ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

Preliminary Evaluation for
Wells & Son Metal Recycling aka Cardinal Grain Property
607 South Chauncey Street
Columbia City, Indiana 46725

1.0 INTRODUCTION

This Analysis of Brownfield Cleanup Alternatives documents the preliminary evaluation of environmental response action alternatives considered to mitigate potential exposures to contaminated soil and groundwater at the Wells & Son Metal Recycling aka Former Cardinal Grain property located at 607 South Chauncey Street in Columbia City, Whitley County, Indiana (hereinto referred to as the "Property"). Remediation of environmental impacts from previous uses of the parcels is needed to prepare this brownfield for redevelopment.

2.0 SITE BACKGROUND AND CONDITIONS

A. Site Location and Description

The 3.159-acre vacant, former industrial site is one parcel identified by the State by parcel #92-06-11-601-326.904-004. The Property is developed with a 3,370 square-foot, single story office building with a partial basement and a 45,790 square foot, single story industrial building with a partial basement, both built in approximately 1945. The office building contains four offices on the ground floor and two offices in the basement. The industrial building contains areas for manufacturing, warehouse space, former welding, paint booths, fabrication, chemical storage, degreasing, restrooms, boiler room and storage. The remainder of the Property is developed with asphalt parking, a grassy former parking area, associated landscaping, and a gravel access road on the southern portion. The Blue River borders the Property to the east.

B. Site History and Uses

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The Property was developed with one residential dwelling by at least 1910; prior to 1910, site usage is unknown. By 1928, the Property was developed as a coal yard with coal storage, two office buildings, a motor house, scales, a residential dwelling, and multiple unidentified buildings. Between 1928 and 1960, operations at the Property are unknown. By 1960, the Property was occupied by LML Engineering and in 1963, it was developed with a boat manufacturing facility. Historical documents also reference the manufacture of concrete blocks on the Property. Between 1963 and 1987, site operations are unknown; however, it is assumed the boat manufacturing operations continued since city directories list LML Corporation/Riviera Cruiser Division as occupants of the Property in 1987. Bond-Flex owned the Property in 1989 until an unknown date and its operations are also unknown. Between 1995 and 2003, the Property was occupied by Cardinal Grain Systems, Inc., which manufactured grain-handling equipment. A trailer manufacturer and scrap/salvage operation have most recently occupied the Property.

C. Site Assessment Findings and Environmental Conditions

Site Assessment Findings

The most recent Phase I Environmental Site Assessment (ESA) was dated March 14, 2017. The Phase I ESA identified the following recognized environmental conditions (RECs) associated with the Property:

- The historical use of the Property as an industrial manufacturing business, as a coal yard, and a scrap/salvage company and known ground water impacts.
- The potential for leaks or spills related to the use of fuel oil.
- The potential for leaching from fill material and spills or leaks.
- The potential for migration of contamination from historical and current uses of nearby sites.

In addition, the following vapor encroachment condition (VEC) was identified:

- Trichloroethylene (TCE) and its degradation products were identified in soil and groundwater on the Property.

Environmental Conditions

Environmental conditions on the Property were determined from information and data contained in the following documents:

- *Phase I ESA (Phase I ESA – January 1995), dated January 1, 1995, prepared by Envirocorp Services & Technology, Inc. (Envirocorp).*
- *Phase I ESA (Phase I ESA – November 2011), dated November 18, 2011, prepared by Arcadis US, Inc. (Arcadis).*
- *Focused Phase II ESA (Phase II ESA – January 2012), dated January 19, 2012, prepared by Arcadis.*
- *Further Site Investigation (FSI – November 2013), dated November 18, 2013, prepared by Arcadis.*
- *Phase I ESA, dated December 4, 2015, prepared by SME.*
- *Phase I ESA, dated June 29, 2016, prepared by SME.*
- *Phase I ESA, dated March 14, 2017, prepared by SME.*

Based on the RECs identified on the Property through the initial Phase I ESAs, Phase II ESA and FSI were conducted to evaluate the potential that former industrial activities, including the use of paints and degreasing solvents, have impacted the environmental conditions on the Property. Contamination by the following CERCLA hazardous substances has been confirmed in soil and groundwater at the Property: primarily TCE and its degradation products. TCE and its degradation products have been identified in soil and groundwater samples collected east and northeast of the former manufacturing building. This generally correlates with the location of the

former degreasing operations conducted while the Property was actively manufacturing products. TCE concentrations in soil and groundwater have been identified through laboratory analysis above their respective Indiana Department of Environmental Management (IDEM) Remediation Closure Guide (RCG) Commercial/Industrial Direct Contact (C/IDC) and Tap Water Screening Levels (SLs). The highest concentration of TCE in soil was 984 mg/kg (sample collected in January 2012 at a depth of 10-12 feet below ground surface), and the highest concentration in groundwater was 1,690 ug/L (sample collected in January 2012). Both were collected from sampling points east of the Property's former manufacturing building.

Groundwater elevation data indicates the groundwater at the site generally flows to the east toward the Blue River, which borders the Property to the east. Based on groundwater flow and the known location of the TCE contamination, the Blue River is a potential environmental receptor for the TCE.

The Property owner, Columbia City Redevelopment Commission, has been issued a Comfort Letter – Bona Fide Prospective Purchaser (BFPP) and qualifies for relief from potential liability related to hazardous substances contamination under the Indiana BFPP exemption assuming it meets its continuing obligations to: stop any continuing release, prevent any threatened future release, and prevent or limit human, environmental or natural resource exposure to any previously released hazardous substances. Pursuant to Indiana Comfort Letter Policy, the BFPP for this Property must abide by specific institutional controls, which are summarized below:

- Property cannot be used for residential purposes.
- Property cannot be used for agricultural purposes.
- Owner must prepare and submit a soil management plan to IDEM for any excavations greater than 10-feet in depth.
- If future use involves occupancy in existing or newly constructed buildings, the owner must either:
    - Evaluate and determine, with IDEM concurrence, the presence or absence of contaminated vapor intrusion in a human occupied building, or
    - Install, operate and maintain a vapor mitigation system consistent with US EPA and IDEM guidance.
- No groundwater from beneath the Property can use used for any purpose other than contaminant assessment or remediation.

It is believed the contamination at the Property is not the result of a specific incident; rather, it has been caused by the long-time historic use of the Property for manufacturing activities.

D. Project Goals and Objectives

The planned reuse for the Property is redevelopment as commercial or industrial land. The objective of the remediation activities is to facilitate redevelopment by mitigating risks to human health and the environment. Through removal of the environmental hazardous substance risks, the Property will be presented as redevelopment ready.

3.0 APPLICABLE REGULATIONS AND CLEANUP STANDARDS

A. Cleanup Oversight Roles and Responsibility

Oversight and technical assistance for the project will be provided by the Indiana Brownfields Program (IBP) under the management of the Indiana Finance Authority (IFA). The IBP provides financial, technical, legal, and educational assistance, and works in partnership with the U.S. EPA and other Indiana agencies to assist communities in making productive use of their brownfield properties. The response actions will be conducted in general accordance with applicable U.S. EPA, IBP, IDEM, and OSHA rules and guidance for soil and groundwater remediation.

B. Cleanup Standards

Cleanup standards for environmental response actions addressing contaminated soil and groundwater on the Property will be as described in the IDEM RCG. The RCG describes selected approaches and cleanup standards for investigation and risk-based closure of contaminated or potentially contaminated sites in the IBP. Its purpose is to provide for consistent application of Indiana Code (IC) 13-12-3-2 and IC 13-25-5-8.5, which form the statutory basis for risk-based cleanup in Indiana.

C. Applicable or Relevant and Appropriate Requirements (ARARs)

Cleanup of the Property is a brownfield redevelopment that is consistent with the operational requirements of the *1995 Brownfields Addendum* to the *Superfund Memorandum of Agreement* between the State of Indiana and the U.S. EPA Region 5. In addition to the statutes and rules governing cleanup oversight and standards described above, the following ARARs have been identified for the project:

- Environmental response actions
    - Waste management
        - 40 CFR 261 – 265: Hazardous waste
        - Indiana Administrative Code 329 IAC 3.1: Hazardous waste
        - Indiana Administrative Code 329 IAC 10: Non-hazardous (municipal) waste
    - Transportation of wastes
        - 40 CFR 262: Hazardous wastes (U.S. EPA)
        - 49 CFR 172: Hazardous materials (DOT)
    - Health and safety
        - 29 CFR 1910.120 (HAZWOPER)
- Storm water management
    - Indiana Administrative Code 327 IAC 15

4.0 ENVIRONMENTAL RESPONSE ACTION ALTERNATIVES

To redevelop the Property, response activities are necessary to protect human health and the environment. Alternative response and environmental management activities considered for the Property consisted of the following:

- Alternative 1 - No environmental response actions are performed on the site (the "no action" alternative), and the existing hazardous substances remain in-place.
- Alternative 2 – Excavation and treatment of TCE-contaminated soil at a licensed off-site treatment facility. Installing a reactive barrier on the eastern property border along the Blue River to treat any TCE-contaminated groundwater before it flows off-site.
- Alternative 3 – *In situ* technologies to remediate TCE-contaminated soil and groundwater is applied to reduce or stabilize the contamination in-place, thus reducing subsequent threats to human health and the environment.

These response action alternatives were evaluated using the following general criteria:

- Effectiveness – 1) the degree to which toxicity, mobility and volume of contamination is reduced, 2) the degree of protection for public health, safety and welfare and for the environment, and 3) the extent of adverse effects on public health, safety and welfare and on the environment during response action implementation.
- Implementability – 1) technical feasibility, 2) availability of needed technologies, materials, equipment, and services needed to conduct the response action, and 3) administrative and permitting feasibility; presence of endangered species or historical structures; technical feasibility of ancillary functions and issues, such as engineering controls, natural attenuation of contaminant concentrations, recycling of materials, and waste treatment or disposal; and project schedule.
- Cost – 1) direct and indirect capital, labor and services costs, including costs of design and testing and 2) annual operation and maintenance costs.

A. Alternative 1 - No-Action Alternative

The no-action alternative would leave all contaminated soil in-place and the Property will not be developable as intended the Columbia City Redevelopment Commission. If the Property is not secured, there is the additional risk that the general public could come into direct contact with impacted surface/shallow soils in areas of the Property that do not contain buildings, gravel lots, et cetera, to act as a barrier.

Alternative 1 does not have an associated cost, as there are no required actions or technology needed. The "no action" alternative does not allow redevelopment of this brownfield.

This alternative was evaluated against the three key criteria as follows:

- Effectiveness – Low: the current cover types at the Property remain in-place, but risks to excavation workers, future site users, and the general public are not mitigated or reduced. Preparation of the site for redevelopment is not supported.

- Implementability – High: no action is needed to implement this alternative.
- Cost – Low

Alternative 1 is the least-cost and most implementable approach of those evaluated, but it is not effective for reducing contaminant levels or existing threats to human health and the environment posed by hazardous substances on the Property. It will not allow for the beneficial reuse of the Property in a manner that is consistent with the redevelopment plan.

B. Alternative 2 – Excavation and Off-Site Treatment of Contaminated Soil; Installation of a Reactive Barrier along east border of the Property.

Alternative 2 involves excavating the TCE-contaminated soil and transporting it off-site for treatment, and installation of a reactive barrier along the east border of the Property to treat the TCE-contaminated groundwater before it leaves the Property.

Alternative 2 is intended to remove the source (contaminated soil) of TCE contamination at the Property, which will significantly reduce the ongoing leaching of TCE to the groundwater at the subject site. TCE reduction will continue over time; however, to reduce the potential for contaminated groundwater from reaching the Blue River (which is hydraulically downgradient of the TCE source area) a reactive barrier will be installed along the eastern border of the Property. The barrier will consist of some form of iron-based reducing material, which will de-chlorinate the groundwater as it passes through. These activities will allow for the redevelopment of the Property for commercial or industrial use. On-going monitoring of the groundwater both upgradient and downgradient of reactive barrier will be required for at least 2-years, at which time the monitoring frequency will be re-evaluated. The following is a summary of the estimated cost analysis for Alternative 2:

Response Activity	Unit Cost	Quantity	Cost
Excavation, transportation and off-site treatment of contaminated soil as a hazardous waste	$450.00/ton	2,600	$1,170,000
Installation of reactive barrier along east Property border (est. 300 linear feet)	$1,200/linear foot	300	$360,000
Post Remediation Monitoring (6 groundwater monitoring wells) per quarter	$6,000	8	$ 48,000
Regulatory Coordination	$35,000	1	$ 35,000
Total			**$1,613,000**

This alternative was evaluated against the three key criteria as follows:

- Effectiveness – High: Current and future exposure risks to contaminated soil will be eliminated, and environmental-sensitive receptor exposure to contaminated groundwater will be mitigated over time.
- Implementability – High: Excavation, transportation and off-site treatment of contaminated soil are common environmental response actions that are technically feasible and easily implemented. Treatment of groundwater through reactive barriers is also technically feasible; however, the length of time for the majority of contaminated groundwater to pass through the barrier for treatment is an unknown. As a result, contaminated groundwater will remain present at the Property for an indeterminable period of time.
- Cost – High: This is a higher cost alternative, and is a solution that will require activity at the Property for several years. It would; however, allow redevelopment to occur.

This alternative was determined to be effective and technically feasible, although it is a higher-cost remedial approach and the length of time to receive regulatory closure is an unknown. Property redevelopment, may be affected by the on-going monitoring required for the contaminated groundwater.

C. Alternative 3 – *In Situ* Reagent Mixing

In situ treatment methods were evaluated as Alternative 3. These methods involve injecting or actively adding and mixing chemicals into the soil and groundwater to chemically react or stabilize the contaminants to reduce toxicity or mobility, then leaving the treated media in-place. Activated ingredients would be added during the mixing, which would allow for continued treatment of contaminated groundwater as it passes through the treatment zone. Use of this remediation approach could be successful in addressing the TCE-contaminated soil and groundwater on the Property. This is a high-cost alternative, and there is a potential for soil instability post-treatment. A geotechnical evaluation would be required to verify the redevelopment constructability over the treatment area; however, this can easily be addressed through the addition of stabilizing agents to the treatment process. On-going monitoring of the groundwater will be required for at least 2-years. The following is a summary of the estimated cost analysis for Alternative 3:

Response Activity	**Unit Cost**	**Quantity**	**Cost**
Reagent Cost and Mixing	$\$6/ft^3$	120,000	$720,000
Post Remediation Monitoring (6 groundwater monitoring wells) per quarter	$6,000	8	$ 48,000
Regulatory Coordination	$35,000	1	$ 35,000
Total			**$803,000**

This alternative was evaluated against the three key criteria as follows:

- Effectiveness – High: Current and future exposure risks to contaminated soil and groundwater will be eliminated, and environmental-sensitive receptor exposure to contaminated groundwater will be mitigated over time.
- Implementability – High: Soil mixing will involve excavating the clean over burden soil, and exposing the contaminated soil area. The reducing reagent is then mixed directly into the contaminated soil and groundwater. A stabilizing agent (e.g., Portland cement or similar) can be mixed with the treated soil to add stabilizing strength to the soil as needed. This treatment method will also treat groundwater which passes through the soil mixing area over time.
- Cost – Moderate - High: This is a moderate to high cost alternative; however, it a solution that will take less time on the Property than Alternative 2 and will allow redevelopment to occur.

This alternative was determined to be effective and technically feasible.

6.0 RECOMMENDED ALTERNATIVE

Alternative 3 is recommended as the appropriate environmental response action as it addresses the immediate environmental and human health risks associated with the contaminated soil and groundwater on the Property. While Alternative 2 would also substantially address the same risks, the costs for implementing Alternative 3 are significantly less, and the estimated time on-site mixing the reagent versus excavating and loading soil onto trucks for off-site treatment is less. Alternative 3 will achieve Property reuse objectives and allow the Property to be redeveloped for commercial/industrial use. Alternative 1 was rejected because it would not adequately mitigate the environmental risks associated with the property nor support the planned brownfield site redevelopment. Alternative 2 was rejected due to cost and potential length of time for monitoring, which could reduce the ability to get the Property back into reuse in a timely manner.