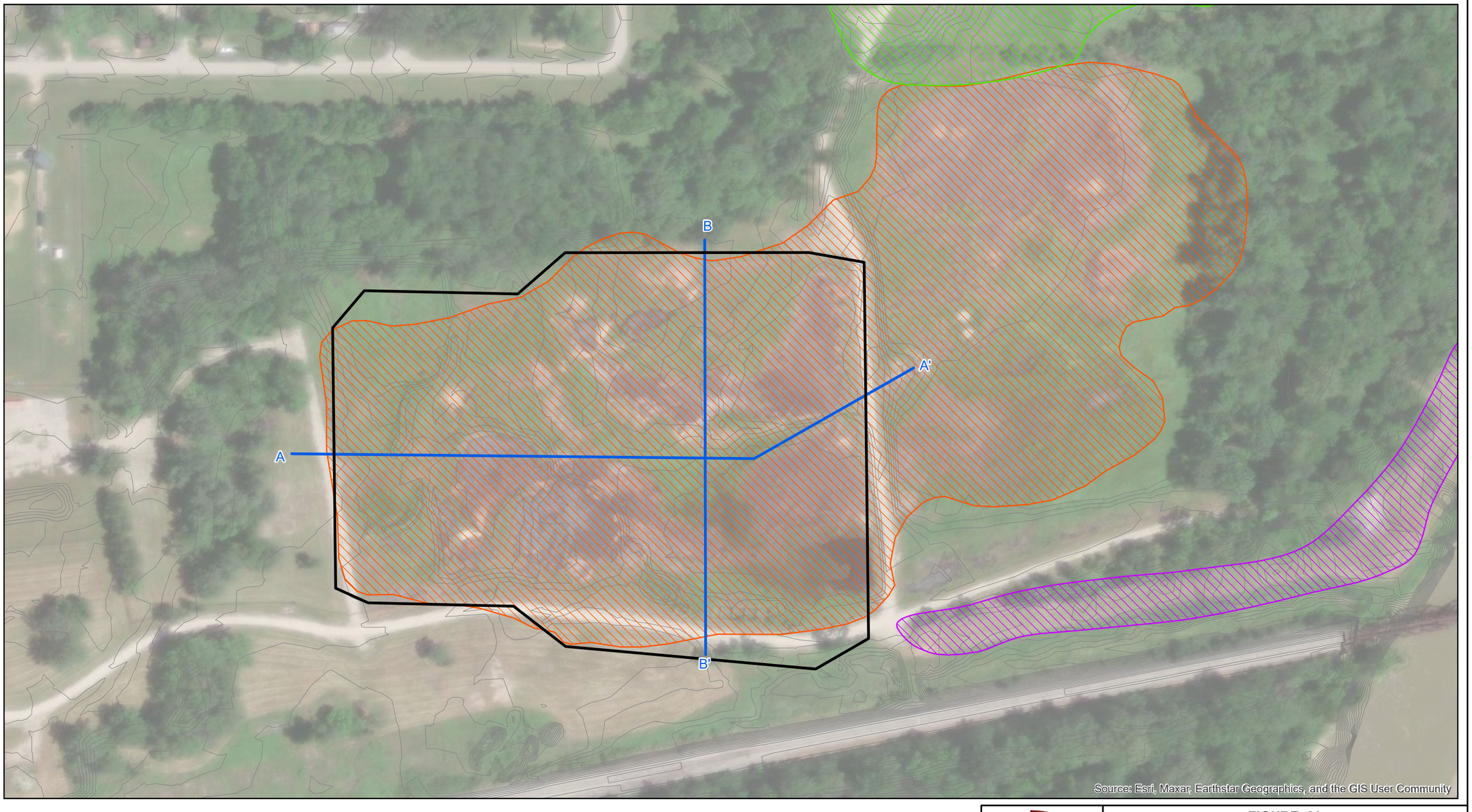

EXPLANATION

- 2003 GROUND SURFACE CONTOURS - 1 FT
- CAP AREA - ALTERNATIVE IA-4
- CROSS SECTION
- EXTENT OF WASTE MATERIAL IDENTIFIED IN LUBE OIL FILTER CLAY DISPOSAL AREA (INDIAN ACRES SOUTH)
- EXTENT OF WASTE MATERIAL IDENTIFIED IN INDIAN ACRES NORTH
- EXTENT OF WASTE MATERIAL IDENTIFIED IN PUMP HOUSE ROAD

N

0 150'

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FIGURE 20

INDIAN ACRES, ALTERNATIVE IA-4 CONCEPTUAL CAP LOCATION

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JP	Scale: 1 " = 150 '	Date: 11/1/23	File: Fig18_LvilleFS_IACAP.mxd

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EXPLANATION

- CROSS SECTION
- EXTENT OF WASTE MATERIAL
- EXTENT OF FORMER SLUDGE PIT
- CAP AREA
- AREA TO BE EXCAVATED; MATERIAL TO BE CONSOLIDATED IN CAP AREA

N

0 250'

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FIGURE 21

SEPARATOR 7 AREA, ALTERNATIVE SEP7-2 CONCEPTUAL CAP LOCATION

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: JP	Scale: 1 " = 250 '	Date: 10/24/23	File: Fig21_LvilleFS_Sep7Alt.mxd

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NOTES:

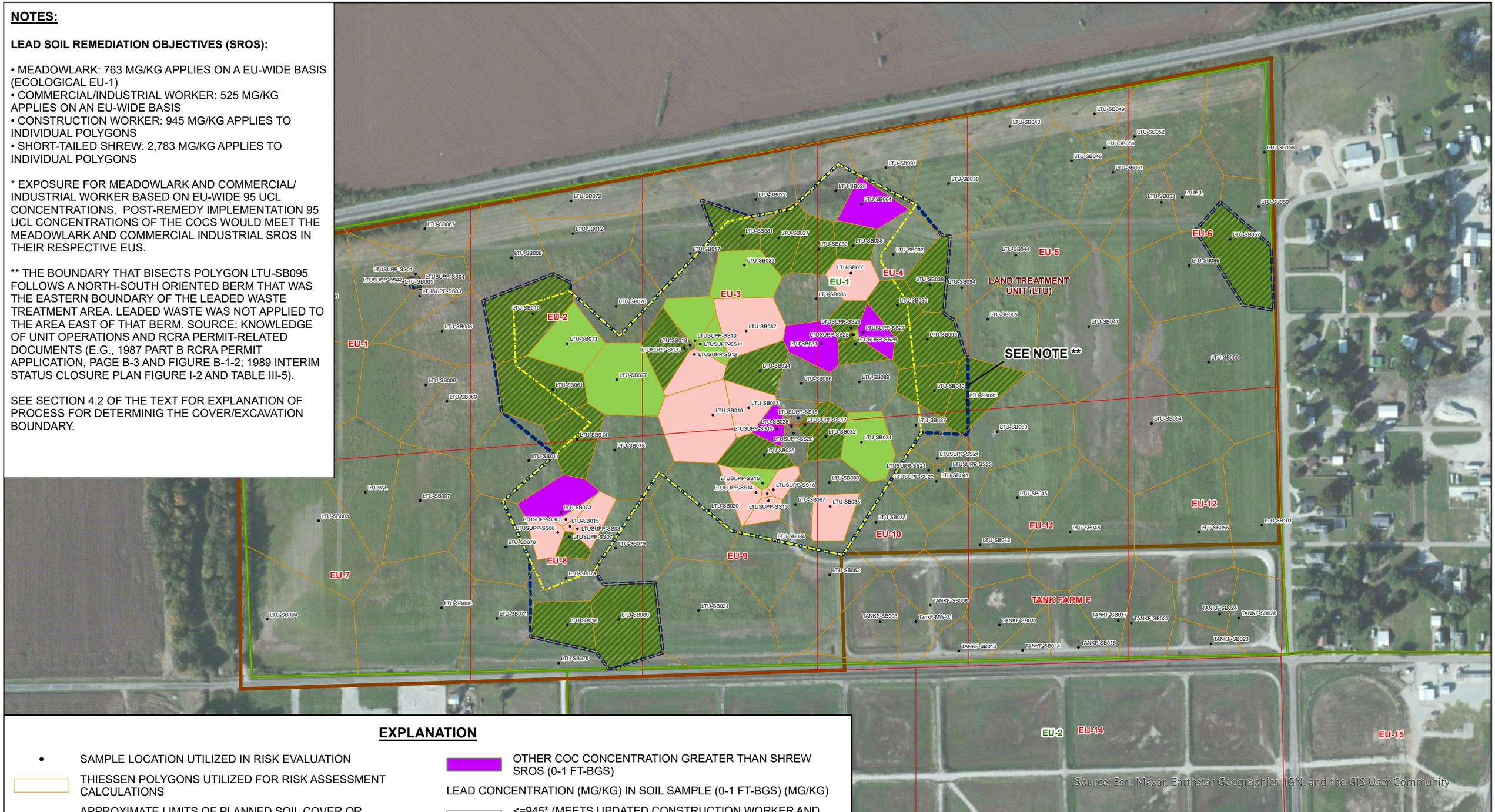
LEAD SOIL REMEDIATION OBJECTIVES (SROS):

• MEADOWLARK: 763 MG/KG APPLIES ON A EU-WIDE BASIS (ECOLOGICAL EU-1)
• COMMERCIAL/INDUSTRIAL WORKER: 525 MG/KG APPLIES ON AN EU-WIDE BASIS
• CONSTRUCTION WORKER: 945 MG/KG APPLIES TO INDIVIDUAL POLYGONS
• SHORT-TAILED SHREW: 2,783 MG/KG APPLIES TO INDIVIDUAL POLYGONS

* EXPOSURE FOR MEADOWLARK AND COMMERCIAL/ INDUSTRIAL WORKER BASED ON EU-WIDE 95 UCL CONCENTRATIONS. POST-REMEDY IMPLEMENTATION 95 UCL CONCENTRATIONS OF THE COCS WOULD MEET THE MEADOWLARK AND COMMERCIAL INDUSTRIAL SROS IN THEIR RESPECTIVE EUS.

** THE BOUNDARY THAT BISECTS POLYGON LTU-SB095 FOLLOWS A NORTH-SOUTH ORIENTED BERM THAT WAS THE EASTERN BOUNDARY OF THE LEADED WASTE TREATMENT AREA. LEADED WASTE WAS NOT APPLIED TO THE AREA EAST OF THAT BERM. SOURCE: KNOWLEDGE OF UNIT OPERATIONS AND RCRA PERMIT-RELATED DOCUMENTS (E.G., 1987 PART B RCRA PERMIT APPLICATION, PAGE B-3 AND FIGURE B-1-2; 1989 INTERIM STATUS CLOSURE PLAN FIGURE I-2 AND TABLE III-5).

SEE SECTION 4.2 OF THE TEXT FOR EXPLANATION OF PROCESS FOR DETERMINIG THE COVER/EXCAVATION BOUNDARY.



EXPLANATION

- SAMPLE LOCATION UTILIZED IN RISK EVALUATION
- THIESSEN POLYGONS UTILIZED FOR RISK ASSESSMENT CALCULATIONS
- APPROXIMATE LIMITS OF PLANNED SOIL COVER OR EXCAVATION UTLIZING ORIGINAL LEAD SRO OF 2,016 MG/KG (CONSTRUCTION WORKER)
- APPROXIMATE LIMITS OF PLANNED SOIL COVER OR EXCAVATION UTILIZING LEAD SRO OF 945 MG/KG (CONSTRUCTION WORKER)**
- HUMAN HEALTH EXPOSURE UNIT BOUNDARY
- ECOLOGICAL EXPOSURE UNIT BOUNDARY - EU-1
- OU-3 - LAND TREATMENT UNIT (LTU)

- OTHER COC CONCENTRATION GREATER THAN SHREW SROS (0-1 FT-BGS)

LEAD CONCENTRATION (MG/KG) IN SOIL SAMPLE (0-1 FT-BGS) (MG/KG)

- <=945* (MEETS UPDATED CONSTRUCTION WORKER AND SHREW SROS)
- 945 - 2,016 (> UPDATED CONSTRUCTION WORKER SRO; MEETS SHREW AND ORIGINAL CONSTRUCTION WORKER SROS)
- 2,016 - 2,783 (> ORIGINAL CONSTRUCTION WORKER SRO; MEETS SHREW SRO)
- >2,783 (> SHREW SRO)

N

0 320'

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FIGURE 22

APPROXIMATE LIMITS OF SOIL COVER (LTU-2) OR EXCAVATION (LTU-3), OU-3 (LTU)

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1" = 313'	Date: 8/12/24	File: Fig6_LvilleFS_SoilLTURev

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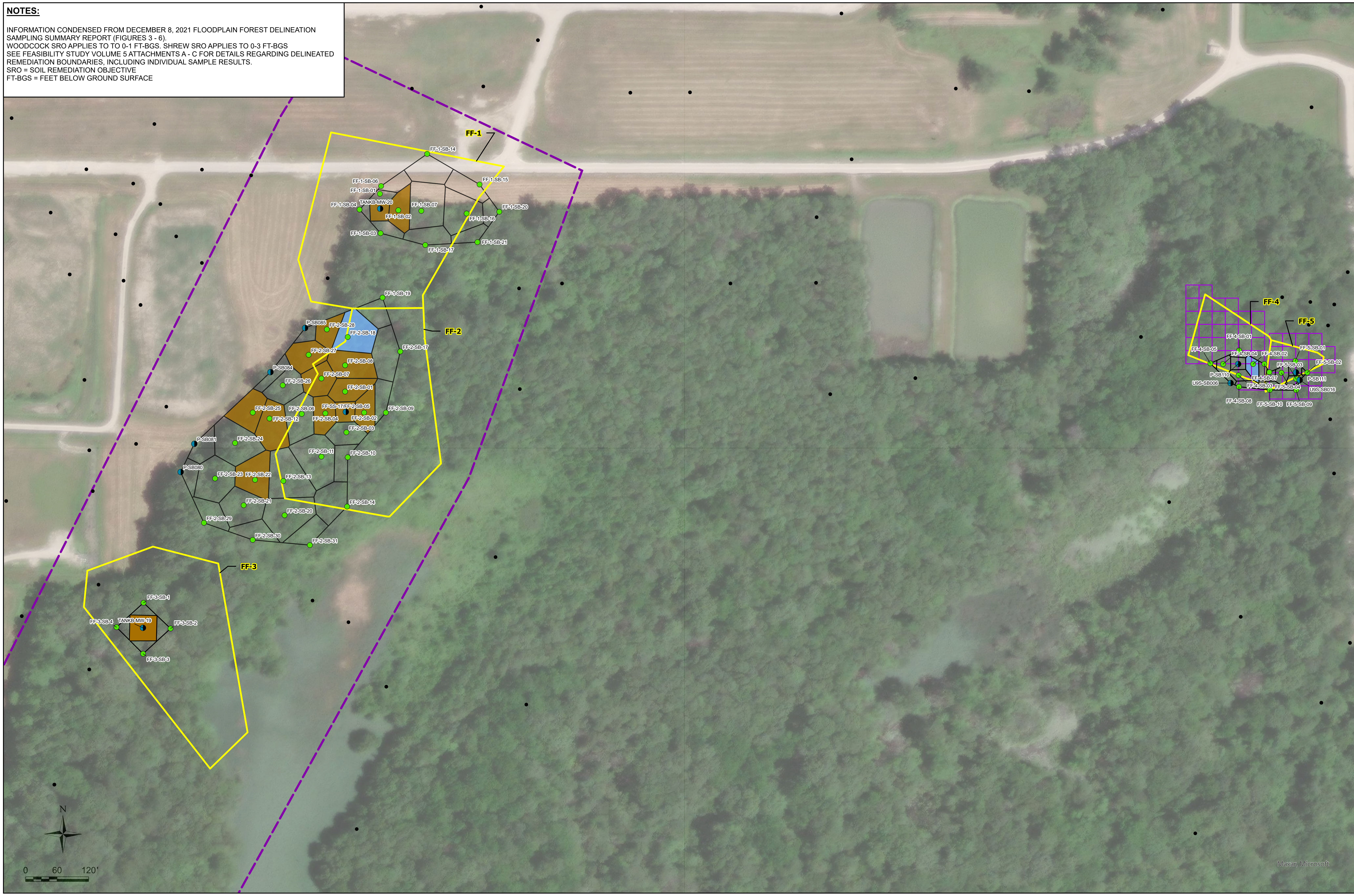
NOTES:

INFORMATION CONDENSED FROM DECEMBER 8, 2021 FLOODPLAIN FOREST DELINEATION SAMPLING SUMMARY REPORT (FIGURES 3 - 6).
WOODCOCK SRO APPLIES TO TO 0-1 FT-BGS. SHREW SRO APPLIES TO 0-3 FT-BGS
SEE FEASIBILITY STUDY VOLUME 5 ATTACHMENTS A - C FOR DETAILS REGARDING DELINEATED REMEDIATION BOUNDARIES, INCLUDING INDIVIDUAL SAMPLE RESULTS.
SRO = SOIL REMEDIATION OBJECTIVE
FT-BGS = FEET BELOW GROUND SURFACE



EXPLANATION

- • HISTORICAL RI SOIL BORING BELOW SRO
- SAMPLE LOCATIONS UTILIZED IN RISK EVALUATION
  - 2020/2021 SOIL DELINEATION SAMPLE
  - RI SOIL SAMPLE
- 25-FOOT DELINEATION GRID (FF-4 AND FF-5)
- 50-FOOT DELINEATION GRID (FF-1, FF-2, FF-3)
- FOREST-GRASSLAND ECOTONE
- THIESSEN POLYGON BASED ON ORIGINAL REMEDIAL INVESTIGATION SAMPLING
- 0-1 FT-BGS REQUIRES REMEDIATION TO MEET SRO ACROSS REMEDY AREA;
- 0-3 FT-BGS REQUIRES REMEDIATION TO MEET SRO ACROSS REMEDY AREA
- DELINEATION SAMPLE POLYGONS USED IN AREA-WEIGHTED 95% UPPER CONFIDENCE LIMIT CALCULATION

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FIGURE 23

APPROXIMATE LIMITS OF SOIL EXCAVATION (FF-2A) OR COVER (FF-3)
OU-4 – FLOODPLAIN FOREST AREA

FORMER INDIAN REFINERY
LAWRENCEVILLE, ILLINOIS

Drawn By: PH	Checked By: KR	Scale: 1" = 120'	Date: 10/3/23	File: 5_ApproxLimits_SoilExcavation

NOTES:

- mg/L - MILLIGRAMS PER LITER
- BENZENE CONTOURING BASED ON GROUNDWATER SAMPLES (DISSOLVED PHASE CONCENTRATIONS) AND LNAPL SAMPLES (EFFECTIVE SOLUBILITIES) COLLECTED IN THE SMEAR ZONE
- ESTIMATED SMEAR ZONE EXTENT FROM 2008 RI REPORT (FIGURE 5-33) AND LSCM (FS VOLUME 1, APPENDIX B).
- BENZENE DATA BASED ON GROUNDWATER SAMPLES (DISSOLVED PHASE CONCENTRATIONS) AND LNAPL SAMPLES (EFFECTIVE SOLUBILITIES) COLLECTED IN THE SMEAR ZONE, AS PRESENTED IN FS VOLUME 1, FIGURE 2-30B (DATA FROM 2018/2019 UNLESS OTHERWISE NOTED ON THAT FIGURE).

OU-5 = SITEWIDE GROUNDWATER AND LNAPL

CITY STORM SEWER INVESTIGATION AREA
INDIAN ACRES
TANK FARM A
B & O POND (SWMU 24)
U2-MW-25
U2-MW-06
MAIN PROCESS AREA
SEPARATOR 7 AREA
LAND TREATMENT UNIT (LTU)
SWMU 9 NORTH DRAINAGE DITCH
U2-MW-04
TANKB-MW-02
TANKE-MW-01
TANK FARM F
TANK FARM D
TANKC-MW-05
TANKB-MW-03
TANK FARM B
TANKE-MW-03
TANKE-MW-06
TANKE-MW-08
TANKD-MW-03
TANKB-MW-04
SWMU 25 (LIME SLUDGE POND)
TANKD-MW-02
TANK FARM E
TANK FARM C
TANKB-MW-07
P-MW-07
FLOODPLAIN FOREST
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

EXPLANATION

- WELL IN PRELIMINARY ACTIVE REMEDY AREA (BENZENE CONCENTRATION GREATER THAN 1 mg/L)
- WELL WITH PRELIMINARY ESTIMATE OF HIGH (60-100 YEAR) LONGEVITY, BUT BENZENE CONCENTRATION < 1 mg/L
- OTHER WELL PREVIOUSLY SAMPLED FOR BENZENE

BENZENE CONTOUR

- 5+ MG/L
- 1 - 5 MG/L
- 0 - 1 MG/L
- OU-1 – TANK FARMS, MAIN PROCESS AREA, AND ROAD RIGHTS-OF-WAY/CITY STORM SEWER INVESTIGATION AREA (SOIL)
- OU-2 – OILY SOIL AREAS, INDIAN ACRES, SEPARATOR 7 AREA
- OU-3 – LAND TREATMENT UNIT (SOIL)
- OU-4 – FLOODPLAIN FOREST (SOIL)
- OU-5 – LNAPL AND GROUNDWATER (SITE-WIDE, NO BOUNDARY SHOWN)
- OU-6 – WASTE WATER TREATMENT PONDS (REMAIN IN USE; TO BE ADDRESSED OUTSIDE OF THIS FS)

- FLOODPLAIN FOREST
- INDIAN ACRES
- LAND TREATMENT UNIT (LTU)
- MAIN PROCESS AREA
- OILY SOIL AREA
- SEPARATOR 7 AREA
- TANK FARM
- ESTIMATED SMEAR ZONE EXTENT
- FORMER REFINERY BOUNDARY

N

0 250 500 '

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FIGURE 24

DISSOLVED-PHASE BENZENE CONCENTRATIONS AND PRELIMINARY LNAPL-2 ACTIVE REMEDY AREAS

FORMER INDIAN REFINERY LAWRENCEVILLE, ILLINOIS

Drawn By: BLM	Checked By: KR	Scale: 1 " = 500 '	Date: 12/14/23	File: 4_LvilleFS_LNAPLRemAreas.mxd

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