ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

Former Exide Corporation

303 Water Street

Logansport, IN

Indiana Brownfields Program / IFA RLF #4B-00E3232-0
Indiana Brownfields Site # 4221108
State Cleanup Site # 0000971
BCA Project No. 23-227

May 6, 2024

BCA™ Environmental Consultants

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Contents

List of Abbreviations

BCA	BCA Environmental Consultants, LLC
BGS	Below Ground Surface
CAHs	Chlorinated Aliphatic Hydrocarbons
CV	Conduit Vapor
CVOCs	Chlorinated Volatile Organic Compounds
EC	Engineering Control
EPA	United States Environmental Protection Agency
ERC	Environmental Restrictive Covenant
ESA	Environmental Site Assessment
GPM	Gallons per Minute
GPS	Global Positioning System
GW	Groundwater
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HHL	Human Health Level (replaced by PLs)
IC	Institutional Control
IDEM	Indiana Department of Environmental Management
LCS	Laboratory Control Standard
mg/kg	milligrams per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MTGW	Migration to Groundwater – from IDEM 2012 Remediation Closure Guide
PID	Photo-Ionization Detector
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RbCG	Risk-based Closure Guide
RbCG EDC-PL	Excavation Direct Contact Published Level (Soil)
RbCG IDC-PL	Commercial/Industrial Direct Contact Published Level (Soil)
RbCG RD-PL	Residential Direct Contact Published Levels (Soil)
RbCG RGWPL	Residential Groundwater Published Level (Groundwater)
RbCG V PL	Vapor Exposure Published Levels (Soil Gas, Indoor Air)
RCRA	Resource Conservation and Recovery Act
RECs	Recognized Environmental Conditions
RPD	Relative Percent Difference
RoW	Right of Way
SAP	Sampling and Analysis Plan
SGe	Exterior Soil Gas
SGss	Sub-slab Soil Gas
SLs	Screening Levels (replaced by PLs)
SOP	Standard Operating Procedures
SVOCs	Semi-Volatile Organic Compounds
ug/kg	micrograms per kilogram
ug/L	micrograms per Liter
USCS	Unified Soil Classification System
USTs	Underground Storage Tanks
VFC	IDEM Virtual File Cabinet
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds
WHPA	Well Head Protection Area

Analysis of Brownfields Cleanup Alternatives – Preliminary Evaluation

Former Exide Battery Facility
303 Water Street, Logansport, IN 46947
Indiana Brownfields Site: 4221108
State Cleanup Site: 0000971

1.0 INTRODUCTION

This Analysis of Brownfield Cleanup Alternatives (ABCA) outlines environmental cleanup alternatives that were evaluated for federally funded remediation work to be conducted at the former Exide Battery Facility located at 303 Water Street, Logansport, Cass County, Indiana (project area/site). This project will help mitigate blight and facilitate redevelopment for the City of Logansport.

The ABCA, required by the U.S. Environmental Protection Agency (U.S. EPA), was prepared in cooperation among the Indiana Finance Authority (IFA)/Indiana Brownfields Program (IBP), the City of Logansport (City), and BCA Environmental (BCA) contracted by IBP/City. The City will utilize U.S. EPA brownfield funding – Revolving Loan Fund (RLF) subgrant from the IFA through the IBP provided to the City of Logansport Storm Water District – to conduct remediation of hazardous substances (lead (Pb) in soils and trichloroethene (TCE) in soil and groundwater) at a portion of the project area. Cleanup will help revitalize approximately 17 acres of blighted property northwest of downtown Logansport, Indiana. The City intends to redevelop the project area/site for municipal and commercial / light industrial use.

The ABCA is prepared in accordance with the public notice requirements of the IFA Brownfield Cooperative Agreement with the U.S. EPA (RLF #4B-00E3232-0).

2.0 BACKGROUND

The Former Exide Corporation site is located at 303 Water Street, in Logansport, Indiana (Subject Site). The Subject Site is composed of a 17.41-acre parcel identified as: #09-17-56-100-001.000-010. The Subject Site is owned by the City of Logansport and is currently a vacant lot.

The surrounding area is mixed use industrial and residential properties (Figure 1). The foundation and slab remaining from the former Exide manufacturing facility covers most of the northern half of the Subject Site. The Site is located on the south side of Water Street, between Aster Street and residential properties to the west and commercial properties to the east. The former Logansport & Eel River Short Line railroad (abandoned) adjoins along the south side of the Site with the former Trelleborg Automotive property beyond. Residential and commercial properties are located to the north across Water Street.

The Subject Site operated as a rail yard and was part of the Terre Haute & Indianapolis Railroad – Vandalia Line from at least 1885 – 1930s. Former railroad operations associated with the Subject Site included rail sidings and maintenance facilities (roundhouse). The Site operated as the National Steel Construction Company – Logansport Plant, manufacturers of steel products from at least 1949 to the late 1950's. General Tire reportedly operated the plant until it was purchased by Exide in 1959. Exide operated the

Site as a lead-acid storage battery manufacturing facility for the automotive industry from about 1960 to approximately 1989, before fully shutting down in 2009. The former building was demolished in 2016 and has since been vacant.

The Site is currently owned by the City of Logansport. Site contacts are:

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3.0 FORECASTED CLIMATE CONDITIONS

According to the US Global Change Research Program (USGCRP), climate trends for Indiana and the Midwest region of the United States include increased warming in winter and spring months, with a general lack of summer warming. Spring and summer precipitation has generally been above average since the 1990s, and severe flooding and drought have occurred periodically in recent years (Indiana State Climate Summary 2022). Some of these factors, most specifically increased precipitation that may affect flood waters and stormwater runoff, are most applicable to the cleanup of the site.

According to FEMA Flood Zone Maps, the Site is located in an area of minimal flood hazard (Appendix A). However, greater storm frequency and intensity in a changing climate may result in more frequent and more powerful flood waters within the Eel River, which may result in changes to the flood zone and increased risk of flooding of the Site.

Residential areas to the west, Water Street to the north, and the commercial property to the east are all serviced by City storm drains. The natural land gradient in the surrounding area slopes gently to the southwest. Stormwater falling onsite typically flows south-southwest to grassy areas where it will infiltrate into to soil. Under current Site conditions, increased precipitation and extreme weather could result in additional stormwater runoff and potential erosion to the Site from the mostly impermeable concrete slab.

Based on the nature of the Site and its proposed reuse, changing temperature, increased precipitation, flooding and/or drought, and changing dates of ground thaw/freezing are not likely to significantly affect the Site.

4.0 ENVIRONMENTAL INVESTIGATIONS AND RESULTS

4.1 Phase I ESA

A Phase I Environmental Site Assessment (ESA) of the Subject Site was conducted for the City of Logansport, by BCA Environmental Consultants, LLC (BCA), dated September 25, 2020. The Phase I ESA was funded through a U.S. EPA Brownfield Assessment Grant to the City of Logansport (Cooperative Agreement No. BF-00E02313). The Phase I ESA identified the following recognized environmental conditions (RECs):

- The Subject Site had been used as a rail maintenance yard and rail lines for over 60 years. There is minor risk of spillage from railroad operations along the main lines and sidings.
- Coal ash and cinders (CAC) were observed on the ground surface along the southern fence line of the Subject Site.
- Herbicides were commonly used on rail lines to control vegetation.
- Former operations as a steel product manufacturer from about 1948 to 1959
- Former operations as lead-acid battery manufacturing facility from 1960 until 1989.
- Lead impacts have been found in surface soils on and around the perimeter of the Site.

4.2 Phase II ESA

A Phase II ESA of the Subject Site was conducted by BCA for the City of Logansport, with the report dated June 1, 2021. The investigation was also funded through the EPA Grant (Cooperative Agreement No. BF-00E02313). The Phase II identified shallow soil (0-4' depths) impacts from lead, exceeding the IDEM Remediation Closure Guide (RCG) industrial direct contact screening level (IDC SL) and excavation direct contact SLs (ExDC SL or ESL) in 18 sampled locations throughout the Site, including samples collected from within historical excavation/remediation areas. Trichloroethene (TCE) was detected in groundwater samples exceeding the RCG Industrial Vapor Intrusion Groundwater Screening Level (I-VIGWSL) at one location and exceeded the RCG Residential VIGWSL at a second (VIGWSLs are no longer applicable for closure). The two probes were located near the eastern property line away from the historical production area and the groundwater flow is likely to the south or southeast. An auto repair facility is located to the north across Water Street and a Pepsi distribution site adjoins Exide to the east. Neither was identified in the Phase I ESA as a REC for chlorinated solvents, but both are potential sources or contributors (in addition to historical Exide operations) to the TCE. Several groundwater samples exceeded the RCG RGSL for lead in the unfiltered samples. Field filtered samples from 5 of the sampled locations were analyzed for lead and exceeded the RCG RGSL in four (4) of those samples. Recommendations based on the results of the Phase II ESA included:

- Determine the extents of lead in excess of the RCG ESLs identified in the shallow soils.
- Install permanent monitoring wells to confirm the presence or absence of lead and arsenic in the groundwater.
- Remove/remediate lead impacted soils within the area defined by samples SS-1 – SS-9.
- Investigate further the TCE identified in the groundwater samples from the east end of the Subject Site.

- Establish use restrictions on the property to eliminate potential pathways of exposure to impacted soil and groundwater.

4.3 Supplemental Phase II ESA

A Supplemental Phase II ESA of the Subject Site was conducted by BCA for the City of Logansport, with the report dated August 15, 2022. The investigation was funded through the EPA Grant (Cooperative Agreement No. BF-00E02875). The Supplemental Phase II included advancing 21 soil and groundwater probes and five (5) permanent monitoring wells on the Subject Site at locations based on the recommendations of the Phase II ESA and to delineate the extent of the impacts. Soil samples were collected from each boring location, and groundwater was sampled from the six (6) designated probe and five (5) monitoring well locations. Soil was analyzed for lead by EPA Method 6010, and groundwater samples were analyzed for VOCs by EPA Method 8260, and lead and arsenic by EPA Method 6010. Based on field observations made and XRF screening during the Phase II activities, twenty-two (22) surface soil samples were also collected and analyzed for lead only. Acidic odors and discoloration of the gravel and surface was noted at and around the former Acid Charge Area during the May 25, 2022, site visit. Soil pH was tested on three samples.

Shallow sub-surface and surface soils at some locations on the eastern portion and the northern edge and along the Water Street right-of-way are impacted by metals and are above the RCG RDCSL for lead in several locations. Surface and shallow sub-surface soils in areas of the former battery manufacturing operations are impacted by lead in excess of the RCG ESL at one location near the southern fence.

Groundwater exceeded the former residential VIGWSL for TCE in one location, and the RCG RGWSL at one location near the northeastern property line. In addition to on-site sources, off-site operations could potentially have contributed to the TCE. However, borings SB-21 and SB-22, located to the northeast and northwest of SB-23 and MW-5 in the upgradient direction, were below detection limits for VOCs, suggesting that migration from an upgradient, off-site source is unlikely.

Although field observations of the Acid Charge Area suggested impacts, the soil pH at one location did not show significant impact. However, acid impacts at other locations nearby cannot be ruled out. Recommendations based on the results of the Supplemental Phase II ESA included:

- Determine the extents of lead in excess of the RCG ESLs identified in the shallow soils defined by sample SB-30.
- Further delineate the extent of lead in soils near and beneath the footprint of the building.
- Investigate further the TCE identified in the groundwater samples from the northeast end of the Subject Site.

Further characterize the possible acid release at and around the Acid Charge Area.

4.4 2nd Supplemental Phase II ESA

Based on the results of the 2022 Supplemental Phase II ESA, a 2nd Supplemental Phase II ESA of the Subject Site was conducted by BCA for the City of Logansport, with the report dated November 8, 2022. The

subsurface investigation included installing 26 shallow soil gas samplers to investigate further the TCE identified in the groundwater samples from the northeast end of the Subject Site, at or near a former loading dock area. The investigation also included advancing seven (7) soil probes on the Subject Site to attempt to identify the source of the VOCs and to further delineate the lead impacts identified in the 2021 Phase II and 2022 Supplemental Phase II ESAs.

Based on the results of the soil gas survey, four (4) soil probes (HS-1 through HS-4) were located within the soil gas hot spots and the collected soil samples were analyzed for VOCs by EPA Method 8260. The remaining three (3) soil probes (SB-42 through SB-44) were located in the area between SB-8, SB-26, and SB-28 where no sample data was collected during the previous investigations, and soil samples analyzed for lead by EPA Method 6010. In addition to the probes, three (3) surface material samples were collected from the former Acid Charge Area and analyzed for pH via method 9045C. The analytical results were compared to IDEM's R2 Residential Direct Contact (RDC), Commercial/Industrial Direct Contract (IDC), and Excavation Direct Contact (EDC) HHLs (RbCG Risk Screening Table, Table 1: Human Health Levels - 2022).

TCE was detected above the R2 Residential SGe HHL in three of the 23 shallow soil gas sample locations, exceeded the Industrial SGe HHL in one location, and the Large Industrial SGe HHL in one location. TCE was also detected above the industrial Sub-slab Soil Gas (SGss) HHL in one SGss location, situated approximately 60 feet away from the highest TCE concentration in the SGe samples, but still in the former loading dock area. The two locations may be independent hotspots, or they may represent a single continuous source area.

Field screening of the subsequent soil probes HS-1 through HS-4 suggested the presence of VOCs in the soil cores from HS-1 at 0-2' and 5-6'. TCE was found to exceed the R2 IDC HHL in the soil samples from HS-1 (2') and HS-1 (6'). Boring HS-1 was located within 2 feet of the SGe point where TCE was above the R2 Large Industrial SGe HHL. Several VOCs, including c-DCE, PCE, 1,1,1-TCA, and 1,1,2-TCA were detected above IDEM's former RCG migration to groundwater screening levels. Many of these compounds, particularly 1,1,1-TCA, were detected in the soil gas samples as well. HS-1 was located along the south side of a former loading dock area. Although the TCE soil gas concentrations at the SGss point are similar to those at the high SGe point, soil concentrations are likely much lower since the concrete slab often causes higher soil gas concentrations, it was concluded that the TCE soil concentration at HS-1 likely do not extend far.

Surface and shallow sub-surface soils showed lead impacts exceeding the R2 RDC HHL in the soil sample from SB-42 (1.0 – 2.0'), the IDC HHL in the soil sample from SB-42 (0-1.0'), and the EDC HHL in the samples from SB-43 (1.0-2.0'), SB-44 (0-1.0'). The data closed a data gap from previous investigations.

Field evidence of staining and odor suggested possible acid impacts throughout the former Acid Charge Area. Samples collected of the flooring material of the former Acid Charge Area (AC-1, AC-2, and AC-3) were analyzed for pH by the laboratory. Two of the three samples showed lowered pH levels, indicating impacts from residuals from the acid charge activities are present.

Recommendations based on the results of the 2nd Supplemental Phase II ESA included:

Develop a Remediation Work Plan (RWP) to:

- Remove / remediate lead impacted soils in excess of the RCG ISL to facilitate commercial redevelopment.
- Remove / remediate TCE impacted soils
- Monitor and/or remediate groundwater to the extent necessary.
- Remove acid impacted building materials.
- Establish use restrictions on the property to eliminate potential pathways of exposure to residual impacted soil and groundwater.
- Establish use restrictions on the property to eliminate potential vapor exposure pathways

4.5 3rd Supplemental Phase II ESA / Additional Soil Delineation

A 3rd Supplemental Phase II ESA was conducted on the Subject Site was conducted by BCA for the City of Logansport with a report dated April 5, 2024 to further delineate the extents of lead and TCE hotspots which will require remediation. Fieldwork was completed in two phases, the first occurring in late August to early September, and the second in early November 2023. The first phase included two (2) sewer gas samples, six (6) sub-slab soil gas samples, 48 soil probes, and 43 surface soil samples, while the second phase of this investigation included 54 soil probes and four (4) groundwater samples.

Sewer gas samples were collected from two manhole locations to the east and northeast of the Subject Site and were analyzed for VOCs by EPA method TO-15 LL. Sub-slab soil gas samples were collected at 20-foot step-outs from SGss-1 where TCE exceeded the commercial / industrial sub-slab HHL in the previous investigation, and west of the TCE hotspot at HS-1. Sewer gas samples were all below HHLs while two sub-slab samples exceeded the large commercial/industrial soil gas HHL, suggesting that a secondary TCE hotspot is present to the northwest of the loading dock area.

Groundwater samples were collected from four (4) locations (3 temporary / 1 permanent monitoring wells) to further define the areas impacted by TCE. TCE was found in all groundwater samples exceeding the R2 PLs with the highest located at the HS-5 hotspot (468 ug/L). PCE also slightly exceeded the R2 PLs at this location.

Results of soil sampling indicate that the TCE soil hotspot at HS-1 does not appear to be extensive in size and does not extend more than 10 feet laterally. TCE was also found to be present in the soil at HS-5, located approximately 100 feet to the north-northwest of HS-1. Soil and soil gas samples in between these two locations do not show exceedances of TCE, confirming that HS-5 is a secondary, independent hotspot. In the 2nd phase of the investigation, 20’ step out samples were collected around HS-5, and the northern and eastern probes were found to be free of TCE contamination. The soil sample from HS-5 20’W (3’) contained TCE at 1040 mg/kg, exceeding the R2 EDC PL, however samples from 4.5’ and 6’ bgs were both well below all R2 PLs. Further samples around HS-5 20’W were not collected, so delineation remains incomplete at this location, and the full extent of chlorinated compounds near HS-5 remains unknown.

To further the delineation for lead in the shallow soils, Initial samples in the first phase were placed around several hotspots found in previous Phase II investigations, however sample results suggested these hotspots were more extensive than previously thought. In the second phase, soil samples were collected to fill in gaps and provide better sample density throughout the area south of the former building footprint. In total, about 750 soil samples were screened by a handheld XRF device, and 291 of those samples were analyzed for lead. Of the 291 samples, 103 exceeded the RbCG IDC HHL (800 mg/kg) and 86 exceeded the RbCG EDC HHL (1,000 mg/kg).

Areas to the east and northeast of the former building footprint were consistently above 1,000 mg/kg (in the top 12 to 18" bgs) and often much higher, with the average for this area exceeding 5,000 mg/kg. A large swath of the grassy area south of the building footprint is also impacted to a lesser extent. Shallow soils in these areas vary from a few hundred mg/kg up to about 5,000 mg/kg in the top 12" to 18", with an average closer to about 2,000 mg/kg. The soils underneath the concrete slab at the southwest corner have also been found to be impacted by lead to about 5 feet bgs at highly variable levels ranging from a few hundred mg/kg up to a high of 40,500 mg/kg in one of the step-out samples around SB-9.

A total of 34 of the above soil samples were also analyzed for TCLP lead where lead total results varied from a low of 804 mg/kg up to 46,000 mg/kg. Of those TCLP samples, 23 exceeded the 5.0 mg/L threshold for characteristic hazardous waste. All samples over 1540 mg/kg total lead failed TCLP while all samples under 1380 mg/kg passed TCLP. Four (4) of the five (5) samples from 1380 to 1540 mg/kg passed TCLP.

4.6 Hydrogeology Investigation Results

At sampling locations where parent CAH compounds (TCE and 1,1,1-TCA) were found, daughter products (c-DCE, VC, 1,1-DCA and 1,1-DCE) were also detected, although at low to trace concentrations. The presence of daughter products indicates biological reductive dechlorination could be occurring and suggests that natural attenuation could be an effective remediation method.

No permeability study has been conducted on any of the wells within the monitoring well network. However, almost all of the monitoring wells have enough permeability to sustain low-flow sampling, indicating at least moderate permeability. Based on flow rates and draw-down data collected during low-flow sampling throughout the monitoring well network, horizontal permeability (k_h) is estimated to range from 10^{-4} to 10^{-5} cm/sec in the unconsolidated aquifer system.

The following chart summarizes well installation history:

Well Number	Date Installed	Depth	Notes
MW-1	3/31/2022	16.18'	GeoProbe Direct Push Rig
MW-2	3/31/2022	14.30'	GeoProbe Direct Push Rig
MW-3	3/31/2022	14.95'	GeoProbe Direct Push Rig
MW-4	3/31/2022	13.00'	GeoProbe Direct Push Rig
MW-5	3/31/2022	11.80'	GeoProbe Direct Push Rig

4.7 Data Quality Assessment

During Site investigation activities, all soil and groundwater samples were placed on ice and hand-delivered to the analytical laboratory within 24 to 72 hours. Pursuant to EPA Method 5035A (terra core samplers), soil samples for VOC analysis were stored on ice and frozen within 48 hours of collection. EPA Method 5035A/8260 (VOCs), EPA Method 8270SIM (PAHs), EPA Methods 6010B, 7470, 7471 (metals), and EPA Method TO-15 were the primary analyses conducted for the on-site investigations.

QA/QC reports are included with, and the results of QA/QC samples are discussed in detail in each of the investigation reports. The results of the field duplicates and field equipment blanks are included in the appropriate data summary tables. The groundwater sampling results generally showed high precision based on low field duplicate RPD. Low matrix interference was indicated by acceptable MS/MSD recoveries and low carry-over interference from field equipment blanks (usually no detections).

4.8 Data Quality Objectives

The DQOs include acceptable precision (based on field duplicate RPD), acceptable matrix interference based on acceptable MS/MSD recoveries, low blank interference based on field equipment and trip blanks and good sensitivity based on analytical reporting limits at or below the RCG SLs. DQOs were generally met on investigation data sets.

5.0 PROJECT CONCEPTUAL MODEL

5.1 Physical Setting/Subsurface Conditions

As estimated from the U.S. Geologic Survey Logansport Indiana Quadrangle Map (1972, photo-revised 1980; C.I. = 10 feet), the elevation of the site is approximately 600 feet above mean sea level (ft MSL). The Subject Site is situated on relatively level terrain. Surface drainage in the area of the Subject Site is to the south and southeast toward the Wabash and Eel Rivers, located approximately 0.5 and 0.75 miles to the south and southeast.

5.1.1 Soils

The soil under the Subject Site is mapped as belonging to a single soil type:

- Gilford loam, gravelly substratum (Gg) with 0 to 2 percent slopes, covering 100% of the site (Web Soil Survey, 2022). The Gilford series soils consist of deep, poorly drained, gently sloping soils situated in depressions on outwash plains, formed from loamy outwash over sandy and gravely outwash. (Web Soil Survey, 2022)

5.1.2 Surficial Geology

The area of the Subject Site is located approximately on the border between the two physiographic provinces known as the Tipton Till Plain and the Steuben Lacustrine Plain of the Northern Moraine and Lake Region (Fenelon, et al, 1994). The landforms encountered in the area around the Subject Site are glacially or post-glacially derived. The relief around the area tends to reflect the Steuben Lacustrine Plain in the form of till knobs or kame knobs, as much of the Steuben Lacustrine Plain province consists of kame complexes. The kames are comprised of ice-contact sand and gravel deposits. The bedrock physiographic province is known as the Bluffton Plain (Fenelon, et al, 1994).

The unconsolidated deposits are predominantly outwash deposits (Gray, 1989). These Wisconsinan age glacial outwash deposits are comprised of sand and gravel deposits of the Atherton Formation (Gray, 1989). It is reported up to eighty feet of unconsolidated sediments overlie the bedrock in the Logansport area. However, refusal, likely bedrock, has been encountered at depths ranging from 11.5 to more than 20 feet at the Subject Site.

5.1.3 Bedrock Geology

The bedrock geology of the area is recognized as part of the Wabash Formation (Gray, et al, 1987). The Wabash Formation is comprised of limestone, dolomite, and argillaceous dolomite, which is Silurian in age (Fenelon, et al, 1994).

5.1.4 Hydrology

The Subject Site is located within the hydrogeologic province of the Upper Wabash River Basin, which is considered to be the largest water management basin in Indiana (Fenelon, et al, 1994). The main tributary of the area is the Upper Wabash River. There are minor tributaries associated with the basin, more specifically, as located in Logansport, is the Eel River. Three aquifers have been identified in the area around Logansport: a surficial sand and gravel aquifer; buried sand and gravel aquifer; and a carbonate bedrock aquifer (Fenelon, et al, 1994). The City of Logansport is served by a public water supply. Static water level in the area is approximately 21 feet to 24 feet BGS (Fenelon, et al, 1994).

5.1.5 Subject Site Physical Observations

Based on the probes the soils on the site are silty and sandy clays grading to sand and gravel generally starting around 2.0 – 5.0 feet BGS. Refusal, likely bedrock, was encountered at about 11 – 13.0 feet BGS in most locations (SB-GW-25, SB-GW-23, SB-GW-21, SB-GW-22, SB-GW-24, MW-4, and MW-5) and around 14 - 20 feet BGS at all other probe locations (SB-GW-26, MW-1 through MW-3). Water levels collected from the temporary monitoring well network during previous investigations indicate static water levels between 5.80 and 7.45 feet BGS throughout the Site. Groundwater flow at the Subject Site is estimated to be to the southwest toward the Wabash River.

5.2 Surrounding Land Use

The surrounding area is mixed use commercial and residential properties. The Site is located on the south side of Water Street, between Aster Street to the west and a commercial property to the east. The former Logansport & Eel River Short Line railroad (abandoned) adjoins along the south side of the Site with the former Trelleborg Automotive property beyond. Residential and commercial properties are located to the north across Water Street and west across Aster Street.

5.3 Current and Future Land Use

The site is currently vacant. A 6' tall chain link surrounds the property and the foundation and slab remaining from the former Exide manufacturing facility covers most of the northern half of the Subject Site, while most of the southern half is grassy area. The planned reuse for the Site is for municipal and commercial/light industrial purposes. About half of the Subject Site will be converted into a new facility for the City of Logansport Streets Department, while the other half will be sold or leased as commercial / light industrial land.

5.4 Potential Exposure

Environmental investigations have revealed that the soils over a large area on the site contain lead in excess of IDEM's RbCG EDC PLs. Two TCE hotspots are also present on the eastern side of the property, one underneath the concrete slab and another at the southern edge of the former loading dock area. Groundwater on the eastern portion of the site has also been found to have TCE present at levels exceeding the RbCG RGW PL, however sampling has indicated that impacted groundwater is not migrating offsite.

Unless remediation efforts are performed, there would be a high risk of soil direct contact both during and after site development is completed based on the high levels of lead present in the shallow soils. Vapor intrusion on the east side of the property would be a concern for any buildings which are constructed over either the TCE hotspots or the TCE groundwater plume. The risk of use or consumption of groundwater would be limited due to the availability of City water for the property and a City Ordinance prohibiting the installation of drinking water wells. With or without remediation efforts, institutional controls will likely be required in the future to minimize exposure pathways and prevent exposure.

5.5 Remediation Objectives

The overall objective of the project is to complete demolition of the remaining concrete slab and reduce the soil exposure pathway to below the R2 Commercial Direct Contact Published Levels, based on averages for both lead and TCE. Remove/remediate the bulk of the TCE source to reduce potential for vapor intrusion and groundwater impact. Control remaining exposure pathways through institutional controls.

5.6 Cleanup Oversight Responsibility

Oversight of daily activities will be performed by BCA Environmental Consultants. Regulatory oversight of all remedial activities will be performed by the Indiana Department of Environmental Management (Indiana Brownfields Site # 4221108 / State Cleanup Site # 0000971).

5.7 Laws & Regulations Applicable to the Cleanup

Project Activities will be carried out in accordance with all applicable state, local, and federal laws and regulations. In addition, all appropriate permits (*e.g.*, notify before you dig, soil transport/disposal manifests) will be obtained prior to the work commencing.

6.0 SUMMARY OF CORRECTIVE ACTION ALTERNATIVES

6.1 Cleanup Alternatives Considered

To address contamination at the Site, four different alternatives were considered, including:
Alternative #1: No Action,
Alternative #2: Capping,
Alternative #3- Soil Treatment,
Alternative #4: Excavation with Offsite Disposal.

6.2 Evaluation of Cleanup Alternatives

To satisfy EPA requirements, the effectiveness, implementability, and cost of each alternative must be considered prior to selecting a recommended cleanup alternative.

6.2.1 Effectiveness

a. the degree to which toxicity, mobility, and contaminant volume is expected to be reduced.
b. the degree to which corrective action will protect human health and the environment over time.
c. consideration for any adverse impact on human health and the environment during corrective action implementation.

6.2.2 Implementation

a. technical feasibility of corrective action at the site.
b. availability of materials, equipment, and services needed to carry out corrective action.
c. administrative feasibility of corrective action (access agreements, permits, approvals from municipal, state, and/or federal agencies).

6.2.3 Cost

a. initial costs – planning and implementation (contractors, laboratory, etc.)
b. Annual operation and maintenance costs

6.3 Corrective Action Alternatives

6.3.1 Alternative 1 – No Action

This alternative leaves the site "as is" with no corrective actions taken. If no corrective action is conducted at the Site, impacted soil will remain in-place indefinitely. While this option is the least expensive and easiest alternative, it is not effective in controlling or preventing the future exposure of receptors to contamination at the Site. The direct contact exposure issue will remain a potential liability for the City of Logansport and will prevent the redevelopment potential of the site. This alternative is the least protective of human health and the environment and the site will continue to be an issue until soil contamination is addressed.

1. Effectiveness: None. This alternative does not reduce the impact or exposure issues.
2. Implementation: Easy. No actions are required to implement this alternative.
3. Cost: None $0. This alternative does not require initial costs or annual costs.

6.3.2 Alternative 2 – Isolation/Cap

A layer of soil, stone, pavement, or building pad cap/cover may be constructed over impacted soils on the Subject Site to prevent direct contact exposure. If it is necessary to maintain the grade, then a significant volume of soil would have to be removed before placement of the cover. A maintenance plan and environmental restrictive covenant would be needed to maintain the cover and coordination with property developers would be required to ensure the affected area is properly addressed and cap maintained during any future construction. Vapor barriers or active mitigation systems would be required on the eastern portion of the site to control vapor intrusion. Redevelopment is somewhat limited due to the need to maintain the cover, barrier and mitigation system.

1. Effectiveness: Moderate. Isolation is an effective alternative as long as the barrier is properly maintained. Redevelopment plans would need to incorporate barriers to ensure exposure risk is addressed. Groundwater impact would not be reduced.
2. Implementation: Moderate. Approximately 25% of the impacted area is currently covered by a concrete slab. Capping is relatively easy to implement, however ongoing monitoring and maintenance of the cap will require periodic coordination and reporting.
3. Cost: Moderate. Concrete slab removal costs would be on the order of $400,000 - $450,000 plus crushing the concrete for onsite re-use. Capping costs will be on the order of $350,000. Other associated costs would include periodic monitoring of the cap, groundwater monitoring and any additional costs required when developing the site.

6.3.3 Alternative 3 – In-situ Soil Treatment

In-Situ Soil Treatment involves importing an approved amendment material and mixing that material with contaminated soil. For the lead contaminated soils, treatment does not physically remove contaminants, rather it locks contaminants in the soil matrix preventing potential to leach as measured through TCLP failures. For TCE contaminated soils, a soil treatment amendment which is applied after hotspot removal will further reduce TCE concentrations in the soil and prevent further transport to the onsite groundwater.

1. Effectiveness: None / Marginal - Soil Treatment does not remove or reduce lead concentrations from the treatment area. Lead concentrations in treated areas would remain the same and exposure pathways would continue to exist. Soil treatment for TCE is effective at promoting chlorinated reduction, however source levels in the TCE hotspots need to be reduced prior to applying treatment materials.
2. Implementation: Moderate – Treatment requires heavy machinery with proper attachments to distribute the amendment and properly mix it into the soils. Coordination (e.g., dust suppression and monitoring) will be required during soil mixing and short-term disturbances (*e.g.*, trucks transporting amendment materials to the site) to minimize impacts to the surrounding areas.
3. Cost: Moderate – Costs associated with soil treatment include importing soil amendment materials to the site, heavy equipment for dispersing and mixing the amendment with the soils,

and dust monitoring and suppression as necessary while mixing is in progress. The cost to treat all areas where soil lead concentrations exceed 1500 mg/kg is estimated at approximately $300,000. Source area treatment for TCE hotspots is estimated at $10,000 (treatment and materials only).

6.3.4 Alternative 4 – Excavation with offsite Disposal

Excavation with offsite disposal is one of the most common and effective methods to eliminate site risk, by transferring that risk to an approved disposal facility capable of safely containing the most impacted excavated soils.

1. Effectiveness: Complete - Excavation with Offsite Disposal is an effective way to eliminate risk at the Site, since contamination will be removed, and the exposure pathways will no longer exist on the site. TCE source removal is achieved.
2. Implementation: Moderate - Excavation with Offsite Disposal is moderately difficult to implement. Coordination (e.g., dust suppression and monitoring) during cleanup activities and short-term disturbance to the community (*e.g.*, trucks transporting contaminated soils and backfill) are anticipated. However, ongoing monitoring and maintenance will not be required following excavation and offsite disposal, and development onsite can proceed without the concern for future exposure to contaminated soils. Some testing for vapor intrusion potential will be needed as well as post-remediation groundwater monitoring.
3. Cost: Very High - Due to the presence of lead which exceeds the TCLP threshold for characteristic hazardous waste, disposal costs alone for soil could exceed $2 million with overall project costs exceeding $3 million. Performing soil treatment to stabilize lead and prevent TCLP failures will allow for off-site disposal at a non-hazardous landfill at significant cost savings.

7.0 RECOMMENDED CLEANUP ALTERNATIVE

The recommended cleanup alternative is a combination of Alternative #3: In-situ Soil Treatment and Alternative #4: Excavation with Offsite Disposal, along with partial application of Alternative #2 Capping.

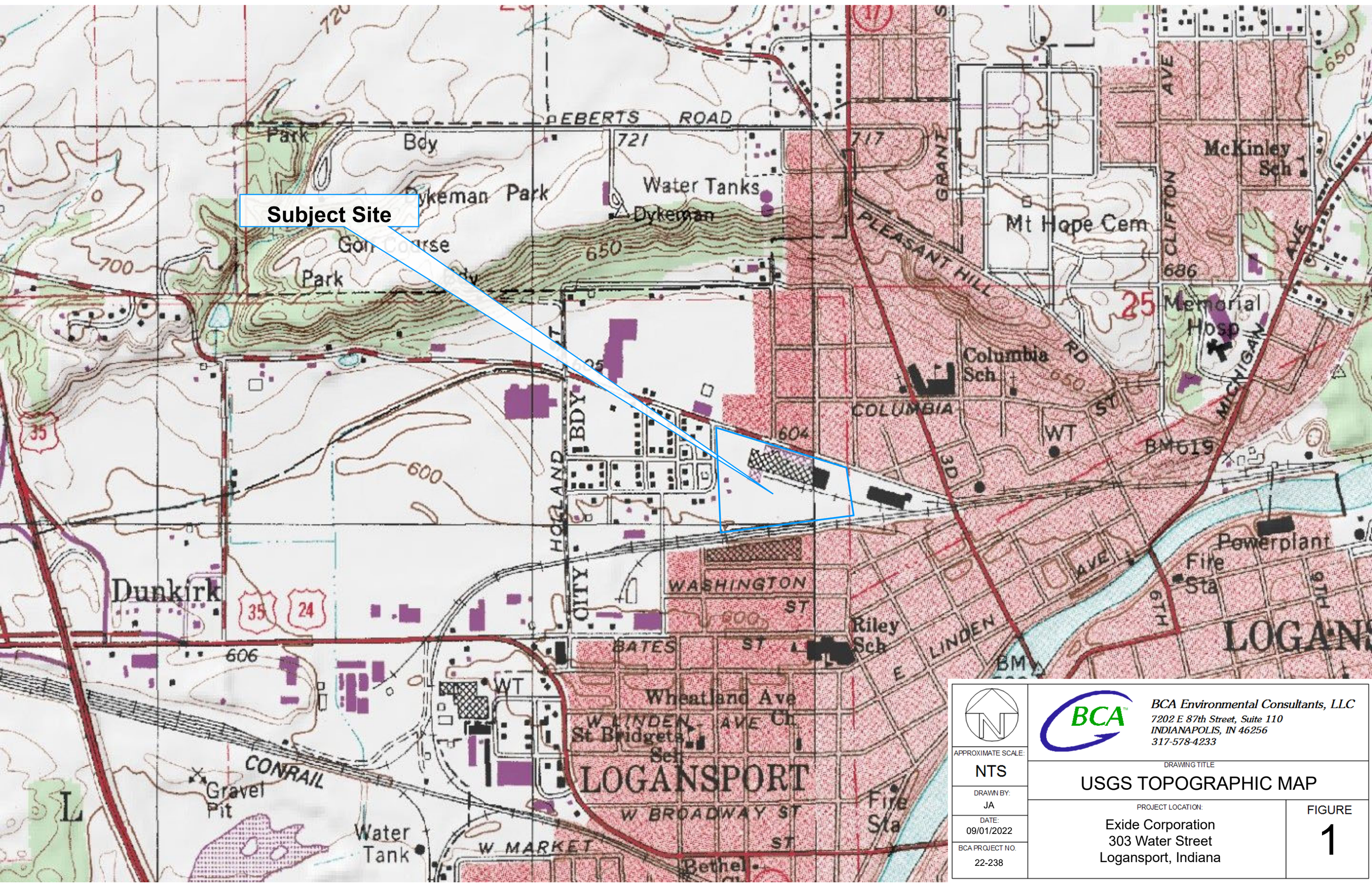
Alternative #1: No Action cannot be recommended since it does not address site risks and leaves the site as unusable land for future development. Alternative #2: Capping is less expensive than excavating soils and disposing them offsite. However, Alternative #2: Capping would require ongoing monitoring and maintenance of the cap and limit or restrict future development of the land except by incurring additional design or disposal costs in the future. Alternative #3: In-situ soil treatment would have no effect on total lead levels in the soil, so treatment alone does not address site risks and is not recommended. Alternative #4: Excavation with offsite disposal alone would be successful at eliminating risk at the site and would allow future development to proceed unhindered, however the cost of disposing material in a hazardous waste landfill would be excessive.

Combining Alternative #3: In-Situ Soil Treatment with Alternative #4: Excavation with Offsite Disposal would allow any lead contaminated soil which is excavated to be disposed of as non-hazardous wastes rather than hazardous wastes at significant cost savings. TCE contaminated soils would be excavated prior

to the application of amendments. An appropriate non-hazardous waste landfill is located less than 5 miles from site which would allow for more efficient disposal and less carbon generated compared with transportation to the nearest hazardous waste facility (approximately 85 miles). If the cost of treating and landfill disposal of the soil exceeds the available funding, some treated soils could be left in place and capped.

Figures

Analysis of Brownfield Cleanup Alternatives
Former Exide Corporation
303 Water Street
Logansport, IN



APPROXIMATE SCALE: NTS	BCA Environmental Consultants, LLC 7202 E 87th Street, Suite 110 INDIANAPOLIS, IN 46256 317-578-4233
DRAWN BY: JA	DRAWING TITLE: USGS TOPOGRAPHIC MAP
DATE: 09/01/2022	PROJECT LOCATION: Exide Corporation, 303 Water Street, Logansport, Indiana
BCA PROJECT NO. 22-238	FIGURE 1

APPROXIMATE SCALE:	NTS
DRAWN BY:	DS
DATE:	09/01/2022
BCA PROJECT NO.	8130 / 22-238

BCA Environmental Consultants, LLC
7202 E 87th Street, Suite 110
INDIANAPOLIS, IN 46256
317-578-4233

DRAWING TITLE

2018 Aerial Photo

PROJECT LOCATION:
Exide Corporation
303 Water Street
Logansport, Indiana

FIGURE
2

Residential Area

Aster Street

Commercial

Residential Area

Liberty Street

Residential Area

Residential Area

Chicago Street

Residential Area

Residential Area

Commercial

College Street

Residential Area

Gravel

Gravel

Water Street

Offices

Sloped Loading Dock

Concrete Slab

Sloped Loading Dock

Gravel

Gravel

Former Steel Mfg and General Tire Plant

Sloped Loading Dock

Warehouse

Concrete Slab

Concrete Slab

Battery Manufacturing

Truck/Trailer Parking

Gravel

Gravel

Bag House

Sloped Loading Dock

Gravel

Acid Charge Area

Former Box Drain / Dry Well Trailer Wash Basin
15' x 15' x 6' Inverted box structure with Drain pipes extending 15' outward.
59,781 ppm lead

Gravel Drive

Gravel Drive

Gravel Drive

Gravel Drive

Gravel Drive

Gravel Drive

Warehouse

Residential Area

Grassy Area

Grassy Area

Possible Production Well

Asphalt Parking

Lead exceeds RbCG EDC HHL

Gravel Drive

Wooded Area

Wooded Area

Wooded Area

Abandoned Tracks

Abandoned Tracks

Former Trelleborg Automotive Facility

Residential Area

0 25 50 100 200

BCA Environmental Consultants, LLC
7202 E 87th Street, Suite 110
Indianapolis, IN 46256
317-578-4233

DATE: 4/5/2024

SCALE: 1" = 100'

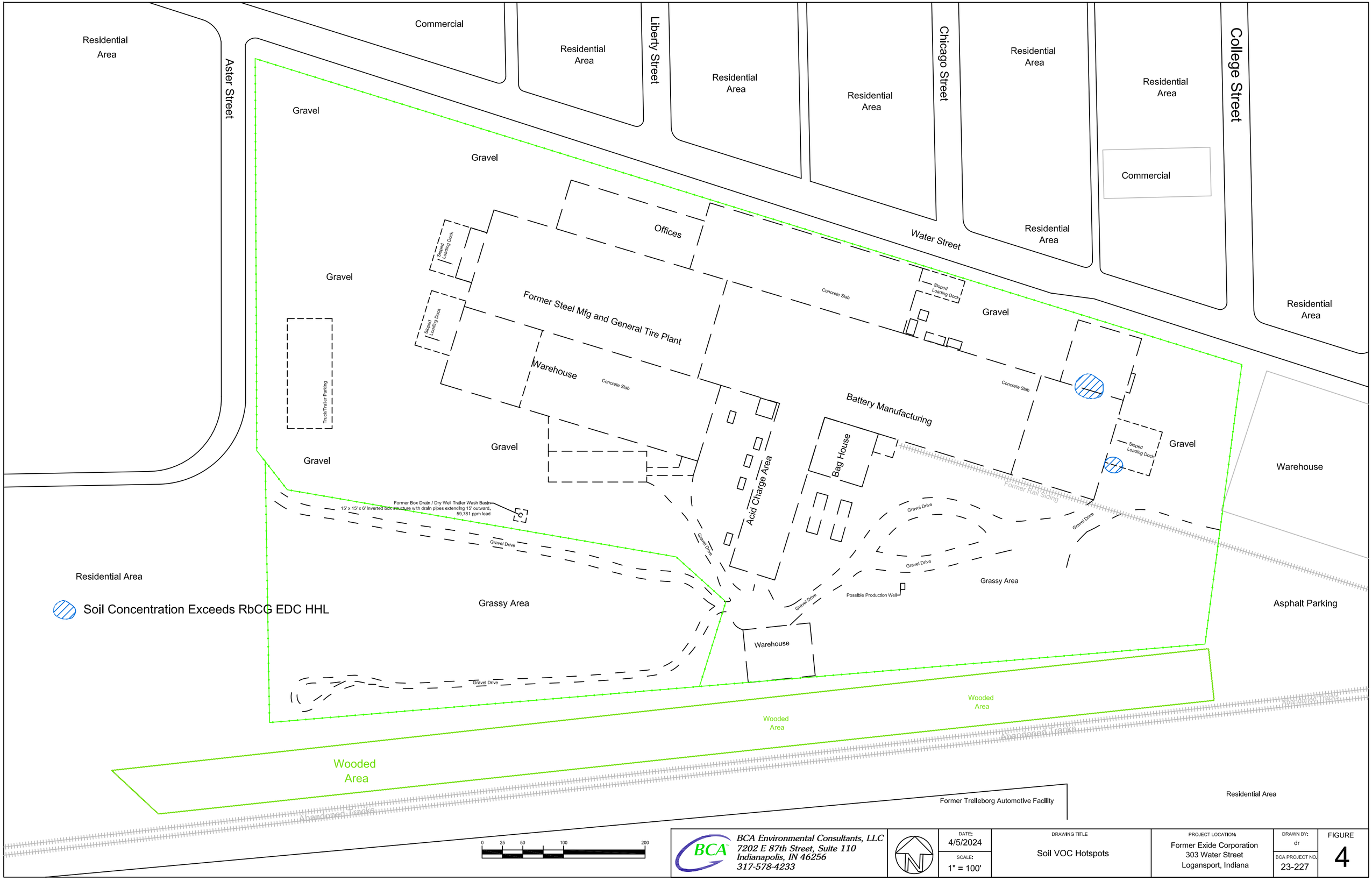
DRAWING TITLE: Lead Concentrations exceeding 1000 mg/kg

PROJECT LOCATION: Former Exide Corporation, 303 Water Street, Logansport, Indiana

DRAWN BY: dr

BCA PROJECT NO.: 23-227

FIGURE 3



BCA Environmental Consultants, LLC
7202 E 87th Street, Suite 110
Indianapolis, IN 46256
317-578-4233

DATE: 4/5/2024

SCALE: 1" = 100'

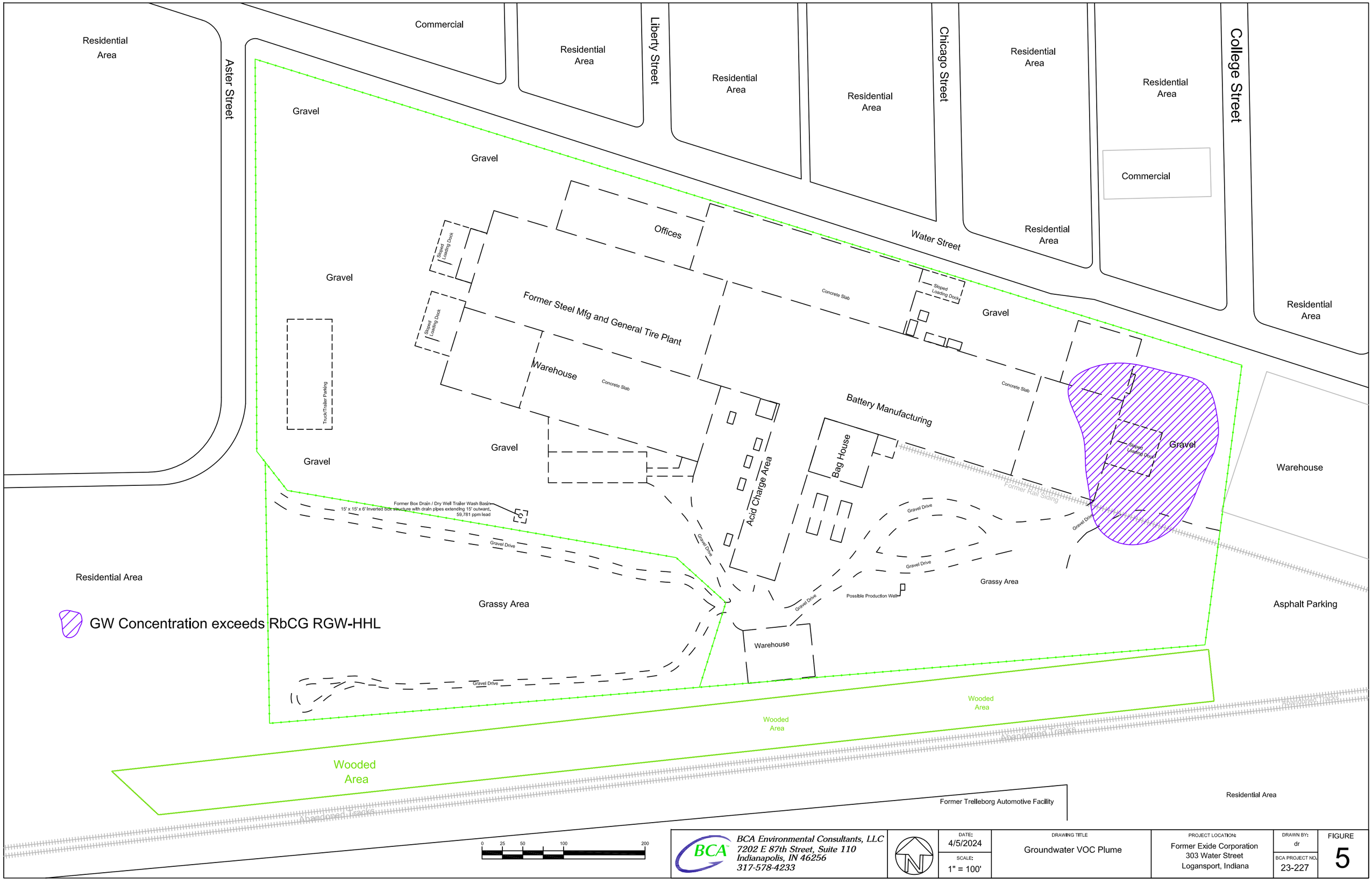
DRAWING TITLE: Soil VOC Hotspots

PROJECT LOCATION: Former Exide Corporation, 303 Water Street, Logansport, Indiana

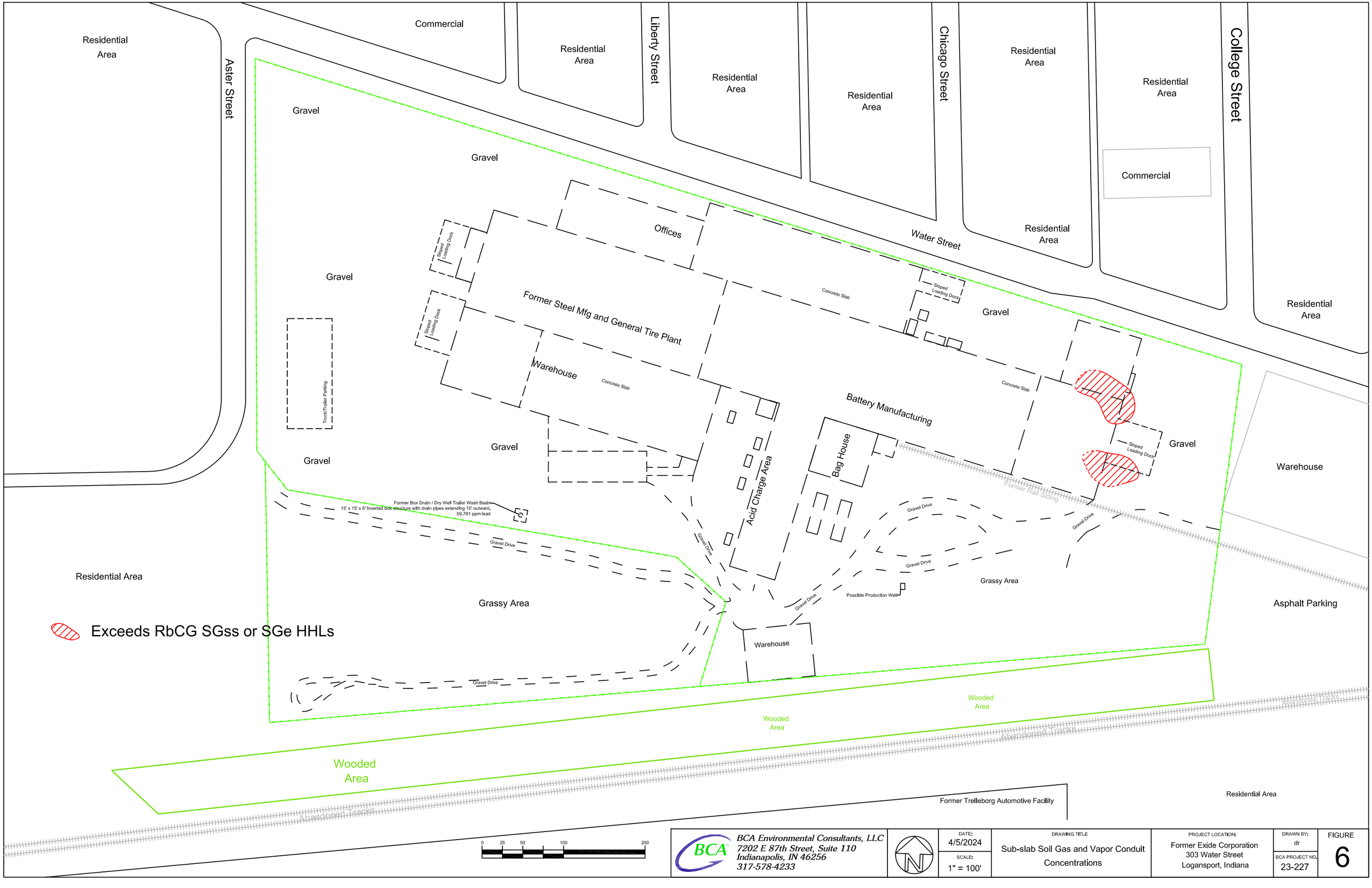
DRAWN BY: dr

BCA PROJECT NO.: 23-227

FIGURE 4



BCA Environmental Consultants, LLC 7202 E 87th Street, Suite 110 Indianapolis, IN 46256 317-578-4233	DATE: 4/5/2024 SCALE: 1" = 100'	DRAWING TITLE: Groundwater VOC Plume	PROJECT LOCATION: Former Exide Corporation 303 Water Street Logansport, Indiana	DRAWN BY: dr BCA PROJECT NO.: 23-227	FIGURE 5



BCA Environmental Consultants, LLC
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Indianapolis, IN 46256
317-578-4233

DATE:	DRAWING TITLE	PROJECT LOCATION:	DRAWN BY:	FIGURE
4/5/2024	Sub-slab Soil Gas and Vapor Conduit Concentrations	Former Exide Corporation 303 Water Street Logansport, Indiana	dr	6
SCALE: 1" = 100'			BCA PROJECT NO.: 23-227	

Appendix A

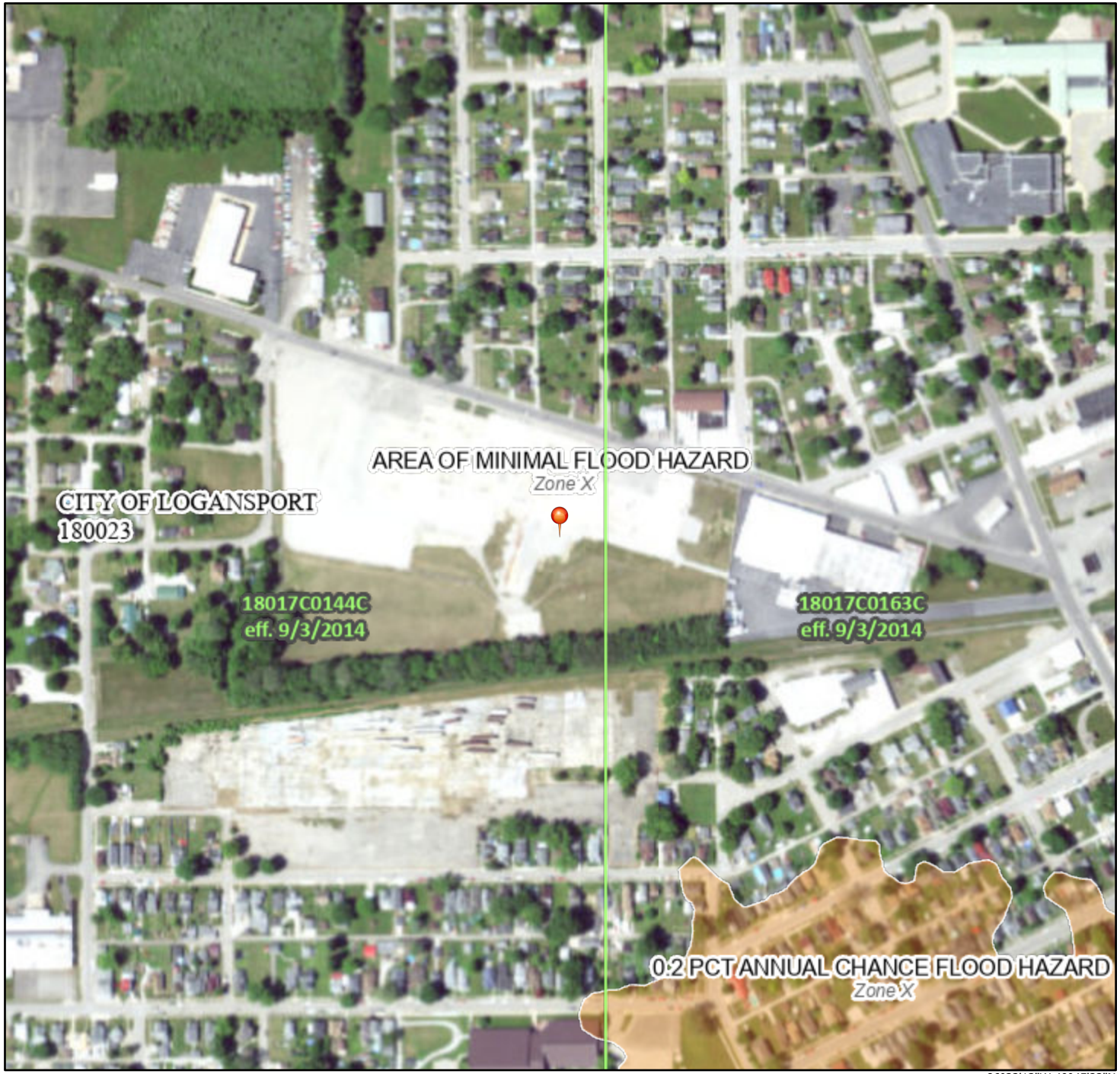
FEMA Flood Hazard Map

Analysis of Brownfield Cleanup Alternatives
Former Exide Corporation
303 Water Street
Logansport, IN

National Flood Hazard Layer FIRMette

FEMA

86°22'50"W 40°45'50"N



86°22'13"W 40°45'22"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/24/2024 at 9:46 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.