ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

U.S. EPA Brownfield
Revolving Loan Fund Cooperative Agreement # BF-00E48101-B
Indiana Brownfields Program Site No. 4171102

Former Central Siding Property
129 West Main Street
Elwood, Madison County, Indiana
May 2019

This Analysis of Brownfield Cleanup Alternatives (ABCA) was cooperatively prepared by the Indiana Brownfields Program (Program), the City of Elwood (City), and Industrial Waste Management Consulting Group, LLC (IWM Consulting) as a requirement for utilizing United States Environmental Protection Agency (U.S. EPA) Revolving Loan Fund (RLF) monies to remediate a brownfield. The Former Central Siding Property (EPA ACRES ID: 205001 and Indiana Brownfield Site ID: 4171102) located at 129 West Main Street in Elwood, Madison County, Indiana (Site) is currently an unoccupied former manufacturing facility from the 1940s through the 1990s. The site location is illustrated on **Figure 1**. Former Site operations included metal finishing and possible metal casting involving oils, solvents, degreasers, metals, and plating chemicals. These operations at the Site are believed to be the primary source of chlorinated volatile organic compound (cVOC) and metals contamination in soils and groundwater at the Site. This ABCA presents remedial alternatives considered to mitigate potential exposure to contaminated soil and groundwater associated with the historical release(s). Site redevelopment plans have not been finalized, but expected future use of the Site will likely be commercial.

Site Details

Site Name:	Former Central Siding Property 129 West Main Street Elwood, Madison County, Indiana
Property Owner:	City of Elwood 1505 South B Street Elwood, Indiana 46036
Site Representative:	Mr. Todd Jones Mayor, City of Elwood 1505 South B Street Elwood, Indiana 46036

Summary of Previous Site Activities

Site History

Based on standard historical sources, previous Phase I Environmental Site Assessments (ESA) discovered the Site was used for residential purposes in the 1930s; for metal coating, casting and manufacturing in the 1940s through the 1950s; as a home improvement center in the 1950s; for Central Siding from the 1980s to 1990s; and for a daycare in the 2000s. In 2014 the manufacturing/warehouse building was razed, leaving only a storage building on the Site and the concrete pads associated with a previous building(s). The remainder of the Site supports vegetative cover (weeds, bushes, and grass).

Previous Environmental Assessments/Environmental Investigations

Environmental conditions at the Site were assessed between 2015 and 2018. Historical environmental assessments and investigations of the Site were documented in the following reports, which are described below. Key Site features are illustrated on **Figure 2**.

1. IWM Consulting Group, LLC, 2015, Phase I Environmental Site Assessment
2. IWM Consulting Group, LLC, 2016, Phase II Environmental Site Assessment
3. IWM Consulting Group, LLC, 2017, Further Site Investigation
4. Morgan Clark Associates, LLC, 2018, Phase I Environmental Site Assessment
5. IWM Consulting Group, LLC, 2018, Further Site Investigation

IWM Consulting Group, LLC, Phase I Environmental Site Assessment, October 19, 2015
The following Recognized Environmental Concerns (RECs) were identified by IWM Consulting during a 2015 Phase I ESA.

- The Site was utilized for metal finishing and possible metal casting operations from circa 1940 until the early 1950s. Oils, solvents, metals, and plating chemicals may have been utilized in these operations. Concrete filled floor drains and a possible sump were observed on the concrete pad. Rectangular floor repairs may indicate filled pits. Materials utilized in metal finishing operations may have been discharged to on site soil and groundwater from leaks in the drains or pits.

- Historical metal finishing operations were reportedly conducted on the Site. Materials containing volatile organic compounds (VOCs), such as degreasers, typically utilized in metal finishing may have been used and released on the Site. Based on historical operations on the Site, a Vapor Encroachment Condition (VEC) cannot be ruled out.

- Staining around the base of a used oil drum in the storage building appears to have migrated below the door of the storage building and may have impacted soil outside of the building.

IWM Consulting Group, LLC, Phase II Environmental Site Assessment Report, September 23, 2016

In April 2016, IWM Consulting personnel conducted Phase II ESA activities at the Site in order to provide characterization and delineation of potential metals and VOCs contamination located on the Site. A geophysical survey was conducted in an effort to identify any unmarked private utilities and to assist in determining the location of the sewer laterals (if any) associated with the historical drains. Three (3) anomalies were detected along the southern Site boundary beneath the slab of the former building. IWM Consulting subsequently advanced nine (9) soil borings (CS-GP1 through CS-GP9) for the purposes of obtaining near-surface and subsurface soil samples and groundwater samples. Upon completion of the soil borings, temporary 1- or 2-inch polyvinyl chloride (PVC) screens and risers were placed in the boreholes in order to obtain one-time low-flow groundwater samples. Conclusions and recommendations provided in the Phase II ESA Report are summarized below.

- Based upon the near surface soil analytical data obtained at the Site during this investigation, it appears historical releases have adversely impacted the near surface soil. Lead concentrations in excess of the Indiana Department of Environmental Management (IDEM) *Remediation Closure Guide* (RCG) Excavation Worker Soil Exposure Direct Contact Screening Level (EXDCSL), arsenic in excess of the RCG Residential Soil Exposure Direct Contact Screening Level (RDCSL), along with tetrachloroethene (PCE) and trichloroethene (TCE) in excess of the RCG Residential Soil Migration to Groundwater Screening Level (MTGSL) are present in the near-surface soils. The near-surface chlorinated VOC (cVOC) concentrations are relatively minor and are limited to CS-GP2 and CS-GP3. The highest concentration of metals (notably lead) are at CS-GP1, located north of the storage building, and the Pit sample. All of the remaining metals detected in the soil exhibited concentrations less than the corresponding RCG Commercial/Industrial Soil Exposure Direct Contact Screening Level (RCG IDCSL), with most being less than the RCG RDCSL.

- The subsurface soil analytical data obtained at the Site during this investigation also indicates metals and adsorbed cVOCs have affected the subsurface of the Site. TCE concentrations in excess of the RCG EXDCSL; arsenic concentrations in excess of the RCG RDCSL but less than the RCG IDCSL; along with cis-1,2-dichlorethene (cis-DCE), PCE, and hexavalent chromium concentrations in excess of the RCG Residential Soil MTGSLs are present in the subsurface soils. The highest subsurface arsenic concentration was from the shallowest subsurface sample - CS-GP4-SB1 (2-4'). Also, arsenic concentrations decreased with depth in every boring which had multiple samples. As such, it would appear the arsenic concentrations may be least partly derived from historical surface activities or naturally occurring; however, establishment of a background concentration for arsenic was not determined. Conversely, the highest cVOC concentrations were found at depth. Although TCE concentrations exceeded at least the RCG Residential Tap MTGSL in every subsurface sample, the highest concentrations were all located near the southeast corner of the Site. This suggests the subsurface solvent impact may be from a different source area than the shallow metal impact.

- Groundwater analytical data indicates groundwater at the Site has been impacted by cVOCs and metals. TCE and vinyl chloride (VC) concentrations in excess of the RCG Commercial/Industrial Vapor Exposure Groundwater Screening Level (VE GWSL); 1,2-dichloroethane (1,2-DCA) concentrations in excess of the RCG Residential VE GWSL; along with 1,1-dichloroethene (1,1-DCE), cis-DCE, and PCE concentrations in excess of the RCG Residential Tap Groundwater Screening Levels (GWSLs) are present in groundwater. The highest cVOC concentrations were also located near the southeast corner of the Site. In addition, total arsenic, total lead, and hexavalent chromium are also present in excess of the RCG Residential Tap GWSLs. However, dissolved (i.e. filtered) concentrations of arsenic and lead are below the RCG Residential Tap GWSLs.

- The maximum observed soil concentrations of lead, and the maximum observed soil and groundwater concentrations of TCE, are high enough such that if this soil/groundwater is removed, it may be considered a Characteristic Hazardous Waste based on the Toxicity Characteristic as specified in the "D List" of 40 CFR 261.24. The concentrations presented on the D List are based on Toxicity Characteristic Leaching Procedure (TCLP) analytical results (SW-846 Method 1311). As this method is predicated on a 20-fold dilution of a solid sample, the general rule of thumb is if the actual solid waste concentration of a contaminant is less than 20 times the D List concentration, then the waste cannot be hazardous. If the soil concentration is 20 times the D List concentration or more, then a TCLP test should be run. For this reason, IWM Consulting recommends TCLP analysis during future soil sampling to delineate potentially hazardous concentrations of lead and TCE.

- cVOC concentrations in soil and/or groundwater exceed commercial/industrial screening levels around the entire investigated perimeter of the Site. Consequently, additional soil and groundwater investigation is warranted in order to further delineate the lateral extents of cVOCs south, west, and north of CS-GP1; north of CS-GP7; east and south of CS-GP2 and CS-GP5; and south of CS-GP3 and CS-GP9.

- Initial groundwater gauging from the temporary sample points suggested a radial flow direction. However, this cannot be confirmed in future monitoring, as the sampling points were only temporary. In addition, IWM consulting anticipates future assessment, remediation, and post-remediation monitoring may be required due to the elevated lead and TCE concentrations at the Site. Permanent, properly constructed and developed monitoring wells should be installed at the Site in the future in order to obtain samples on a long-term basis and to obtain groundwater elevation data which accounts for seasonal variations.

- Due to potentially hazardous concentrations of lead in soil at CS-GP1 and TCE at CS-GP2, CS-GP5, and CS-GP9, IWM Consulting recommends additional vertical delineation of the highest concentrations at these locations. Additional vertical samples are also recommended for any future soil borings installed to delineate impact from these areas.

- Polynuclear aromatic hydrocarbon (PAH) concentrations were not detected in groundwater, and maximum soil concentrations of PAH constituents were less than one half the lowest applicable screening level in the 0-2 foot below surface grade (bsg) sample at CS-GP1. As such, PAH soil and groundwater analysis during future delineation/remediation activities should not be necessary.

- Groundwater concentrations along the property lines exceed RCG Residential VE GWSLs for TCE, VC, and 1,2-DCA. Residential properties neighbor the Site to the south and what visually appears to be a residence (listed as a taxidermist in the Phase I ESA) adjoins the Site to the west. As such, residential vapor encroachment is possible, and additional sampling is required in areas between the Site and the residences in order to determine if combination vapor and indoor air sampling is required.

- Although commercial properties adjoin the Site to the north and east, groundwater concentrations along these property lines exceed RCG Commercial/Industrial VE GWSLs for TCE and VC. However, the nearest building in these directions is about 150 feet from the nearest sample collected during this investigation. Collection of soil and groundwater samples closer to the off-site structures is recommended in order to evaluate this potential exposure pathway.

- The Site is located within a Wellhead Protection Area and private/municipal wells are located within approximately 750 feet of the Site. These wells are reportedly installed within the underlying bedrock aquifer at depths ranging between 78 feet bsg and 465 feet bsg. Depending upon the results of the future soil and groundwater sampling events for the Site, additional investigation of one (1) or more of these wells may be necessary.

- Access agreements with neighboring property owners and/or encroachment permits for the adjoining roads/alleys will be necessary to conduct delineation (and potentially future remediation) activities.

IWM Consulting Group, LLC, Further Site Investigation Report, January 30, 2017

In November 2016, four (4) additional soil borings/temporary wells (CS-GP10 to CS-GP13) and one (1) deeper permanent monitoring well (MW-1D) were installed as part of a further site investigation (FSI) to preliminarily assess the horizontal and vertical extent of cVOC contamination at the Site. Also, crawl space, indoor air, and ambient air sampling was conducted at three (3) residential properties which neighbor the Site to the south and southwest and groundwater grab samples were collected from the two (2) nearest City of Elwood municipal supply wells (City wells #5 and #6). The following conclusions and recommendations were provided in the FSI Report.

- PCE, TCE, cis-DCE, and VC were not detected in any of the vapor samples. Although a number of VOCs were detected, only naphthalene in the crawlspace sample (but not the duplicate sample or the first-floor sample) from 126 South A Street exceeded the laboratory detection limit or RCG VESL. It should be noted naphthalene has not previously been detected in groundwater at the Site, and the highest concentration of naphthalene detected in soil on-site was approximately one-half the lowest applicable screening level. As such, it is

reasonable to question whether the detected crawlspace air naphthalene concentrations are derived from the Site.

- Based upon the vapor intrusion (VI) investigation completed at the Site in December 2016, VI does not appear to be a viable exposure pathway at this time. The exact source of the naphthalene detected in the crawlspace sample is unknown but based upon all of the historical soil and groundwater analytical results, it does not appear to have originated from any onsite source areas.

- Groundwater grab samples obtained from the two (2) nearest City of Elwood municipal supply wells (Well #5 and Well #6) did not contain detectable concentrations of any VOC. However, the City wells are 350 feet deep or deeper, and groundwater concentrations from the bedrock interface (64 feet bsg) at MW-1D exceed RCG Commercial/Industrial VE GWSLs. The IDEM Water-Well Location website shows three (3) located domestic wells within 1,000 feet of the Site with completion ranges of 72, 78, and 140 feet depth. Depending upon the results of the future soil and groundwater sampling events for the Site, additional investigation of one (1) or more of the nearby private wells may be necessary.

- The majority of the cVOCs have a density greater than 1 gram per cubic centimeter (g/cm^3) (i.e. denser than water). As such, they tend to sink in water. For this reason, MW-1D was installed to evaluate the vertical extent of cVOC concentrations. Concentrations of TCE in excess of the RCG EXDCSL and PCE in excess of the RCG Residential MTGSL were present at depths up to 32 feet bsg. In addition, although MW-1D was installed to the bedrock interface (64 feet bsg) and screened from 59 to 64 feet bsg, the TCE concentration in the groundwater sample exceeded the RCG Commercial/Industrial VE GWSL. Although the reported TCE concentration (62.5 micrograms per liter (µg/L)) is several orders of magnitude less than the TCE concentration (158,000 µg/L) observed from the shallow temporary monitoring point (CS-GP2) installed in this area in April 2016, the dissolved TCE plume does not appear to be delineated vertically. Deeper vertical assessment may be required and the lateral extent of the deeper cVOC impacted groundwater has not been defined.

- Dissolved TCE was detected above its RCG Commercial/Industrial VE GWSL at CS-GP12, while dissolved VC was detected above its RCG Residential VE GWSL at CS-GP12. Concentrations of TCE in soil at CS-GP12 exceed the RCG EXDCSL. For this reason, soil and groundwater cVOC concentrations are not delineated east of the Site.

- IWM Consulting anticipates future assessment, remediation, and post-remediation monitoring may be required due to the elevated lead and TCE concentrations at the Site. Additional permanent, properly constructed and developed monitoring wells should be installed at the Site in the future in order to allow better evaluation of the groundwater flow direction and to aid in establishing long-term groundwater concentration trends.

- Due to potentially hazardous concentrations of lead in soil at CS-GP1, IWM Consulting recommends additional vertical delineation (between 2 -10 feet bsg)

of the lead concentration at this location. Additional horizontal and vertical samples are also recommended in order to further define the extent of adsorbed lead impact in this area of the Site.

- Concentrations of cVOCs are defined to the south by CS-GP13. However, additional sampling points may need to be installed between the Site and CS-GP-13 in order to define the edge of the cVOC plume - especially southeast (assumed downgradient) from CS-GP2 and MW-1D. In addition, soil and groundwater concentrations of cVOCs will need to be delineated north, east, and south of CS-GP12. Based on data from MW-1D, additional investigation is necessary to define the vertical extent of cVOC soil and groundwater contamination at the site.

Morgan Clark Associates, LLC, Phase I Environmental Site Assessment, August 27, 2018
The following RECs were identified by Morgan Clark Associates, LLC, during a 2018 Phase I ESA.

- Soil and groundwater are contaminated with metals and cVOCs in excess of IDEM RCG screening levels due to historical metal finishing operations conducted on the Site. Investigations are ongoing.

IWM Consulting Group, LLC, Further Site Investigation Report, August 30, 2018
In May and June 2018, IWM Consulting supervised the installation of forty-one (41) soil borings (CS-WC1 through CSWC41) and five (5) exterior soil gas probes (CS-ESG1 through CS-ESG5) in order to better characterize the hazardous potential of waste which may be generated during future remedial activities and to further assess the potential VI pathway at the Site. In addition, a low-flow groundwater sample was collected from the existing Site monitoring well. The following conclusions and recommendations were provided in the FSI Report.

- The historical lead concentration at CS-GP1 exceeded the RCG EXDCSL. Lead was detected in all current soil samples, but concentrations from all ten (10) waste characterization borings installed in the CS-GP1 vicinity did not exceed the most stringent screening level. However, the four (4) highest lead concentrations were found in the four (4) locations at, and easterly of, the CS-GP1 location (CS-WC36 and CS-WC38 through CS-WC40). As such, lead concentrations above typical background levels appear to be present at the Site, but the historical lead exceedance of the RCG EXDCSL appears to be de minimis in size.

- Based on historical analytical results, lead concentrations in excess of the RCG RDCSL were historically present in the Pit sample, and arsenic in excess of the RCG RDCSL is present at several sample locations. Additional delineation of concentrations from these historical locations was not conducted during this round of work, since the Site is currently zoned for commercial use.

- Although soil concentrations of a number of cVOCs exceeded the most stringent RCG screening level, only TCE and PCE exceeded the RCG IDCSL or RCG EXDCSL.

- Based on TCLP results, hazardous concentrations of TCE are present at the Site. If such soil is excavated during a future remediation without prior in-situ conditioning (and confirmation re-sampling), such soil would be considered Hazardous Waste.

- The southern and eastern extent of TCE concentrations in excess of the RCG EXDCL is not delineated. As TCLP results indicate the bulk of concentrations in excess of the RCG IDCSL would be considered hazardous, the southern and eastern extent of hazardous TCE concentrations is also not delineated.

- For plume core consideration purposes, TCE concentrations in excess of 1,000 milligrams per kilogram (mg/kg) are (or historically were) present at CS-WC14, CS-WC20, CS-WC22, CS-WC27, CSWC28, CS-WC31, and CS-GP2. As such, TCE concentrations in excess of 1,000 mg/kg are also not delineated to the south. A residential property neighbors the Site to the south across the alley.

- Current TCE concentrations in groundwater at MW-1D are about one-quarter the concentration from the last sampling event in November 2016, but still exceed the RCG Residential VE GWSL. Since the well has only been sampled two (2) times, it is not currently possible to evaluate groundwater concentration trends at this location or the reliability of any trends. Additional sampling is required in order to establish a long-term trend of the dissolved TCE concentrations.

- Historical groundwater analytical data indicates groundwater at the Site has been impacted by metals. Total arsenic, total lead, and hexavalent chromium were historically present in excess of the RCG Residential Tap GWSLs. However, dissolved (i.e. filtered) concentrations of arsenic and lead were below the RCG Residential Tap GWSLs. Additional groundwater delineation or confirmation sampling for hexavalent chromium has not been conducted since the initial groundwater sampling in April 2016.

- Soil gas concentrations exceed the calculated RCG Commercial/Industrial sub-slab and exterior soil gas VE screening level for TCE at all five (5) sample points, with the highest concentrations being present near the north property line. However, the northern-most samples were also collected from the deepest depths. Whether this is indicative of a difference in concentrations with depth, localized concentrations along the estimated run of the Site sewer, or whether soil gas concentrations are more widespread cannot be determined without additional soil gas sampling.

- The current information does not rule out potential impacts to the sewer and suggests that the onsite sewer line is acting as a preferential pathway.

- The Site is located within a Wellhead Protection Area and private and municipal wells are located within approximately 750 feet of the Site. Current concentrations from the bedrock interface at MW-1D continue to exceed RCG Residential Tap and Residential VE GWSLs. Depending upon the results of the future soil and groundwater sampling events for the Site, additional investigation of one (1) or more of the shallower (i.e. as shallow as 72 feet deep within approximately 750 feet of the Site) private wells may be necessary.

- Dissolved concentrations of TCE at the bedrock interface continue to exceed RCG Residential VE GWSLs, and are not delineated vertically or horizontally. Therefore, deeper vertical assessment may be necessary, which would require installation of bedrock monitoring wells. Additional sampling points would also need to be installed in order to determine the lateral extent of the deeper (within or immediately above the bedrock unit) cVOCs.

- Soil gas concentrations of TCE are not delineated to the calculated RCG Commercial/Industrial sub-slab or exterior soil gas VE screening level in any direction.

- Targeted remediation of the accessible cVOC plume core should be conducted to address the highest documented concentrations present at the Site. The targeted remediation (soil excavation) activities will likely only be able to extend to a depth of approximately 18 feet bgs.

- Based on data from MW-1D and current TCLP results, hazardous TCE concentrations may be present in MW-1D down to a depth of 32 feet bsg. As such, deeper concentrations below the depth of a future targeted plume core remediation will remain and may require further remediation in the future.

- Adsorbed and dissolved phase cVOCs should be delineated north, east, and south of the historical location of CS-GP12 (located on the church property across 2nd Street east of the Site) as well as south of the Site.

- Additional permanent, properly constructed and developed monitoring wells should be installed at the Site in order to allow better evaluation of the groundwater flow direction and long-term groundwater concentration trends.

- Future monitoring wells may need to evaluate groundwater concentrations in up to three (3) different zones: 1) shallow (first encountered groundwater bearing zone, ~20 feet or less in depth), 2) intermediate (water bearing zone between the top of the water table and the top of the underlying bedrock surface), and 3) deep (water bearing zone immediately above the top of the underlying bedrock unit). Consideration should also be given to installing wells within one (1) or more groundwater producing intervals in the underlying bedrock unit.

- If delineation of the extent of hexavalent chromium which historically exceeded the RCG Residential Tap GWSLs at CS-GP6 and CS-GP7 is desirable, then installation and sampling of additional groundwater monitoring points may be necessary.

- Additional exterior soil gas sampling should be conducted at the Site in order to evaluate the extent of soil gas concentrations in excess of the calculated RCG Commercial/Industrial sub-slab VE Screening Levels.

- If a building is subsequently constructed on the Site for occupation, an evaluation should be made with respect to potential vapor intrusion and a vapor mitigation system may be required before the structure is occupied.

- Sampling in the City of Elwood right of way along the sewer main may also need to be conducted in order to further evaluate its potential as a preferential migration pathway. Depending upon the results of the sampling activities, additional structures in the area and/or sewer laterals may also need to be sampled in order to evaluate this potential vapor intrusion preferential pathway.

- If for some reason the zoning of the Site is changed to residential in the future, additional soil sampling activities will be required to fully delineate the extent of historical adsorbed lead (present in the historical Pit sample) and arsenic (which was present at several historical sample locations) concentrations in excess of the RCG RDCSL.

Summary of Site Characterization

The following summary of results and conclusions is supported by historical and recent Site investigations.

1. The Site is located in Section 16, Township 21 North, Range 6 East in Madison County as shown on **Figure 1**. The Site consists of 0.64 acres and is improved with a metal storage building and concrete pads associated with a previous building(s). The building contains approximately 1,800 square feet of floor space. The remainder of the Site supported vegetative cover (weeds, bushes, and grass). Properties in the immediate Site vicinity are occupied by residences, an automobile refueling facility, a church, vacant commercial property, and a taxidermist.

2. Based on standard historical sources, the Site was unimproved from prior to 1927 until circa 1930, when it was developed with a residence and a second building that was identified on the city directory listing as vacant in 1935. By the 1940s, the Site was utilized for manufacturing activities by Metalco Metal Coatings & Manufacturing and Metal Casting and Manufacturing. In the late 1950s, the Site became occupied by Hoosier Home Products and Hoosier Home Improvement of Goshen. Central Siding occupied the Site from the early 1980s until the early 1990s. A day care center occupied the Site in the early- or mid-2000s. In 2013, the City of Elwood acquired the Site, and in 2014 the manufacturing/warehouse building was razed, leaving only the storage building on the Site.

3. The nearest surface water feature to the Site is Big Duck Creek, located approximately 0.50 miles southeast. No surface water features are located on or adjacent to the Site. The Site is not located within the 100- or 500-year flood plains.

4. Previous environmental investigations conducted at the Site indicate that shallow groundwater beneath the Site is present in saturated poorly graded sands, silty sands, and clayey sands at depths of 10 to 20 feet bsg in soils. Static water levels within temporary groundwater sampling points were encountered between 6.5 and 10 feet below the top of casing. The piezometers were not surveyed; however, shallow groundwater flow beneath the Site appears to be to the east or

southeast based on contaminant migration in soil and groundwater and local topography. This groundwater is not used as a source of potable water for the Site or surrounding properties. Potable water for the City of Elwood is obtained mainly from several groundwater wells located approximately 440 feet south of the Site to 0.6 miles southeast of the Site. According to IDEM, the Site is located within a regulated wellhead protection area.

5. Previous environmental assessments conducted at the Site between 2015 and 2018 identified several metals (lead, arsenic, and hexavalent chromium) and cVOCs in the soils on the Site at concentrations exceeding their respective RCG Residential Soil MTGSLs, RDCSLs, Commercial/Industrial Soil Exposure Direct Contact Screening Levels (IDCSLs), and/or EXDCSLs. Lead was the only metal detected at concentrations in excess of the RCG IDCSL. The investigations also identified several metals (including hexavalent chromium) and cVOCs in the groundwater beneath the Site at concentrations exceeding their respective RCG Commercial/Industrial VE GWSLs, Residential VE GWSLs, and/or Residential Tap GWSLs. Soil gas concentrations have also been detected exceeding the calculated RCG Commercial/Industrial sub slab and exterior soil gas VE screening level for TCE.

Summary of Remedial Alternatives

1. Alternative 1 – No action.

2. Alternative 2 – Electrical resistivity heating.

3. Alternative 3 – Targeted excavation and disposal following in-situ soil conditioning as necessary.

Remedial Action Objectives

Environmental conditions at the Site and current land use suggest that the following human exposure routes represent potential risks for the indicated media and potentially exposed populations:

1. Direct contact with impacted surface soil, subsurface soil, or groundwater by on-site workers or future construction workers performing maintenance or excavation;

2. Ingestion of groundwater by future users of water wells that might be drilled at the Site or in the immediate vicinity of the Site, within the areas exhibiting cVOC impacts above the IDEM RCG Residential Tap GWSLs; and,

3. Inhalation of vapors by potential users of future structures on the Site and potentially occupants of nearby structures that are in close proximity to the Site (within 100 feet of the known cVOC impacts above the RCG Residential and/or Commercial/Industrial VE GWSL) and that have not yet been evaluated.

Three (3) aspects of the Site are identified as needing corrective action based on the results of previous Site investigations. The IDEM RCG provides numeric remedial action objectives in the form of screening levels (SLs) for the relevant exposure routes and land uses. Land use at the Site is currently zoned commercial/industrial, and is expected to remain so for the foreseeable future. Soil, groundwater, and/or vapor media exceeding applicable SLs include the following:

1. Surface soil media to depths of up to two (2) feet bsg that exceed one (1) or more RCG IDCSL.

2. Subsurface soil media to variable depths that exceed one (1) or more RCG IDCSL.

3. Groundwater media at depths of approximately 10 to 20 feet bsg that exceed one (1) or more RCG Commercial/Industrial VE GWSL.

The objective is to implement a focused remedial program that targets the areas of the Site that exhibit the highest metals and cVOC impacts and to remediate the above referenced media to levels at or below the applicable RCG Commercial/Industrial Screening Levels

Analysis of Remedial Alternatives

The remedial action alternatives considered were evaluated using the following criteria:

(1) Effectiveness
   a. The degree to which the toxicity, mobility, and volume of the contamination is expected to be reduced.
   b. The degree to which a remedial action option, if implemented, will protect public health, safety and welfare and the environment over time.
   c. Taking into account any adverse impacts on public health, safety and welfare and the environment that may be posed during the construction and implementation period until case closure.

(2) Implementability
   a. The technical feasibility of constructing and implementing the remedial action option at the site or facility.
   b. The availability of materials, equipment, technologies and services needed to conduct the remedial action option.
   c. The administrative feasibility of the remedial action option, including activities and time needed to obtain any necessary licenses, permits or approvals; the presence of any federal or state, threatened or endangered species; and the technical feasibility of recycling, treatment, engineering controls, disposal or naturally occurring biodegradation; and the expected time frame needed to achieve the necessary restoration.

(3) Cost
   a. The following types of costs are generally associated with the remedial alternatives:

- Capital costs, including both direct and indirect costs; Initial costs, including design and testing costs.
- Annual operation and maintenance costs.

Remedial Alternatives

1. *Alternative 1 – No Action:* If no action is taken at the Site, the impacted soil and groundwater will remain on the Site and it will not be a developable property. Additionally, if the Site is not secured, it is possible that the general public could come into direct contact with the impacted surface soils, thus creating a potential environmental, health, and welfare liability for the City of Elwood. This option is considered the least environmentally protective and the impacts to the environment (soil and groundwater) will continue for years to come. This option also does not address potential exposure to impacted groundwater and/or vapors emanating from the cVOC impacted soil and groundwater.

    a. **Effectiveness** – None: This option does not decrease the toxicity, mobility, or volume of the contamination and does not protect human health, safety, welfare, or the environment.
    b. **Implementability** – Easy: There are no required actions or technology necessary to implement this option.
    c. **Cost** – None: This option does not require ongoing operation or maintenance costs. Any deficit incurred would be in the form of loss of potential income from redevelopment.

2. *Alternative 2 – Electrical Resistivity Heating*: The advantage of electrical resistivity heating (ERH) is that it quickly addresses the environmental and health risks associated with the presence of cVOCs in soil and groundwater at the Site. The technology reduces contaminant concentrations by applying electrical current through numerous subsurface electrodes that heat the affected soil resulting in increased volatilization of the cVOCs. ERH should be paired with a soil vapor extraction (SVE) system or dual-phase extraction (DPE) system to recover the volatilized and/or desorbed contaminants.

    a. **Effectiveness** – High: This method is effective at quickly recovering contaminants that extend deep into the subsurface and treating both subsurface soil and groundwater.
    b. **Implementability** – Moderate: The Site is currently vacant, so no operations would be interrupted. The design and installation of the ERH system typically takes 6-9 months once this remedy is selected and the operational period is typically 1 year or less. Additional permits and utility infrastructure (electrical transformers) would also be required for this remedial option.
    c. **Cost** – High: Costs would include installation and subsequent maintenance of an electrical resistive heating system, multiple electrodes, recovery wells, and a vapor and/or groundwater treatment system. This remedial alternative is estimated to cost over 2 million dollars.

3. *Alternative 3 – Targeted Soil Excavation and Disposal Following In-situ Soil Conditioning as Necessary*: The advantage of the targeted excavation and disposal is that it expeditiously addresses the environmental concerns with

respect to the hazardous substances adsorbed to the subsurface soil and removes the impacted soil from the Site. The excavation areas can focus on source areas or only areas with the highest contaminant concentrations and alleviates any long-term effects with managing soil contamination migration to groundwater and subsequent groundwater impacts. This remedial approach does not include excavation of impacted soil that may be present offsite.

In order to dispose of the cVOC-impacted Site soils at an offsite Subtitle D landfill as a non-hazardous solid waste, additional treatment will be required to render the soils non-hazardous. Soils that have been determined to be hazardous based on TCLP analyses will be conditioned in-situ with a chemical oxidant (sodium persulfate, hydrogen peroxide, and water) in order to quickly decrease the cVOC concentrations to levels that reduce the leachability of the contaminants in the soil to non-hazardous levels. The in-situ conditioning activities will occur at depths between 8 - 18 feet bsg in approximate two (2)-foot intervals. The soil, oxidant, and lime will be mixed in-situ, below grade, with a hydraulic excavator. Following receipt of laboratory results for confirmations soil samples, application of agricultural lime will dry and reduce the pH of the conditioned soil for off-site disposal. After the non-hazardous soils have been excavated and disposed, the process will be repeated for each subsequent deeper treatment interval.

If the soil conditioning is successful, the soils can be disposed of as non-hazardous solid waste instead of a hazardous waste. Surface and near-surface soils that have not been impacted will be stockpiled on-site and used as backfill following excavation. All of the soil samples obtained from the 0-4 feet bsg interval exhibited adsorbed cVOC concentrations less than the corresponding RCG IDCSLs, therefore it will remain onsite and will not be disposed off-site at a landfill. IWM Consulting anticipates having to condition approximately 1,450 to 1,500 tons of soil in-situ prior to removal and offsite disposal and another approximately 1,000 tons of soil can be directly loaded and transported to the landfill without having to condition the soil in-situ since previous TCLP testing has confirmed that this soil is not characteristically hazardous.

In an effort to remediate the deeper interval immediately below the base of the cVOC excavation, IWM Consulting proposes to place approximately 4,000 pounds of Provect-Ox, a proprietary oxidant mixture of persulfate and ferric iron. This is consistent with the oxidation approach being utilized to condition the soil prior to excavation and should assist in oxidizing any cVOCs located immediately beneath or adjacent to the base of the cVOC excavation, provided that it comes in contact with the underlying saturated interval. The material will be applied and thoroughly mixed with the soil at the base of the excavation using the bucket of the excavator.

Targeted excavation activities will also occur in the vicinity of soil boring CS-GP1 since the lead concentration for this sampling point exceeds the RCG EXDCSL. The proposed excavation area is rectangular in shape and is located in the central portion of the Site, just north of the existing storage building. The volume of soil within this area, assuming an excavation depth of 2 feet, is estimated to be

approximately 20 tons, depending upon the moisture content of the soil and the final dimensions of the excavation.

a. **Effectiveness** – High: This method eliminates the soil migration to groundwater pathway by removing sorbed contaminants and potential future contact risks with impacted soil or groundwater and vapors. This approach should also result in reduced dissolved cVOC concentrations once the highest site contaminants have been removed from the subsurface.
b. **Implementability** – Easy to Moderate: The Site is currently vacant, so no operations would be interrupted. However, cleaner soil will have to be segregated from the soil being removed from the Site in order to be reused as backfill post excavation activities and the soil currently exhibiting characteristically hazardous conditions (based upon TCLP results) will have to be conditioned in-situ to reach non-hazardous TCLP levels. The work activities will take 4-5 weeks to complete once the contractors have mobilized to the Site.
c. **Cost** – Moderate: Costs would include soil disposal, in-situ mixing of soil with a chemical oxidant as necessary, TCLP confirmation analyses, application of Provect-Ox, imported backfill material, and compaction of imported backfill material. IWM Consulting has estimated that the cost of implementing this remedial alternative to be approximately $582,000.

Remedial Alternatives with Respect to Climate Change Conditions

An evaluation of several climate change consequences (e.g., rising sea level, increased frequency and intensity of flooding and/or extreme weather events, etc.) indicates that the Site is not likely to be materially affected by such conditions.

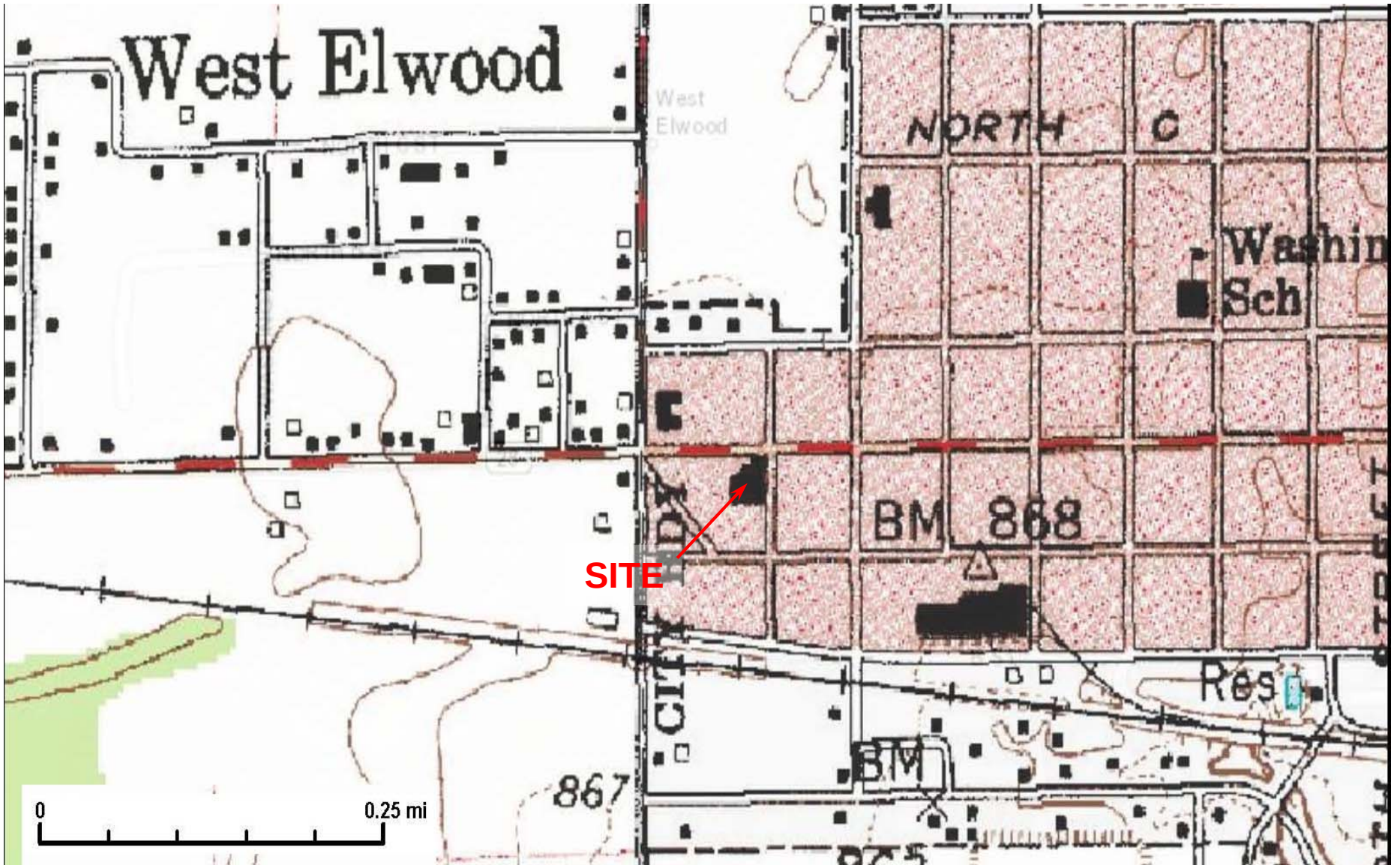
Recommendation for Site Remedy

The most feasible and appropriate cleanup alternative is Alternative 3 (Targeted Excavation and Disposal). This remedial approach immediately remediates and removes areas with the highest contaminant concentrations and expeditiously minimizes potential exposure pathways. The approach promotes redevelopment of the Site by cleaning up the Site to levels below RCG IDCSLs and it is the most health protective option for future Site occupants and construction workers.

Decision Document

A decision document will be issued at the close of the public comment period with additional details on the selected alternative for Site remedy. The decision document will serve as a notice to proceed with federally funded remediation activities and will be available in the local information repository for public review, along with this Site ABCA and other Site-related documents.

FIGURES



IWM CONSULTING GROUP

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Fax: (317) 347-9326

Project	Task	Size	Date
IN19017	01	A	4/16/2019

TITLE **FIGURE 1 – Site Location Map**
Former Central Siding Property
129 West Main Street
Elwood, Indiana

CLIENT **Elwood Redevelopment Commission**
Elwood, Indiana

MAIN ST

CS-ESG5

CS-GP11

CS-ESG4

CONCRETE/FILL

CS-ESG3

CS-GP7

CS-ESG2

EXISTING DRAINS FOR FORMER BATHROOM

PIT

CS-GP6

CS-ESG1

CS-WC3

CS-WC1

CS-WC2

GRAVEL/GRASS

2ND ST

FIRST PRESBYTERIAN CHURCH PROPERTY

CS-WC4

CS-WC5

CS-WC32

CS-WC33 CS-WC34 CS-WC35

CS-WC36 CS-WC37 CS-WC38 CS-WC40

CS-GP1

CS-WC39

CS-GP10

CS-WC41

STORAGE BUILDING

CS-GP8

CS-WC6 CS-WC7 CS-WC8 CS-WC9 CS-WC10 CS-WC11

CS-WC12 CS-WC13 CS-GP5 CS-WC15 CS-WC16 CS-WC17

CS-WC14

CS-GP12

CS-WC18 CS-WC19 CS-WC20 CS-WC21 CS-WC22 CS-WC23 CS-WC24

CS-GP3

CONCRETE

CS-WC25 CS-GP9 CS-GP4 CS-WC28 MW-1D CS-GP2 CS-WC30

CS-WC26 CS-WC27 CS-WC31 CS-WC29

ALLEY

FORMER VECTREN GAS DELIVERY BUILDING

RESIDENTIAL (120 S. A ST.)

RESIDENTIAL (124 S. A ST.)

RESIDENTIAL (126 S. A ST.)

NORTH

LEGEND

- IWM Soil Boring
- IWM Monitoring Well
- Overhead Utility Pole
- Fence Line
- U — Unknown Utility
- OH — Overhead Utility
- E — Underground Electric
- W — Water Line
- G — Gas Line
- S — Sewer Line
- T — Telephone Line

IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA
DATE: 7/8/16
REVISED: 8/30/18
IN18005.09
#Haz...Site Map.DWG

FIGURE 2
SITE MAP

0 20' 40'