ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES / REMEDIAL ACTION PLAN

8920 LAISY AVENUE &
3420 EAST 93RD STREET
CLEVELAND, OHIO 44104

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PREPARED FOR:
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APPENDICES

1.0 INTRODUCTION

The Mannik & Smith Group, Inc. (MSG) was retained by the Cuyahoga County Land Reutilization Corporation (Land Bank) to prepare this Analysis of Brownfield Cleanup Alternatives (ABCA) and Remedial Action Plan (RAP) for two contiguous parcels located at 3420 East 93rd Street and 8920 Laisy Avenue in Cleveland, Cuyahoga County, Ohio (Parcel Nos. 127-13-004 and 127-13-031), collectively referred to as the "Subject Property." A Subject Property Location Map is provided as Figure 1, and a Phase II Environmental Site Assessment (ESA) Sampling Map is included as Figure 2, both located in Appendix A.

In preparing this ABCA/RAP, MSG, in coordination with the Ohio Environmental Protection Agency (EPA) and the Cuyahoga County Land Bank, considered site-specific conditions, technical feasibility, and the intended future use(s) of the Subject Property to establish cleanup objectives and evaluate applicable remedial alternatives.

1.1 Site Description

The Subject Property spans a combined 11.75 acres of vacant commercial land, located between East 88th Street and East 93rd Street, both of which provide access to the Subject Property. There are currently no buildings on the Subject Property. Concrete building foundations are present in the northwest, central, and eastern portions of the Subject Property while the rest of the Subject Property consists of wooded and/or vacant land.

1.2 Forecasted Climate Conditions

According to the U.S. Global Change Research Program (USGCRP, 2018), climate trends for the Midwest region of the United States include rising temperatures, increased precipitation with greater variability, a higher frequency of extreme precipitation events, decreased biodiversity, and elevated ground-level ozone concentrations. Of these factors, increased precipitation and the resulting impacts on stormwater runoff and potential flooding are particularly relevant to the cleanup and redevelopment of the Subject Property.

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (Map Nos. 39035C0184E and 39035C0203E), the Subject Property is currently located within Zone X—an area of minimal flood hazard—within the City of Cleveland-Cuyahoga River watershed. However, as climate change contributes to more frequent and intense storms, the risk of localized flooding may increase, potentially altering the flood zone designation and increasing the vulnerability of the Subject Property to flood-related impacts.

Given the nature and location of the Subject Property, it is reasonable to anticipate that climate-related changes—such as rising temperatures, increased precipitation variability, and more intense stormwater runoff—could affect future site conditions. These factors should be considered in the development and implementation of the cleanup strategy to ensure long-term resilience and environmental sustainability.

1.3 Site History

The Subject Property was originally developed for industrial use around 1922 by the National Bronze & Aluminum Foundry Company (8920 Laisy Avenue). By the early 1950s, industrial development in the area had expanded, and the property was subsequently occupied by the Harshaw Chemical Company. Additionally, by 1952, the central and eastern portions of the property were developed with a large industrial building used by the Cleveland Transit System. Various industries occupied the buildings from the 1970s to the 1990s, before they were demolished—at 8920 Laisy Avenue in the late 1970s to early 1980s, and at 3420 East 93rd Street in the mid to late 1990s.

Historical Sanborn Maps also show three oil underground storage tanks (USTs) in the southeast corner of the Subject Property and a gasoline UST in the west-central portion of the property, with these tanks depicted from at least 1951 through at least 1973.

1.4 Previous Environmental Investigations

MSG completed a Phase I ESA at the Subject Property in October 2023 that identified the following Recognized Environmental Conditions (RECs) / Identified Areas (IAs):

REC-1/IA-1: The likely release of petroleum products at the Subject Property associated with historical on-property petroleum USTs on the southeast portion of the Subject Property.

REC-2/IA-2: The likely release of petroleum products at the Subject Property associated with historical on-property gasoline UST on the southwest portion of the Subject Property.

REC-3/IA-3 & IA-4: The likely release of polychlorinated biphenyls (PCBs) associated with former transformer houses/transformers located on the northern portion of the Subject Property.

REC-4/IA-5: The likely release of hazardous and/or petroleum products associated with the long-term industrial uses of the Subject Property (entire property).

REC-5/IA-5: The likely presence of hazardous and/or petroleum products at the Subject Property associated with the placement of historical fill material throughout the Subject Property (entire property).

REC-6/IA-6: The likely presence of PCBs and/or petroleum products on the southern portion of the Subject Property due to a release/spill of transformer oil in August 1985.

The potential presence of USTs was evaluated in March 2024 through a combined electromagnetic induction (EM) and ground penetrating radar (GPR) survey. The survey focused on areas of the Subject Property where historical Sanborn Maps indicated the presence of USTs. In both areas surveyed, strong EM in-phase (metal) anomalies were detected, which were interpreted as potential orphan USTs. To verify these findings, exploratory excavations were subsequently performed. Further details regarding the excavation results are provided later in this section.

Additionally, a Phase II ESA of the Subject Property was completed in June 2024. The Phase II ESA identified soil and groundwater samples above applicable Bureau of Underground Storage Tank Regulations (BUSTR) Closure Action Levels and/or Ohio EPA Voluntary Action Program (VAP) Construction/Excavation and Commercial/Industrial standards, as described below:

Soil Analytical Results – IAs 1 & 2

- Naphthalene was detected above the BUSTR Closure Action Level, but below the VAP Commercial/Industrial and Construction/Excavation Worker Generic Numeric Standards (GNS) in SB-2 (2-4') within IA-1; and,
- Low levels of several other volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and/or total petroleum hydrocarbons (TPH) diesel range organics (DRO) and oil range organics (ORO) were detected in the submitted soil samples collected from IAs 1 and 2; however, all detections are below their respective BUSTR Closure Action Levels and/or Ohio VAP GNS'.

Soil Analytical Results – IAs 3 & 4

- Benzo(a)pyrene and 1-Methylnaphthalene were detected in SB-15 (0-2') above both their respective VAP Commercial/Industrial GNS';
- Aroclor 1260 was detected above the VAP Commercial/Industrial GNS in SB-15 (0-2') within IA-3;
- Lead was detected in SB-5 (0'-2') above the VAP Construction/Excavation GNS; and,
- Low levels of several other metals, VOCs, and/or semi-volatile organic compounds (SVOCs) were detected in the submitted soil samples collected from IAs 3 and 4; however, all detections are below their respective GNS'.

Soil Analytical Results – IA-5

- Lead was detected above the VAP Construction/Excavation Worker GNS, but below the Commercial/Industrial GNS in SB-8 (5-7'), SB-20 (0-2'), and SB-24 (0'-2');
- Benzo(a)pyrene was detected above the VAP Commercial/Industrial GNS in SB-7 (0-2'); and,
- Low levels of several other metals, VOCs, and SVOCs were detected in the submitted soil samples collected from IA-5; however, all detections are below their respective Ohio VAP GNS'.

Soil Analytical Results – IA-6

- PCBs were not detected above their respective laboratory reporting limits in any of the samples collected from IA-6.

Groundwater Analytical Results

- 1,2,4-Trimethylbenzene, 1-methylnaphthalene, and/or naphthalene were detected in MW-2 and MW-16 above their respective Ohio VAP Unrestricted Potable Use Standards (UPUS) and/or BUSTR Drinking Water Action Level;
- 1-Methylnaphthalene was detected in MW-10 and MW-12 above the Ohio VAP UPUS. However, the detection limits of 1-methylnaphthalene are above the UPUS for this compound; and,
- Low levels of several other metals, VOCs, and PAHs were detected in groundwater samples from across the Subject Property; however, all detections are below their respective Ohio VAP UPUS.

Soil Vapor Point Sampling Results

MSG used the U.S. EPA Vapor Intrusion Screening Level (VISL) Calculator to evaluate the soil vapor analytical results. MSG entered the maximum concentration of each detected VOC compound into the VISL Calculator to identify if the detected VOCs poses a potential risk to indoor air via the vapor intrusion pathway, as described below:

- Low levels of VOCs were detected at each location below their respective US EPA VISL Target Sub-Slab & Near-Source Soil Gas Concentrations for both Residential and Commercial Land Use;
- The calculated indoor air concentrations were below both their respective VAP Residential and Commercial / Industrial Indoor Air Standards; and,
- The calculated cumulative carcinogenic risk and non-carcinogenic hazard quotients are below their respective target threshold risk and hazard values for both residential and commercial receptors.

Exploratory Excavations

In April 2025, MSG, in collaboration with the Cuyahoga County Land Bank and its contractor, completed two exploratory excavations at the Subject Property to confirm the presence of USTs, as suggested by the October 2023 Phase I ESA and the March 2024 EM and GPR survey.

The first excavation was completed to a depth of five feet below ground surface (bgs) in the southeast corner of the Subject Property, along East 93rd Street. This location aligns with the area identified in the March 2024 EM and GPR survey, which detected strong EM in-phase (metal) anomalies, potentially indicating orphan USTs. Based on the findings from the April 2025 excavation, which revealed three fuel fill ports, dark soils, and petroleum odors, MSG concluded that three approximately 8,000-gallon USTs are likely present in this area of the Subject Property.

Due to the size of a concrete slab covering the suspected USTs, the mini-excavator being used was not able to remove the slab during the exploratory excavation. Therefore, visual confirmation was not possible during the excavation.

A second excavation was conducted in the west-central portion of the Subject Property, corresponding to another area surveyed in the March 2024 EM and GPR survey, which identified a strong EM in-phase (metal) anomaly interpreted as a potential orphan UST. However, the April 2025 excavation revealed a potential building foundation and bricks from the surface to approximately 5.5-feet bgs, leading MSG to conclude that no UST is present in this area of the Subject Property. Visual confirmation to depth was hindered by the presence of construction and demolition debris (buried bricks) and perched groundwater. However, no native soils were encountered, nor were petroleum odors detected.

1.5 Current Environmental Concerns

As noted above, select metals, VOCs, PAHs, and PCBs are present in soil and/or groundwater underlying the Subject Property. Moreover, three approximately 8,000-gallon USTs are suspected to be present in the southeast corner of the Subject Property. Accordingly, the Cuyahoga County Land Bank intends to mitigate the soil and groundwater impacts and remove the petroleum USTs at the Subject Property prior to site redevelopment.

2.0 APPLICABLE REGULATIONS AND CLEANUP STANDARDS

As described in Section 1.4, select PAHs, RCRA Metals, VOCs, and PCBs were detected at levels of concern in soil and/or groundwater at the Subject Property. The following is a summary of the applicable regulations and cleanup standards (BUSTR and Ohio EPA VAP) that will apply to the cleanup of the Subject Property.

2.1 Soil Cleanup Standards

Table 2.1 summarizes exceedances to applicable BUSTR and Ohio VAP generic direct-contact soil chemicals of concern (COCs) associated with the former use of the Subject Property and the maximum concentrations detected in Subject Property soils.

Table 2.1 Chemicals of Concern – Applicable Soil Cleanup Standards

Parameter	Applicable Ohio VAP Soil Cleanup Standards (mg/Kg)		BUSTR Closure Action Levels (mg/kg)	Max Detected Site Conc. (mg/kg)	Sample ID and Depth (ft)
	Commercial/ Industrial	Construction/ Excavation			
Lead	800	200	--	520	SB-8 (5'-7')
Naphthalene	230	560	0.511	0.53	SB-2 (2'-4')
1-Methylnaphthalene	1.9	7.1	--	2.3	SB-15 (0'-2')
Benzo(a)pyrene	62	230	--	160	SB-15 (0'-2')
Aroclor 1260	28	450	--	37	SB-15 (0'-2')

2.2 Groundwater Cleanup Standards

Table 2.2 summarizes exceedances to applicable BUSTR and Ohio VAP UPUS for COCs associated with the former use of the Subject Property and the maximum concentrations detected in Subject Property groundwater.

Table 2.2 Chemicals of Concern – Applicable Groundwater Standards

Parameter	Ohio VAP UPUS (ug/L)	BUSTR Drinking Water Action Level (ug/L)	Max Detected Site Concentration (ug/L)	Sample ID
1,2,4-Trimethylbenzene	56	15	24	MW-2
Naphthalene	1.2	1.4	320	MW-2
1-Methylnaphthalene	0.0063	--	110	MW-2

3.0 EVALUATION OF CLEANUP ALTERNATIVES

The following sections summarize the objectives of the proposed remedial actions, alternative remedial options, the recommended remedial alternative, and justification for the recommendation.

3.1 Remedial Objectives

The Cuyahoga County Land Bank plans to complete sub-surface remediation of hazardous substances to help prepare the Subject Property for redevelopment. The Cuyahoga County Land Bank plans to use grant funding to finance:

- The removal of impacted soil from the Subject Property,
- The closure and removal of petroleum USTs at the Subject Property under BUSTR guidelines; and,
- The active monitoring of groundwater impacts throughout the Subject Property

Completing these remedial tasks will reduce hazardous substance exposure pathways for future occupants of the Subject Property, thereby facilitating redevelopment of the Subject Property. The Ohio VAP Commercial/Industrial and Construction/Excavation GNSs for soil cleanup standards and the BUSTR Soil Class 1 Action Levels, as discussed in Section 2.0, will serve as the target cleanup standards for the Subject Property.

3.2 Potential Remedial Alternatives – BUSTR Regulated Subsurface Contamination (RECs/IAs 1 &2)

3.2.1 Alternative No. 1 – No Action

The no action alternative would be the lowest cost alternative. However, the no action alternative would not mitigate the potential threats to human health and the environment that are known to exist at the Subject Property. In addition, the no action alternative would not facilitate preparation of the Subject Property for the planned redevelopment.

3.2.2 Alternative No. 2 – Permanent UST Closure & Removal

This alternative involves the proper closure and removal of the three approximately 8,000-gallon fuel oil USTs, as well as the removal of contaminated soil surrounding the USTs in the southeast corner of the Subject Property, in accordance with BUSTR guidelines.

Naphthalene was detected in soil boring SB-2 at depths ranging from two feet to four feet bgs near the UST system. SB-2 was advanced on the west side of the suspected UST cavity.

Additionally, 1,2,4-trimethylbenzene, naphthalene, and 1-methylnaphthalene were detected in groundwater near the suspected UST cavity, as indicated by samples from monitoring well MW-2, which was installed on the west side of the suspected UST cavity.

To address the contamination in both subsurface soils and groundwater within REC-1/IA-1, the USTs will be removed from the Subject Property along with the contaminated soils, in accordance with BUSTR UST closure guidelines.

An environmental remediation contractor will complete UST and soil removal activities, transport petroleum contaminated soils and residual UST liquids to an approved landfill for disposal, transport the removed USTs to an approved landfill or recycling center, backfill the UST excavation, seed and straw the area of disturbance for site reuse, and assist in the collection of confirmation and waste characterization samples, as necessary.

The remediation contractor would:

- Mobilize to the Subject Property with the proper equipment;
- Excavate overburden soil to confirm the presence of USTs and visually inspect the USTs for signs of deterioration;
- Stockpile overburden, non-petroleum impacted soil, at the Subject Property for subsequent backfill material.
- Remove residual liquids, if any, from the USTs for proper disposal;
- Remove USTs from the ground;
- Excavate and stockpile petroleum contaminated soils at the Subject Property for characterization;
- Load, transport, and dispose of petroleum contaminated soils at an approved landfill;
- Load, transport, and dispose of the USTs at an approved landfill, or recycling center;
- Assist in the collection of confirmation and waste characterization samples (as necessary);
- Backfill the UST excavation with clean soil, seed, and straw for site reuse.

An environmental consulting firm will oversee soil removal activities, collect confirmation samples from excavation sidewalls and bottoms for laboratory analysis, document final quantities of soil removed and backfilled placed, and prepare a BUSTR Closure Assessment Report following the soil and UST removal activities. On-going groundwater monitoring may also be necessary in accordance with BUSTR guidelines.

The environmental consultant would:

- Monitor and oversee the UST/soil removal activities in accordance with BUSTR guidelines;
- Collect confirmation samples from the UST cavity and from excavated/stockpiled material to determine if the materials meet acceptable BUSTR closure action levels;
- Prepare a BUSTR Closure Assessment Report or remedial actions completion report documenting UST and petroleum contaminated soil removal and disposal activities.

One consideration that may make excavation slightly more difficult to implement is the increased frequency of heavy rainfall events that has been experienced in recent years in Cleveland, Ohio. Although efforts will be made to schedule the work in the dry weather months, the amount of precipitation over a short period of time from one of these heavy rainfall events could cause delays in the implementation of the excavation work.

Cost: The cost to complete the UST closure and soil removal activities is estimated to be approximately $85,000.

- $3,000 (estimated) for developing a Quality Assurance Project Plan (QAPP) in accordance with U.S. EPA guidelines;
- $70,000 (estimated) for removal of USTs, load, transport, and dispose of up to 100 tons of impacted soil and to import and place clean backfill;
- $12,000 (estimated) for soil removal oversight, testing, and final remediation reporting.

This alternative would remove the source of the petroleum contamination at the Subject Property near the USTs and would meet the remediation objectives. Human health and environmental risks posed by the petroleum impacts would be mitigated and the impediments to site redevelopment would be removed. This alternative has the greatest ability to meet the objectives of the redevelopment plans for the Subject Property for REC-1/IA-1.

3.2.3 Alternative No. 3 – UST Closure in Place

This alternative involves the proper closure in-place of approximately three 8,000-gallon fuel oil USTs. Closure activities would include the removal of any residual liquids within the USTs, internal cleaning of the tanks, and filling the tanks with a solid inert material with a density greater than that of water. These activities would be performed in accordance with American Petroleum Institute (API) Standard 1604-01 and BUSTR requirements.

In some cases, closure in-place can offer significant advantages. It is typically less invasive and less costly than full removal, particularly when tanks are located beneath active structures, utilities, or hardscape features such as roads or buildings. It minimizes disturbance to the site, reduces safety risks associated with excavation, and can be completed more quickly than tank removal. For sites with no confirmed or suspected contamination, in-place closure can be an effective and compliant long-term management option.

However, site investigations at the Subject Property have identified both soil and groundwater contamination in the vicinity of the USTs. Naphthalene was detected in soil boring SB-2 at depths between two and four feet bgs, on the west side of the suspected UST cavity. Groundwater samples collected from monitoring well MW-2—also located west of the suspected UST area—contained 1,2,4-trimethylbenzene, naphthalene, and 1-methylnaphthalene, confirming petroleum-related impacts.

An environmental remediation contractor would perform the in-place UST closure, including:

- Mobilization to the Subject Property with appropriate equipment;
- Cleaning of the USTs;
- Removal and proper disposal of residual liquids;
- Site restoration, including grading, seeding, and application of straw for erosion control.

An environmental consulting firm would oversee closure activities to ensure compliance with BUSTR regulations. The consultant will also:

- Monitor and document UST closure-in-place procedures;
- Document volumes of material removed;
- Prepare and submit a BUSTR Closure Assessment Report or Remedial Action Completion Report.
- Conduct ongoing groundwater monitoring, if required by BUSTR.

One logistical consideration is the increasing frequency of heavy rainfall events observed in Cleveland, Ohio in recent years. Although work will be scheduled during typically dry weather periods, sudden, intense precipitation could delay the implementation of excavation or remediation efforts.

Cost: The cost to complete the UST closure in-place activities is estimated to be approximately $80,000.

- $3,000 (estimated) for developing a Quality Assurance Project Plan (QAPP) in accordance with U.S. EPA guidelines;
- $67,000 (estimated) for removal for UST tank cleaning, liquid disposal, tank filling;
- $10,000 (estimated) for closure in-place oversight and final remediation reporting.

While the closure in-place alternative would remove residual liquids from the USTs, it would not include excavation or disposal of contaminated soils. As a result, known soil contamination would remain on-site. This approach does not adequately address the environmental and human health risks posed by subsurface petroleum contamination and would not resolve the barriers to future site redevelopment. Accordingly, this alternative is not the selected remedy for site cleanup.

3.3 Potential Cleanup Alternatives – Hazardous Subsurface Contamination (Soil – contaminated areas throughout the entire Subject Property)

3.3.1 Alternative No. 1 – No Action

The no action alternative would be the lowest cost alternative. However, the no action alternative would not mitigate the potential threats to human health and the environment that are known to exist at the Subject Property. In addition, the no action alternative would not facilitate preparation of the Subject Property for redevelopment and therefore the hazardous substance subsurface impact would remain an impediment for the planned redevelopment.

3.3.2 Alternative No. 2 – Capping

Under this alternative, capping would involve importing and placing a minimum of two feet of clean fill material over impacted areas surrounding soil borings SB-5, SB-7, SB-14, SB-15, SB-20, and SB-24.

Cost: The cost to leave contaminated soils in place and cap the area with clean fill material is estimated to be approximately $115,000.

- $3,000 (estimated) for developing a Quality Assurance Project Plan (QAPP) in accordance with U.S. EPA guidelines;
- $12,000 (estimated) for approximately 120 tons of clean fill material, including transportation and spreading, plus mobilization and demobilization of equipment; and,
- $100,000 (estimated) for soil testing and remediation reporting, and preparation of a No Further Action (NFA) letter and supporting documents in accordance with Ohio VAP rules and guidance.

Capping is not considered an effective alternative in this ABCA for a commercial/industrial land use scenario for several reasons, despite its ability to provide a physical barrier between contaminated soils and potential receptors. While a cap can reduce direct contact risks, its effectiveness is contingent on long-term maintenance and monitoring to ensure its integrity is preserved—something that can be difficult to guarantee in active commercial or industrial settings where site disturbance (e.g., construction, utility work, or heavy equipment use) is common.

Additionally, capping does not address shallow subsurface contamination that may be encountered during future redevelopment or utility installation activities, which are more likely in commercial or industrial environments. If contaminated soils are exposed during such activities, there is a renewed risk of human exposure and environmental impact, potentially requiring additional remediation at that time.

For these reasons—limited long-term reliability in active use settings and the potential for exposure during site work—capping is not considered the most effective or sustainable remedial alternative for addressing contamination at the site under a commercial or industrial land use scenario.

3.3.3 Alternative No. 3 – Soil Removal Activities

This alternative involves the removal of shallow surface soils (0 to 2 feet below ground surface) in the vicinity of soil borings SB-5, SB-7, SB-14, SB-15, SB-20, and SB-24, in accordance with Ohio EPA VAP guidelines. Excavation areas are expected to be approximately 10 feet by 10 feet around each impacted boring; however, the final excavation limits will be determined based on field screening data and visual assessment of soil conditions encountered during the work.

Under this alternative, five distinct areas near soil borings SB-5, SB-7, SB-14/SB-15, SB-20, and SB-24 would be excavated to an approximate depth of two feet below ground surface (bgs). Prior to excavation, additional delineation soil borings would be advanced in the vicinity of SB-7 to better characterize and define the extent of subsurface impacts in that area of the Subject Property. This pre-excavation delineation will help guide the extent of soil removal and ensure that impacted soils are adequately addressed.

A total of approximately 100 tons of impacted soil from all areas would be removed.

An environmental remediation contractor will complete soil removal activities, transport contaminated soils to an approved landfill for disposal, backfill, seed and straw the area of disturbance for site reuse, and assist in the collection of confirmation and waste characterization samples, as necessary.

The remediation contractor would:

- Mobilize to the Subject Property with the proper equipment;
- Excavate contaminated soils;
- Load, transport, and dispose of contaminated soils at an approved landfill;
- Assist in the collection of confirmation and waste characterization samples (as necessary);
- Backfill with clean soil, seed, and straw area of disturbance for site reuse.

An environmental consulting firm would oversee soil removal activities, collect confirmation samples for laboratory analysis, document final quantities of soil removed and backfilled placed, and prepare a remedial actions completion report following the soil removal activities.

The environmental consultant would:

- Monitor and oversee the soil removal activities;
- Collect confirmation samples to determine if the backfill materials meet acceptable VAP standards;
- Prepare a remedial action completion report documenting contaminated soil removal and disposal activities.

Cost: The cost to complete the soil removal project is estimated to be approximately $125,000.

- $25,000 to load, transport, and dispose of up to 100 tons of impacted soil and to import and place clean backfill (includes mobilization and demobilization of equipment); and,
- $100,000 for soil removal oversight, testing, remediation reporting, and preparation of a NFA letter and supporting documents in accordance with Ohio VAP rules and guidance.

This alternative would remove the source of the contamination at the Subject Property and would meet the remediation objectives. Human health and environmental risks posed by the subsurface impacts would be mitigated and the impediments to site redevelopment would be removed. This alternative would present the greatest ability to meet unrestricted use criteria objectives of the redevelopment plans for the Subject Property.

3.4 Potential Cleanup Alternatives – Hazardous Subsurface Contamination (Groundwater)

3.4.1 Alternative No. 1 – No Action

Under this alternative, no remedial activities would be undertaken to address the impacted groundwater identified at the Subject Property. This approach would involve no active treatment, monitoring, or institutional controls, and assumes that natural attenuation or other subsurface conditions would ultimately mitigate groundwater impacts over time without human intervention.

The primary advantage of the No Action alternative is that it incurs no immediate cost or logistical burden. It avoids potential disturbances to the site and may be appropriate in situations where contamination is minimal, naturally attenuating, or where no current or future exposure pathways exist. It also allows time to evaluate long-term trends in groundwater quality, which could inform future decisions should conditions change.

However, this alternative does not actively address the petroleum-related constituents detected in groundwater, including 1,2,4-trimethylbenzene, naphthalene, and 1-methylnaphthalene, as observed in samples from monitoring well MW-2 and MW-16. As a result, groundwater contamination would persist on-site for an indefinite period, potentially allowing the contaminants to migrate or pose risks to downgradient receptors. The No Action alternative would also be inconsistent with BUSTR and Ohio EPA cleanup objectives, which seek to mitigate environmental and human health risks to support safe redevelopment and reuse of brownfield properties.

In addition, without active monitoring or control measures, there would be no mechanism to verify whether contaminant concentrations are increasing, decreasing, or remaining stable over time. This limits the ability to demonstrate compliance with applicable standards and may result in future regulatory or liability concerns.

The no action alternative would be the lowest cost alternative. However, the no action alternative would not mitigate the potential threats to human health and the environment that are known to exist at the Subject Property. In addition, the no action alternative would not facilitate preparation of the Subject Property for redevelopment and therefore the hazardous substance subsurface impact would remain an impediment for the planned redevelopment.

3.4.2 Alternative No. 2 – Groundwater Monitoring

The groundwater monitoring alternative is considered the most appropriate and cost-effective cleanup option for the Subject Property. Located within an Urban Setting Designation (USD), the property is exempt from the requirement to remediate groundwater to unrestricted potable use standards, as groundwater is not used for drinking purposes. As such, this alternative leverages the USD designation to responsibly manage groundwater risks without unnecessary and costly active remediation.

Under this alternative, a new groundwater monitoring well would likely be installed in the northwest corner of the Subject Property to monitor conditions near existing well MW-16 and ensure that contamination is not migrating off-site. Regular sampling and analysis would provide critical data to confirm that contaminant concentrations remain stable or are decreasing over time through natural attenuation. To prevent future use of groundwater as a potable resource, an institutional control—such as an environmental covenant—would be recorded on the property deed prohibiting the installation of potable water wells.

This groundwater monitoring alternative offers several advantages. It is cost-effective, representing the lowest-cost groundwater management option compared to active remediation strategies. The approach aligns with the property's USD, eliminating the need to remediate groundwater to unrestricted potable use standards, since the groundwater is not intended for drinking purposes. Groundwater monitoring also supports redevelopment flexibility by allowing site activities to proceed with minimal disruption while still maintaining regulatory oversight. Additionally, this alternative enables adaptive management, as ongoing monitoring can inform future decision-making and provide early detection of any contaminant plume migration.

However, there are also notable disadvantages. This alternative does not include active cleanup, meaning that contaminants would remain in the subsurface, and natural attenuation could take years to bring concentrations to acceptable levels. It also entails a long-term obligation, requiring regular monitoring, reporting, and the implementation and maintenance of institutional controls, such as environmental covenants. Lastly, potential land use restrictions—such as prohibiting the installation of potable water wells—could limit certain redevelopment opportunities or complicate project financing.

While this alternative does not actively remove contamination, its reliance on institutional controls and long-term monitoring is consistent with risk-based cleanup strategies supported by Ohio EPA's VAP. Although long-term obligations and land use restrictions are required, these are manageable trade-offs compared to the higher costs and invasiveness of active remediation. For these reasons—cost-effectiveness, regulatory compliance, redevelopment flexibility, and suitability under the USD designation—groundwater monitoring is identified as the preferred cleanup alternative for the Subject Property.

Cost: The estimated cost to implement groundwater monitoring is approximately $15,000. This estimate does not include expenses related to project reporting or the preparation and associated fees for obtaining the Ohio VAP NFA Letter.

- $3,000 (estimated) for developing a Quality Assurance Project Plan (QAPP) in accordance with U.S. EPA guidelines;
- $12,000 (estimated) for installation of a permanent groundwater monitoring well, two rounds of groundwater sampling, and two rounds of laboratory analysis.

3.4.3 Alternative No. 3 – Groundwater Remediation

Groundwater remediation can be employed through a wide variety of state-of-the-art remediation technologies. These technologies can include the following, but not limited to dual-phase extraction (DPE), bio-enzyme application, air sparging, groundwater pump and treat, and in-situ chemical oxidation. Although groundwater remediation technologies can enjoy exceptional success, the Subject Property is located within an USD and therefore, remediating groundwater to UPUS is not necessary, as potential receptors are not drinking the groundwater. Accordingly, costs to remediation groundwater through remediation technologies were not calculated.

3.5 Recommended Brownfield Cleanup Alternatives

Potential Cleanup Alternatives – BUSTR Regulated Subsurface Contamination (RECs/IAs 1 &2):

Alternative No. 2 (Permanent UST Closure & Removal) would fulfill the project objectives by removing the suspect USTs and addressing the human health and environmental risks associated with petroleum contamination in the subsurface soils and groundwater, ahead of planned redevelopment activities. This alternative offers the greatest potential to support the redevelopment goals for the Subject Property.

Potential Cleanup Alternatives – Soil contaminated areas throughout the entire Subject Property

Alternative No. 3 (Soil Removal Activities) would meet the project objectives by addressing the human health and environmental risks posed by hazardous substance contamination in the subsurface soils, prior to planned redevelopment activities. This alternative offers the greatest potential to support the redevelopment goals for the Subject Property.

Potential Cleanup Alternatives – Groundwater Impact:

Alternative No. 2 (Groundwater Monitoring) would meet the project objectives posed by sub-surface groundwater contamination. Although, an institutional control would likely need to be recorded on the deed to prevent the installation of potable water wells at the Subject Property, groundwater monitoring will ensure that contaminated groundwater is not migrating off-site.

3.6 Risk Mitigation Plan

An EPA Risk Mitigation Plan will be drafted to address the remaining subsurface contamination identified at depths of 5 to 7 feet below ground surface at SB-8. This plan will outline specific procedures and safety measures to be implemented if contaminated soils are encountered during redevelopment activities at the site. The objective is to minimize potential risks to human health and the environment by ensuring proper handling, management, and, if necessary, removal or remediation of impacted soils. The plan will also include protocols for monitoring, worker protection, and regulatory compliance in accordance with applicable EPA guidelines and local environmental regulations.

3.7 Green and Sustainable Remediation Measures for the Selected Alternatives

To make the selected alternatives greener or more sustainable, several techniques are planned. The most recent Best Management Practices (BMPs) issued under ASTM Standard E-2893: Standard Guide for Greener Cleanups will be used as a reference in the cleanup efforts. The Cuyahoga County Land Bank will recommend that the cleanup contractors follow an idle-reduction policy and use heavy equipment with advanced emissions controls operated on ultra-low sulfur diesel. The excavation work will be completed during the dry-weather months (i.e. summertime) in order to minimize potential groundwater infiltration into the excavation area, thereby reducing potential dewatering needs and the amount of dewatering liquids requiring disposal/treatment. The number of mobilizations to the Subject Property will be minimized to reduce the amount of vehicle exhaust from project vehicles and erosion control measures will be used to minimize runoff into environmentally sensitive areas.

4.0 CONCLUSIONS

The remedial alternatives were evaluated based on effectiveness in meeting the remedial objectives, ability to be implemented, cost-effectiveness, ability to meet project time constraints, and the intended future use of the Subject Property. We consider the following remedial alternatives to be the most technically feasible, the most likely to protect human health and the environment, and the timeliest options to meet the project goals:

- BUSTR Regulated Subsurface Contamination (RECs/IAs 1 &2) – Alternative No. 2
- Soil contaminated areas throughout the entire Subject Property – Alternative No. 3
- Groundwater Hazardous Subsurface Contamination – Alternative No. 2

5.0 REFERENCES

ASTM E2893-16e1, Standard Guide for Greener Cleanups, ASTM International, West Conshohocken, PA, 2016, www.astm.org.

FEMA, July 27, 2024. Flood Zone Map No. 39035C0184E and 39035C0203E. https://msc.fema.gov/portal/search#searchresultsanchor

MSG. Phase I Environmental Site Assessment, 8920 Laisy Avenue and 3420 East 93rd Street, Cleveland, Cuyahoga County, Ohio, October 2023.

MSG. Phase II Environmental Site Assessment, 8920 Laisy Avenue and 3420 East 93rd Street, Cleveland, Cuyahoga County, Ohio, June 2024.

USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.F. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

APPENDIX A
FIGURES

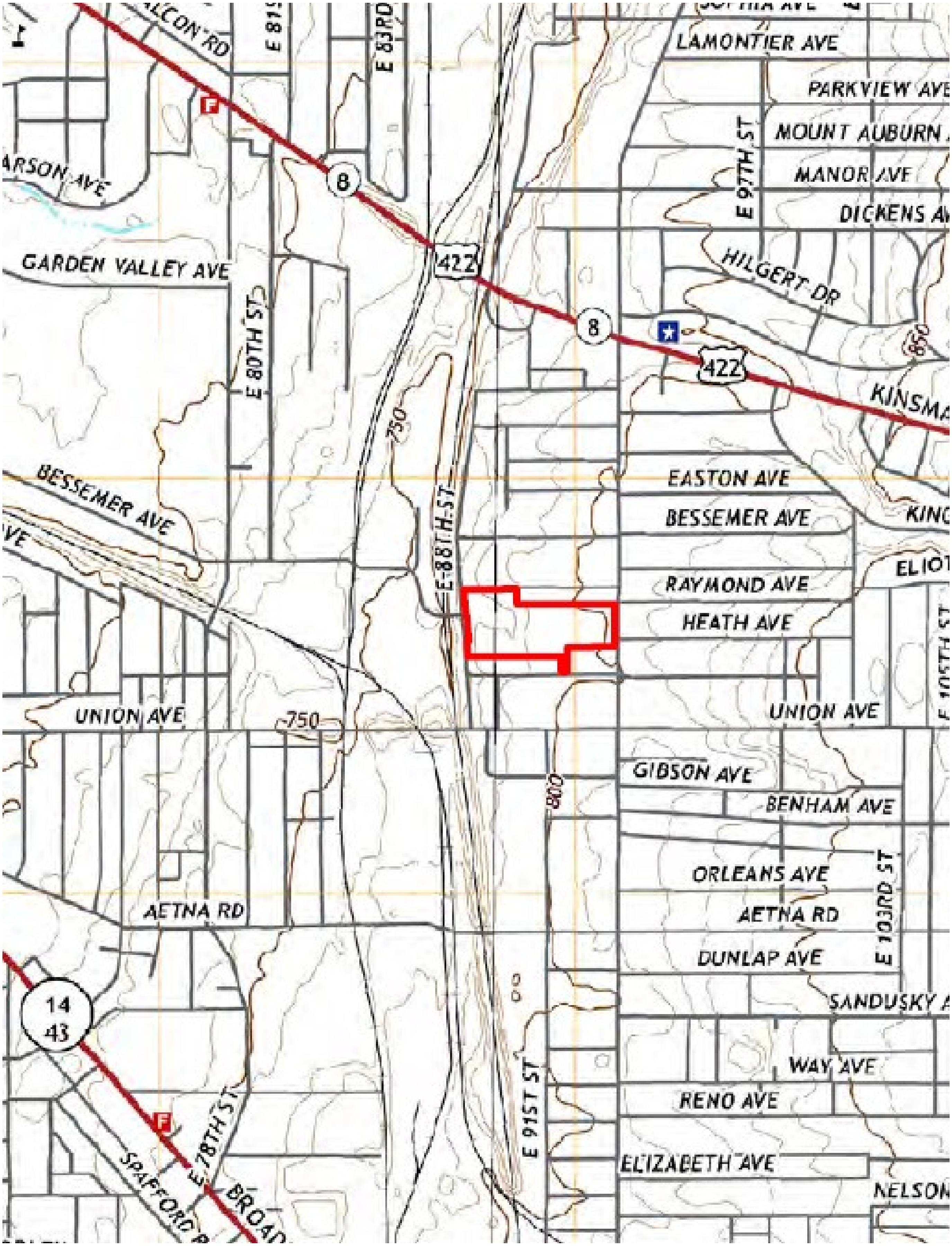

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Figure 1: Subject Property Location – 8920 Laisy Ave & 3420 East 93rd Street

Notes

USGS Quadrangle, The National Map
Shaker Heights, OH 2019

N

NTS

Path: W:\Projects\Projects K-O\ODAS0003\ENGAPPS\GIS\53-Laisy93rd\ODAS0003_53_Samples.mxd

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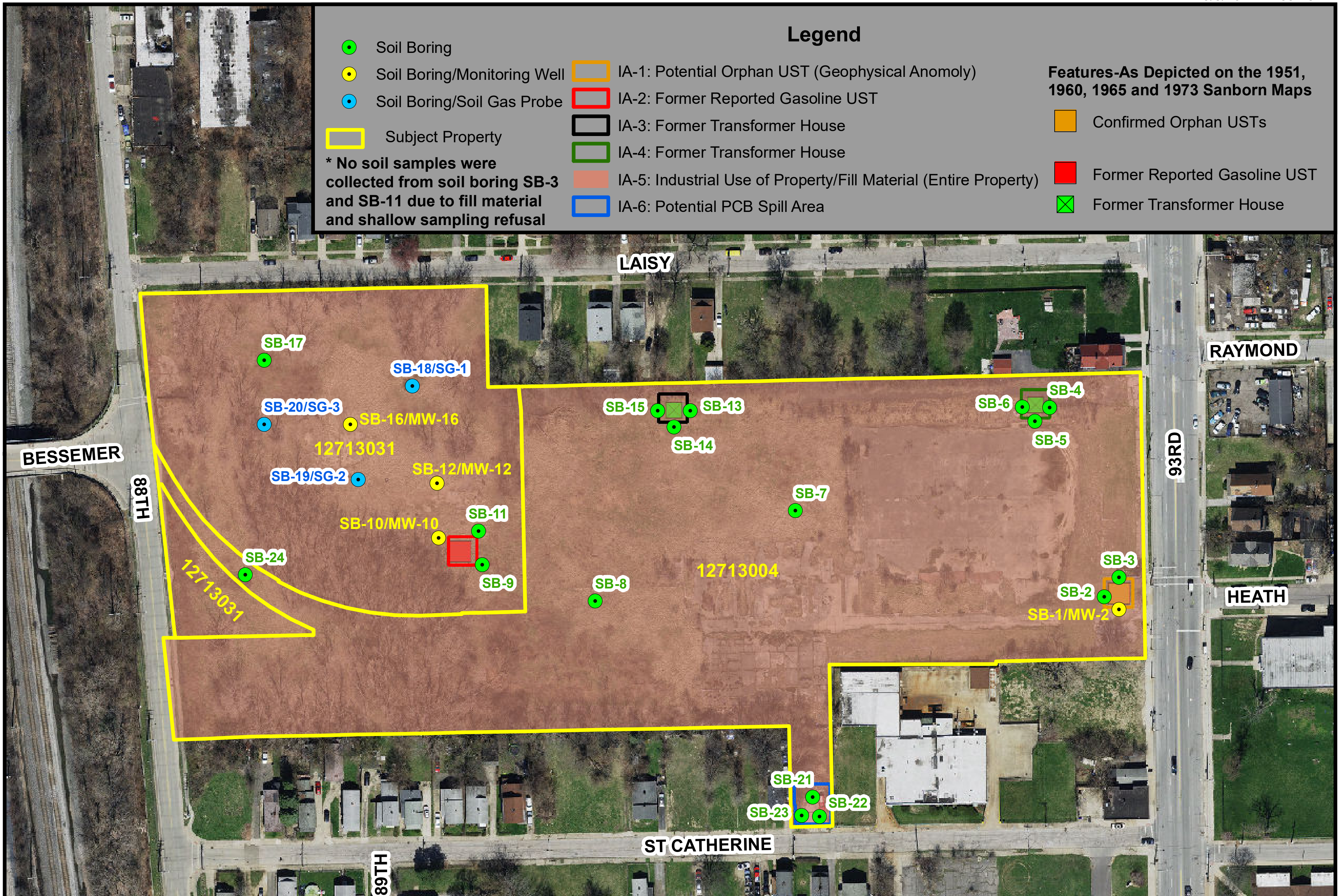

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Figure 2: Sample Location Map
8920 Laisy Avenue & 3420 East 93rd Street
Cleveland, Ohio

Notes

The Cuyahoga county photography, dated April 2023, is provided by OGRIP as part of the Ohio Statewide Imagery Program.

Feet
0 75 150

APPENDIX B
TABLES

Table 1
Groundwater Elevation Data
8920 Laisy Avenue
Cleveland, Ohio

Well	Date	TOC Elevation (feet above msl)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-2	4/25/2024	802.22	6.52	795.70
MW-10	4/25/2024	778.44	5.62	772.82
MW-12	4/25/2024	777.97	4.70	773.27
MW-16	4/25/2024	778.11	9.16	768.95

Table 2
Soil Sample Results - IAs 1 & 2
8920 Laisy Avenue
Cleveland, Ohio

Soil Sample							SB-1 (2-4')	SB-2 (2-4')	SB-9 (0-2')	SB-10 (2-4')
Laboratory ID							24040599-02A	24040599-01A	24040599-12A	24040599-11A
Sample Date							04/10/24	04/10/24	04/11/24	04/11/24
IA							IA-1	IA-1	IA-2	IA-2
Constituent	**CAS #**	**Units**	**Ohio VAP Const/Exc GNS**	**Ohio VAP Comm/Ind GNS**	**BUSTR Closure Action Levels***	**Analytical Method**	**Results**			
Volatile Organic Compounds										
Benzene	71-43-2	mg/kg	1,100	130	0.246	EPA 8260	< 0.0041	< 0.0054	**0.0089**	< 0.0057
Bromomethane	74-83-9	mg/kg	540	76	NA	EPA 8260	< 0.0041	< 0.0054	**0.027**	**0.008**
Carbon disulfide	75-15-0	mg/kg	740	740	NA	EPA 8260	**0.007**	**0.016**	< 0.0072	< 0.0057
Chloromethane	74-87-3	mg/kg	1,300	1,200	NA	EPA 8260	< 0.0041	< 0.0054	**0.11**	**0.1**
Naphthalene	91-20-3	mg/kg	560	230	0.511	EPA 8260	< 0.0041	**0.0083**	< 0.0072	< 0.0057
p-Isopropyltoluene	99-87-6	mg/kg	NA	NA	NA	EPA 8260	< 0.0041	**0.0065**	< 0.0072	< 0.0057
Polycyclic Aromatic Hydrocarbons										
2-Methylnaphthalene	91-57-6	mg/kg	5,800	8,900	NA	EPA 8270	< 0.22	**0.26**	< 0.26	< 0.29
Acenaphthene	83-32-9	mg/kg	290,000	130,000	NA	EPA 8270	< 0.22	**0.30**	< 0.26	< 0.29
Anthracene	120-12-7	mg/kg	1,000,000	670,000	NA	EPA 8270	< 0.22	**0.56**	< 0.26	< 0.29
Benzo(a)anthracene	56-55-3	mg/kg	9,600	610	12	EPA 8270	< 0.11	**0.85**	< 0.13	< 0.14
Benzo(a)pyrene	50-32-8	mg/kg	230	62	1.2	EPA 8270	< 0.11	**0.74**	< 0.13	< 0.14
Benzo(b)fluoranthene	205-99-2	mg/kg	10,000	620	12	EPA 8270	< 0.22	**0.87**	< 0.26	< 0.29
Benzo(g,h,i)perylene	191-24-2	mg/kg	430,000	67,000	NA	EPA 8270	< 0.22	**0.45**	< 0.26	< 0.29
Benzo(k)fluoranthene	207-08-9	mg/kg	100,000	6,200	120	EPA 8270	< 0.22	**0.31**	< 0.26	< 0.29
Chrysene	218-01-9	mg/kg	1,000,000	62,000	1,200	EPA 8270	< 0.22	**0.84**	< 0.26	< 0.29
Dibenzofuran	132-64-9	mg/kg	9,700	4,700	NA	EPA 8270	< 0.22	**0.32**	< 0.26	< 0.29
Fluoranthene	206-44-0	mg/kg	140,000	89,000	NA	EPA 8270	< 0.22	**2.1**	< 0.26	< 0.29
Fluorene	86-73-7	mg/kg	1,200	89,000	NA	EPA 8270	< 0.22	**0.48**	< 0.26	< 0.29
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	10,000	620	12	EPA 8270	< 0.11	**0.32**	< 0.13	< 0.14
Naphthalene	91-20-3	mg/kg	560	230	0.511	EPA 8270	< 0.22	**0.53**	< 0.26	< 0.29
Phenanthrene	85-01-8	mg/kg	1,000,000	670,000	NA	EPA 8270	< 0.22	**2.0**	< 0.26	< 0.29
Pyrene	129-00-0	mg/kg	430,000	67,000	NA	EPA 8270	< 0.22	**1.6**	< 0.26	< 0.29
Total Petroleum Hydrocarbons										
TPH C10-C20		mg/kg	2,000*			EPA 8015B	**91**	**44**	< 17	**61**
TPH C20-C34		mg/kg	5,000*			EPA 8015B	**340**	**240**	**170**	**440**

NA -- No BUSTR Action Level Established for this Constituent
*Represents BUSTR Closure Action Level for Soil Type 1
mg/Kg - milligram per kilogram (ppm)
Highlighted cell indicates constituent above one or more BUSTR Action Level and/or Ohio EPA VAP Standard

Table 3
Soil Sample Results - IAs 3 & 4
8920 Laisy Avenue
Cleveland, Ohio

Soil Sample						SB-4 (0-2')	SB-5 (0-2')	SB-5 (2-4')	SB-6 (0-2')	SB-13 (0-2')	SB-14 (0-2')	SB-14 (10-12')	SB-15 (0-2')
Laboratory ID						24040599-03A	24040599-05A	24040599-06A	24040599-04A	24040835-02A	24040835-03A	24040835-04A	24040835-01A
Sample Date						04/10/24	04/10/24	04/10/24	04/10/24	04/15/24	04/15/24	04/15/24	04/15/24
IA						IA-4	IA-4	IA-4	IA-4	IA-3	IA-3	IA-3	IA-3
Constituent	**CAS #**	**Units**	**Ohio VAP Const/Exc GNS**	**Ohio VAP Comm/Ind GNS**	**Analytical Method**	**Results**							
Inorganics													
Antimony	7440-36-0	mg/kg	970	1,900	EPA 6010B	**1.1**	**2.9**	**0.79**	**3.3**	**2.4**	**3.8**	**1.8**	**3.0**
Arsenic	7440-38-2	mg/kg	760	100	EPA 6010B	**8.8**	**11**	**7.2**	**11**	**3.6**	**13**	**9.3**	**7.9**
Barium	7440-39-3	mg/kg	350,000	760,000	EPA 6010B	**43**	**64**	**100**	**45**	**53**	**62**	**29**	**130**
Beryllium	7440-41-7	mg/kg	3,500	8,800	EPA 6010B	**0.65**	**0.64**	**0.65**	**0.65**	**0.53**	**0.45**	**0.34**	**0.63**
Cadmium	7440-43-9	mg/kg	710	350	EPA 6010B	**0.29**	**2.2**	< 0.25	**0.65**	**0.6**	**1.1**	**0.72**	**1.5**
Chromium III	7440-47-3	mg/kg	920,000	470,000	EPA 6010B	**13**	**16**	**9.7**	**14**	**12**	**14**	**9.1**	**17**
Cobalt	7440-48-4	mg/kg	2,900	1,400	EPA 6010B	**8.2**	**4.5**	**2.6**	**7.1**	**7.2**	**7.0**	**6.3**	**8.4**
Lead	7439-92-1	mg/kg	200	800	EPA 6010B	**23**	**200**	**23.0**	**190**	**32**	**65**	**6.8**	**140**
Mercury	7439-97-6	mg/kg	3.1	3.1	EPA 7471	**0.023**	**0.049**	**0.032**	**0.096**	**0.024**	**0.028**	< 0.013	**0.054**
Nickel	7440-02-0	mg/kg	3,200	52,000	EPA 6010B	**26**	**24**	**8.5**	**21**	**22**	**34**	**25**	**43**
Vanadium	7440-62-2	mg/kg	12,000	23,000	EPA 6010B	**75**	**66**	**82**	**25**	**93**	**53**	**140**	**61**
Zinc	7440-66-6	mg/kg	730,000	1,000,000	EPA 6010B	**78**	**580**	**33**	**110**	**130**	**240**	**58**	**520**
Volatile Organic Compounds													
Bromomethane	74-83-9	mg/kg	540	76	EPA 8260	< 0.0049	< 0.0054	< 0.0052	< 0.0046	< 0.0052	**0.015**	< 0.0054	< 0.0052
Chloromethane	74-87-3	mg/kg	1,300	1,200	EPA 8260	< 0.0049	< 0.0054	< 0.0052	< 0.0046	**0.0084**	**0.014**	< 0.0054	< 0.0052
Toluene	108-88-3	mg/kg	820	820	EPA 8260	**0.0052**	< 0.0054	< 0.0052	< 0.0046	< 0.0052	< 0.0043	< 0.0054	< 0.0052
Semi-Volatile Organic Compounds													
1-Methylnaphthalene	90-12-0	mg/kg	7.1	1.9	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**2.3**
2-Methylnaphthalene	91-57-6	mg/kg	5,800	8,900	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**2.4**
Acenaphthene	83-32-9	mg/kg	290,000	130,000	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**36**
Acenaphthylene	208-96-8	mg/kg	290,000	130,000	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**1.9**
Anthracene	120-12-7	mg/kg	1,000,000	670,000	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**86**
Benzo(a)anthracene	56-55-3	mg/kg	9,600	610	EPA 8270	< 0.11	**0.65**	< 0.13	< 0.12	< 0.13	**0.63**	< 0.12	**210**
Benzo(a)pyrene	50-32-8	mg/kg	230	62	EPA 8270	< 0.11	**0.47**	< 0.13	< 0.12	< 0.13	**0.59**	< 0.12	**160**
Benzo(b)fluoranthene	205-99-2	mg/kg	10,000	620	EPA 8270	< 0.23	**0.81**	< 0.25	< 0.24	< 0.25	**0.80**	< 0.24	**210**
Benzo(g,h,i)perylene	191-24-2	mg/kg	430,000	67,000	EPA 8270	< 0.23	**0.50**	< 0.25	< 0.24	< 0.25	**0.42**	< 0.24	**58**
Benzo(k)fluoranthene	207-08-9	mg/kg	100,000	6,200	EPA 8270	< 0.23	**0.34**	< 0.25	< 0.24	< 0.25	**0.29**	< 0.24	**83**
Carbazole	86-74-8	mg/kg	NA	NA	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**27**
Chrysene	218-01-9	mg/kg	1,000,000	62,000	EPA 8270	< 0.23	**0.68**	< 0.25	< 0.24	< 0.25	**0.64**	< 0.24	**210**
Dibenz(a,h)anthracene	53-70-3	mg/kg	1,000	62	EPA 8270	< 0.11	< 0.12	< 0.13	< 0.12	< 0.13	< 0.12	< 0.12	**17**
Dibenzofuran	132-64-9	mg/kg	9,700	4,700	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**22**
Fluoranthene	206-44-0	mg/kg	140,000	89,000	EPA 8270	< 0.23	**1.5**	< 0.25	< 0.24	< 0.25	**1.4**	< 0.24	**520**
Fluorene	86-73-7	mg/kg	1,200	89,000	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**42**
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	10,000	620	EPA 8270	< 0.11	< 0.12	< 0.13	< 0.12	< 0.13	**0.36**	< 0.12	**58**
Naphthalene	91-20-3	mg/kg	560	230	EPA 8270	< 0.23	< 0.25	< 0.25	< 0.24	< 0.25	< 0.24	< 0.24	**1.7**
Phenanthrene	85-01-8	mg/kg	1,000,000	670,000	EPA 8270	< 0.23	**1.0**	< 0.25	< 0.24	< 0.25	**0.70**	< 0.24	**390**
Pyrene	129-00-0	mg/kg	430,000	67,000	EPA 8270	< 0.23	**1.3**	< 0.25	< 0.24	< 0.25	**1.1**	< 0.24	**370**
Polychlorinated Biphenyls													
Aroclor 1260	11096-82-5	mg/kg	450	28	EPA 8082	< 0.11	< 0.12	< 0.13	< 0.12	< 0.13	**15**	< 0.12	**37**

mg/Kg - milligram per kilogram (ppm)
Highlighted cell indicates constituent above one or more Ohio EPA VAP Standard

Table 4
Soil Sample Results - IA-5
8920 Laisy Avenue
Cleveland, Ohio

Soil Sample						SB-7 (0-2')	SB-7 (10-12')	SB-8 (10-12')	SB-8 (5-7')	SB-12 (0-2')	SB-12 (5-7')	SB-16 (0-2')	SB-16 (6-8')	SB-17 (0-2')	SB-18 (0-2')	SB-19 (0-2')	SB-20 (0-2')	SB-24 (0-2')
Laboratory ID						24040599-07A	24040599-08A	24040599-10A	24040599-09A	24040599-13A	24040599-14A	24040835-05A	24040835-06A	24040835-07A	24040835-10A	24040835-09A	24040835-08A	24040835-11A
Sample Date						04/11/24	04/11/24	04/11/24	04/11/24	04/11/24	04/11/24	04/15/24	04/15/24	04/15/24	04/15/24	04/15/24	04/15/24	04/15/24
IA						IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5	IA-5
Constituent	CAS #	Units	Ohio VAP Const/Exc GNS	Ohio VAP Comm/Ind GNS	Analytical Method	Results												
Inorganics																		
Antimony	7440-36-0	mg/kg	970	1,900	EPA 6010B	1.7	3.0	1.3	5.3	0.8	1.3	18	0.5	1.9	1.4	1.4	1.8	3.3
Arsenic	7440-38-2	mg/kg	760	100	EPA 6010B	6.6	9.1	3.7	9.8	11	11	8.5	5.0	8.6	17	8.4	8.8	9.7
Barium	7440-39-3	mg/kg	350,000	760,000	EPA 6010B	140	73	290	240	34	47	16	12	82	28	30	160	120
Beryllium	7440-41-7	mg/kg	3,500	8,800	EPA 6010B	0.36	0.85	2.1	0.55	0.36	0.52	< 0.25	< 0.21	0.51	0.23	0.22	0.31	0.51
Cadmium	7440-43-9	mg/kg	710	350	EPA 6010B	1.6	0.42	0.80	4.1	0.32	0.39	0.71	0.5	0.8	< 0.23	0.36	1.6	2.1
Chromium III	7440-47-3	mg/kg	920,000	470,000	EPA 6010B	33	16	9.4	54	9.7	12	250	4.6	23	20	7.8	11	15
Cobalt	7440-48-4	mg/kg	2,900	1,400	EPA 6010B	7.3	6.4	< 1.6	< 1.3	4.0	< 1.3	3.6	3.5	6.1	3.8	4.9	3.0	5.1
Lead	7439-92-1	mg/kg	200	800	EPA 6010B	180	51	110	520	15	10	160	5.6	110	19	23	450	250
Mercury	7439-97-6	mg/kg	3.1	3.1	EPA 7471	0.087	0.054	0.026	0.34	0.015	0.021	0.022	0.023	0.3	0.028	0.019	2.2	0.015
Nickel	7440-02-0	mg/kg	3,200	52,000	EPA 6010B	15	27	7.5	19	15	21	190	7.8	41	12	14	11	24
Selenium	7782-49-2	mg/kg	12,000	23,000	EPA 6010B	< 0.70	< 0.74	1.2	< 0.78	< 0.67	< 0.76	< 0.75	< 0.63	< 0.67	< 0.68	< 0.65	< 0.65	< 0.71
Vanadium	7440-62-2	mg/kg	12,000	23,000	EPA 6010B	590	120	670	310	250	110	13	660	120	27	320	550	160
Zinc	7440-66-6	mg/kg	730,000	1,000,000	EPA 6010B	140	130	510	12,000	57	60	1,100	100	150	75	110	270	450
Volatile Organic Compounds																		
Bromomethane	74-83-9	mg/kg	540	76	EPA 8260	< 0.0053	< 0.0052	< 0.0076	< 0.0071	< 0.0050	< 0.0050	< 0.0059	0.34	< 0.0053	< 0.0049	< 0.0045	< 0.0060	< 0.0052
Chloromethane	74-87-3	mg/kg	1,300	1,200	EPA 8260	< 0.0053	< 0.0052	< 0.0076	< 0.0071	< 0.0050	< 0.0050	0.031	< 0.27	< 0.0053	< 0.0049	< 0.0045	< 0.0060	< 0.0052
Tetrachloroethene	127-18-4	mg/kg	170	170	EPA 8260	< 0.0053	< 0.0052	0.03	< 0.0071	< 0.0050	< 0.0050	< 0.0059	< 0.27	< 0.0053	< 0.0049	< 0.0045	< 0.0060	< 0.0052
Toluene	108-88-3	mg/kg	820	820	EPA 8260	< 0.0053	< 0.0052	< 0.0076	< 0.0071	0.0061	< 0.0050	< 0.0059	< 0.27	< 0.0053	< 0.0049	< 0.0045	< 0.0060	< 0.0052
Semi-Volatile Organic Compounds																		
1-Methylnaphthalene	90-12-0	mg/kg	7.1	1.9	EPA 8270	0.87	< 0.25	1.0	0.59	< 0.22	< 0.25	< 0.25	0.33	< 0.23	< 0.23	< 0.23	< 0.23	< 0.24
2-Methylnaphthalene	91-57-6	mg/kg	5,800	8,900	EPA 8270	0.87	< 0.25	1.3	0.57	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	< 0.23	0.26
Acenaphthene	83-32-9	mg/kg	290,000	130,000	EPA 8270	4.5	< 0.25	2.5	2.6	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	1.1	0.33
Acenaphthylene	208-96-8	mg/kg	290,000	130,000	EPA 8270	0.53	< 0.25	0.38	4.1	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	0.24	< 0.24
Anthracene	120-12-7	mg/kg	1,000,000	670,000	EPA 8270	22	< 0.25	9.9	11	< 0.22	< 0.25	< 0.25	< 0.22	0.40	< 0.23	< 0.23	3.2	0.97
Benzo(a)anthracene	56-55-3	mg/kg	9,600	610	EPA 8270	110	0.18	16	39	< 0.11	< 0.13	< 0.13	< 0.11	1.3	< 0.12	< 0.11	9.1	4.7
Benzo(a)pyrene	50-32-8	mg/kg	230	62	EPA 8270	68	0.17	13	40	< 0.11	< 0.13	< 0.13	0.11	1.4	< 0.12	< 0.11	7.4	3.8
Benzo(b)fluoranthene	205-99-2	mg/kg	10,000	620	EPA 8270	110	< 0.25	16	50	< 0.22	< 0.25	< 0.25	< 0.22	1.7	< 0.23	< 0.23	9.5	5.4
Benzo(g,h,i)perylene	191-24-2	mg/kg	430,000	67,000	EPA 8270	38	0.56	4.9	24	0.33	< 0.25	< 0.25	0.29	0.69	< 0.23	< 0.23	5.3	2.6
Benzo(k)fluoranthene	207-08-9	mg/kg	100,000	6,200	EPA 8270	39	< 0.25	6.1	18	< 0.22	< 0.25	< 0.25	0.50	0.64	< 0.23	< 0.23	3.7	2.7
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	160	5,100	EPA 8270	< 0.79	< 0.41	< 0.51	6.6	< 0.37	< 0.42	< 0.42	< 0.37	< 0.38	< 0.38	< 0.38	< 0.38	< 0.40
Butyl benzyl phthalate	85-68-7	mg/kg	590,000	37,000	EPA 8270	< 0.79	< 0.41	< 0.51	< 0.88	< 0.37	< 0.42	< 0.42	< 0.37	< 0.38	< 0.38	< 0.38	< 0.38	2.1
Carbazole	86-74-8	mg/kg	NA	NA	EPA 8270	9.5	< 0.25	2.5	8.5	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	1.3	0.60
Chrysene	218-01-9	mg/kg	1,000,000	62,000	EPA 8270	110	< 0.25	14	36	< 0.22	< 0.25	< 0.25	1.1	1.3	< 0.23	< 0.23	8.8	4.9
Dibenz(a,h)anthracene	53-70-3	mg/kg	1,000	62	EPA 8270	13	< 0.13	1.4	4.2	< 0.11	< 0.13	< 0.13	< 0.11	0.20	< 0.12	< 0.11	1.6	0.61
Dibenzofuran	132-64-9	mg/kg	9,700	4,700	EPA 8270	3.7	< 0.25	2.3	2.1	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	0.57	< 0.24
Fluoranthene	206-44-0	mg/kg	140,000	89,000	EPA 8270	260	0.32	37	92	< 0.22	< 0.25	< 0.25	< 0.22	2.9	< 0.23	< 0.23	19	8.5
Fluorene	86-73-7	mg/kg	1,200	89,000	EPA 8270	3.5	< 0.25	4.5	2.7	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	1.1	0.30
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	10,000	620	EPA 8270	33	< 0.13	4.3	22	< 0.11	< 0.13	< 0.13	< 0.11	0.66	< 0.12	< 0.11	4.3	2.0
Naphthalene	91-20-3	mg/kg	560	230	EPA 8270	1.1	< 0.25	1.7	0.96	< 0.22	< 0.25	< 0.25	< 0.22	< 0.23	< 0.23	< 0.23	0.31	0.25
Phenanthrene	85-01-8	mg/kg	1,000,000	670,000	EPA 8270	93	< 0.25	29	58	< 0.22	< 0.25	< 0.25	0.34	1.7	< 0.23	< 0.23	12	4.6
Pyrene	129-00-0	mg/kg	430,000	67,000	EPA 8270	180	0.26	27	70	< 0.22	< 0.25	< 0.25	3.4	2.3	< 0.23	< 0.23	15	6.9
Polychlorinated Biphenyls																		
Aroclor 1260	11096-82-5	mg/kg	450	28	EPA 8082	1.9	< 0.13	< 0.16	0.79	< 0.11	< 0.13	< 0.13	< 0.11	< 0.12	< 0.12	< 0.11	0.22	0.52

mg/Kg - milligram per kilogram (ppm)
Highlighted cell indicates constituent above one or more Ohio EPA VAP Standard

Table 5
Soil Sample Results - IA-6
8920 Laisy Avenue
Cleveland, Ohio

Soil Sample							SB-21 (0-2')	SB-21 (6-8')	SB-22 (0-2')	SB-23 (0-2')
Laboratory ID							24040920-01A	24040920-02A	24040920-04A	24040920-03A
Sample Date							04/17/24	04/17/24	04/17/24	04/17/24
IA							IA-6	IA-6	IA-6	IA-6
Constituent	**CAS #**	**Units**	**Ohio VAP Residential GNS**	**Ohio VAP Const/Exc GNS**	**Ohio VAP Comm/Ind GNS**	**Analytical Method**	**Results**			
Polychlorinated Biphenyls							*Analyzed, All Non-Detect*			

Table 6
Groundwater Sample Results
8920 Laisy Avenue
Cleveland, Ohio

Monitoring Well						MW-2	MW-10	MW-12	MW-16
Laboratory ID						24041466-01A	24041466-02A	24041466-03A	24041466-04A
Sample Date						4/25/2024	4/25/2024	4/25/2024	4/25/2024
Constituent	**CAS #**	**Units**	**Ohio VAP UPUS**	**BUSTR Drinking Water Action Level**	**Analytical Method**	**Results**			
Inorganics (Total Concentrations)									
Arsenic	7440-38-2	µg/L	10	NA	EPA 6020B	--	--	**6.9**	< 5.0
Barium	7440-39-3	µg/L	2,000	NA	EPA 6020B	--	--	**80**	**36**
Volatile Organic Compounds									
1,2,4-Trimethylbenzene	95-63-6	µg/L	56	15	EPA 8260	**24**	< 5.0	< 5.0	< 5.0
Naphthalene	91-20-3	µg/L	1.2	1.4	EPA 8260	**320**	< 5.0	< 5.0	**14**
n-Butylbenzene	104-51-8	µg/L	1,000	NA	EPA 8260	**5.1**	< 5.0	< 5.0	< 5.0
p-Isopropyltoluene	99-87-6	µg/L	NA	NA	EPA 8260	**10**	< 5.0	< 5.0	< 5.0
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	90-12-0	µg/L	0.0063	NA	EPA 8270	**110**	< 0.14	< 0.192	**15.5**
2-Methylnaphthalene	91-57-6	µg/L	36	NA	EPA 8270	**26**	< 0.14	< 0.192	**16.8**
Acenaphthene	83-32-9	µg/L	530	NA	EPA 8270	**12**	< 0.14	< 0.192	**1.38**
Acenaphthylene	208-96-8	µg/L	520	NA	EPA 8270	**15**	< 0.14	< 0.192	< 0.200
Anthracene	120-12-7	µg/L	1,800	NA	EPA 8270	**3.0**	< 0.14	< 0.192	**0.256**
Carbazole	86-74-8	µg/L	NA	NA	EPA 8270	**13**	< 0.14	< 0.192	< 0.200
Dibenzofuran	132-64-9	µg/L	7.9	NA	EPA 8270	**17**	< 0.14	< 0.192	**0.464**
Fluoranthene	206-44-0	µg/L	800	NA	EPA 8270	**1.8**	< 0.14	< 0.192	< 0.200
Fluorene	86-73-7	µg/L	290	NA	EPA 8270	**21**	< 0.14	< 0.192	**1.81**
Phenanthrene	85-01-8	µg/L	1,700	NA	EPA 8270	**19**	< 0.14	< 0.192	**1.24**
Pyrene	129-00-0	µg/L	120	NA	EPA 8270	**1.1**	< 0.14	< 0.192	**0.216**

NA -- No BUSTR Action Level Established for this Constituent
µg/L - microgram per liter (ppb)
Highlighted cell indicates constituent above Ohio EPA VAP UPUS and/or BUSTR Action Level
-- Sample Not Analyzed for this Constituent

Table 7
Soil Gas Sample Results
8920 Laisy Avenue
Cleveland, Ohio

Constituent	CAS #	Units	U.S. EPA VISL Target Sub-Slab & Near-Source Soil Gas Concentrations - Residential Land Use*	U.S. EPA VISL Target Sub-Slab & Near-Source Soil Gas Concentrations - Commercial Land Use*	Analytical Method	SG-1	SG-2	SG-3	Site Maximum Soil Gas Concentration	Calculated Indoor Air Concentration	Residential VI Carcinogenic Risk (CR)	Residential VI Hazard (HQ)	Commercial VI Carcinogenic Risk (CR)	Commercial VI Hazard (HQ)	Ohio VAP Residential Indoor Air	Ohio VAP Com/Ind. Indoor Air
Laboratory ID						24041473-01A	24041473-02A	24041473-03A								
Sample Date						04/25/24	04/25/24	04/25/24								
Environmental Media						Sub-Slab Vapor										
						Results			**VISL Calculator Screening Level Results**							
Volatile Organic Compounds																
1,1,1-Trichloroethane	71-55-6	μg/m^3	174,000	730,000	EPA TO-15	< 2.73	< 2.73	**2.78**	2.78	0.08	NA	1.60E-05	NA	3.81E-06	5,200	22,000
1,2,4-Trimethylbenzene	95-63-6	μg/m^3	2,090	8,760	EPA TO-15	**4.33**	**3.64**	< 2.46	4.33	0.13	NA	2.08E-03	NA	4.94E-04	63	260
1,3-Butadiene	106-99-0	μg/m^3	31.2	136	EPA TO-15	**0.642**	< 0.442	< 0.442	0.642	0.02	2.06E-07	9.23E-03	4.71E-08	2.20E-03	0.94	4.1
Acetone	67-64-1	μg/m^3	NA	NA	EPA TO-15	**20.7**	**17.7**	**14.4**	20.7	NA	NA	NA	NA	NA	NS	NS
Benzene	71-43-2	μg/m^3	120	524	EPA TO-15	**9.04**	< 1.60	< 1.60	9.04	0.27	7.53E-07	8.67E-03	1.72E-07	2.06E-03	3.6	16
Carbon disulfide	75-15-0	μg/m^3	24,300	102,000	EPA TO-15	**9.71**	**14.4**	**2.34**	14.4	0.43	NA	5.92E-04	NA	1.41E-04	730	3,100
Chloroform	67-66-3	μg/m^3	40.7	178	EPA TO-15	< 0.976	**4.2**	< 0.976	4.2	0.13	1.03E-06	6.20E-02	2.36E-07	1.48E-02	1.2	5.3
Cyclohexane	110-82-7	μg/m^3	209,000	876,000	EPA TO-15	**36.3**	**7.68**	< 1.72	36.3	1.09	NA	1.74E-04	NA	4.14E-05	6,300	26,000
Dichlorodifluoromethane	75-71-8	μg/m^3	3,480	14,600	EPA TO-15	**4.01**	< 2.47	**2.82**	4.01	0.12	NA	1.15E-03	NA	2.75E-04	NS	NS
Ethylbenzene	100-41-4	μg/m^3	374	1,640	EPA TO-15	**8.51**	< 2.17	< 2.17	8.51	0.26	2.27E-07	2.45E-04	5.20E-08	5.83E-05	11	49
Heptane	142-82-5	μg/m^3	13,900	58,400	EPA TO-15	**19.6**	**11.6**	< 2.05	19.6	0.59	NA	1.41E-03	NA	3.36E-04	NS	NS
Hexane	110-54-3	μg/m^3	24,300	102,000	EPA TO-15	**61.4**	**29.9**	**3.7**	61.4	1.84	NA	2.52E-03	NA	6.01E-04	730	3,100
Naphthalene	91-20-3	μg/m^3	27.5	120	EPA TO-15	**1.63**	**1.73**	**1.15**	1.73	0.05	6.28E-07	1.66E-02	1.44E-07	3.95E-03	0.83	3.6
Propene	115-07-1	μg/m^3	104,000	438,000	EPA TO-15	< 0.861	**11.1**	< 0.861	11.1	0.333	NA	1.06E-04	NA	2.53E-05	NS	NS
Toluene	108-88-3	μg/m^3	174,000	730,000	EPA TO-15	**18.4**	**2.45**	< 1.88	18.4	0.55	NA	1.06E-04	NA	2.52E-05	5,200	22,000
Trichlorofluoromethane	75-69-4	μg/m^3	NA	NA	EPA TO-15	**8.32**	< 2.81	**13.4**	13.4	NA	NA	NA	NA	NA	NS	NS
Xylenes	1330-20-7	μg/m3	3,480	14,600	EPA TO-15	**70**	**2.21**	<4.34	70	2.1	NA	2.01E-02	NA	4.79E-03	100	440
										Cummulative CR/HQ	2.84E-06	0.12	6.51E-07	0.03		
										Target CR / HQ	1E-05	1	1E-05	1		

NS -- No Ohio VAP Standard available. Constituent is not a hazardous or petroleum-related substance as defined by the VAP statute (ORC 3746.01)
μg/m^3 - microgram per cubic meter
VI - vapor intrusion
VISL - Vapor Intrusion Screening Level
CR - Carcinogenic Risk
HQ - Hazard Quotient for Non-Carcinogens
IUR - Inhalation Unit Risk
NA - Not Applicable (constituent not included in VISL Calculator program)
*Represents VISL using Target Cancer Risk of 1E-05 and Target Hazard Quotent of 1.0

Table 8
Quality Assurance / Quality Control
8920 Laisy Avenue
Cleveland, Ohio

Lab	ALS	ALS	ALS	ALS	ALS
SDG	24040599	24040835	24040920	24041466	24041473
Collection Date(s)	4/10/24 - 4/11/24	04/15/24	04/17/24	04/25/24	04/25/24
Collected by	MSG	MSG	MSG	MSG	MSG
Matrix	Soil	Soil	Soil	Water	Soil Vapor
Chain of Custody	Ok	Ok	Ok	Ok	Ok
Cooler Temperature	4.4 °C	2.1 °C	3.3 °C	2.3 °C	NA
Sample Preservation	Ok	Ok	Ok	Ok	Ok
Custody Seals	No	No	No	No	No
Bottles	Lab Provided	Lab Provided	Lab Provided	Lab Provided	Lab Provided
Case Narrative	QC sample results for this data met laboratory specifications.	QC sample results for this data met laboratory specifications.	QC sample results for this data met laboratory specifications.	QC sample results for this data met laboratory specifications.	QC sample results for this data met laboratory specifications.
Lab Statement of Quality	VAP Certified	VAP Certified	VAP Certified	VAP Certified	VAP Certified
Holding Times met?	Yes	Yes	Yes	Yes	Yes
Proper Methods	Yes	Yes	Yes	Yes	Yes
Reporting Limits acceptable	Yes	Yes	Yes	Yes	Yes
Surrogate recoveries within limits	Batch 98168, Method 8015_DRO_S, Sample 24040599-02C: Surrogate failure due to sample matrix.	Batch 98342, Method 8270_SVOC_S, Sample 24040835-09B: Select surrogate spike recoveries fall outside of quality control limits due to sample matrix interference.	Yes	Yes	Yes
Blanks	Method Blanks Non-Detect	Method Blanks Non-Detect	Method Blank Non-Detect	Method Blank Non-Detect	Method Blank Non-Detect
Duplicates	None	Yes	None	None	None
LCS within limits?	In Control	In Control	In Control	In Control	In Control
MS/MSD within limits?	Batch 98168, Method 8015_DRO_S, Sample 24040616-24BMS/MSD: MS/MSD failure due to hydrocarbons.	Batch 98340, Method 8082_PCB_S, Sample 24040838-07AMS: 1260 failed due to the presence of PCB's in the sample.	Batch 98340, Method 8082_PCB_S, Sample 24040838-07AMS: 1260 failed due to the presence of PCB's in the sample.	Yes	NA
MS/MSD client generated?	No	No	No	No	NA
Overall Quality	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

MB - Method Blank
ND - Non Detect
FB - Field Blank
PQL - Practical Quantification Limit
RPD - Relative Percent Difference
LCS - Laboratory Control Sample
MS/MSD - Matrix Spike / Matrix Spike Duplicate