

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES

**U.S. EPA Brownfield
American Recovery and Reinvestment Act of 2009 (ARRA) Revolving Loan Fund
(RLF) Assistance Amendment (AA)# 2B-00E96801-2
and RLF AA# BL-00E48101-4
Indiana Brownfields Program
And
U.S. EPA Brownfield Cleanup CA# BF-00E61501
City of Richmond
for the
Former Richmond Gas Plant (a.k.a. MGP)
16 East Main Street
Richmond, Indiana
Indiana Brownfields Program
September 2012**

This Analysis of Brownfield Cleanup Alternatives (ABCA) was prepared in cooperation among the Indiana Brownfields Program (Program), the City of Richmond (City), and AECOM as a requirement for utilizing United States Environmental Protection Agency (U.S. EPA) Revolving Loan Fund (RLF) and Cleanup monies to remediate a brownfield. This ABCA presents three remedial alternatives considered to mitigate potential exposure to affected **soil** at the Former Richmond Gas Plant site in Richmond, Indiana (Site). This ABCA and associated funding pertain only to source removal activities at the Site. Additional Site remediation activities are being contemplated and will be addressed in future, separate documentation. Remedial measures to address impacted source soil are anticipated to be completed in 2012. This ABCA focuses on the Site information pertinent to the property that was once the western portion of the Richmond former manufactured gas plant (MGP). This ABCA includes Site details, a summary of remedial alternatives, a summary of previous Site activities, remedial action objectives, the analysis of remedial alternatives and the selected site remedy. The vacant, vegetated Site is designated industrial with anticipated recreational re-use.

Site Details

Site Name: Richmond Gas Plant (MGP)
16 East Main Street
Richmond, Indiana

Property Owner: City of Richmond
Department of Metropolitan Development
50 North 5th Street
Richmond, IN 47374

Site Representative: Mr. Tony Foster
Executive Director
City of Richmond

Department of Metropolitan Development

Summary of Remedial Alternatives for Soil

1. Alternative 1 – Institutional control to restrict future land use to recreational.
2. Alternative 2 – Stabilization with soil additive material to encapsulate and immobilize contaminants.
3. Alternative 3 – Source material removal and disposal.

Summary of Previous Site Activities

Site investigations have been performed to delineate soil and groundwater impacts associated with the Site through means of records searches, subsurface structure identification, local hydrogeological investigations, surface and subsurface sampling, installation of groundwater monitoring wells, and laboratory analysis of soil and groundwater samples. The results and findings from previous investigation efforts were presented in a number of previously prepared documents and are summarized below. A list of documents prepared of the Site is provided in a subsequent section. Investigation activities to characterize and define the nature and extent of MGP related residuals were conducted in multiple iterations between 1994 and 2012 and are summarized below.

Subsurface structures identified during these investigation activities include a gas holder, tar well and multiple building foundations associated with historic gas plant activities. An existing basement is located in the south central portion of the Site which contains a shallow well in its base, approximately 8 feet below grade. An abandoned tunnel or cistern, presumably utilized for the City of Richmond's historical sewer system was also identified during the investigation activities. Removal of residual tar material from the well in the basement, backfilling of the basement and removal of impacted water from the onsite tunnel/cistern are included in this source removal project.

Constituents of concern (COCs) identified in the soil during previous investigations include: benzene, ethylbenzene, and xylenes; benzo(a)-anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene and, total and WAD cyanide. Source areas of this material were located in the vicinity of the tar well in the northwest portion of the Site and in the vicinity of one soil boring located in the northeastern corner of the Site. A third source area was identified during test pitting activities in 2012. This ABCA pertains to the removal of these source materials from the Site to reduce COC impacts to below Indiana Department of Environmental Management (IDEM) Risk Integrated System of Closure (RISC) levels.

Environmental Investigations Conducted at the Site Include the Following:

- Preliminary Assessment. The Preliminary Assessment (PA) was completed by RETEC in August 1993 and concluded that below-grade structures may contain MGP residuals.
- Site Inspection. A Site Inspection report was completed by RETEC in October of 1995 addressing evaluation of the vertical and horizontal extent of MGP residuals in subsurface soils. During the investigation, 22 soil borings were completed, four of which were converted to monitoring wells MW-1 through MW-4. A concrete structure was

encountered during the advancement of soil boring SB-A, and several attempts were made within an area of approximately 20 square feet to install the boring; however, at a depth of approximately seven feet auger refusal occurred. Soil boring observations indicated that the uppermost water bearing unit is located at approximately 13 to 21 feet below ground surface (bgs). Soil borings generally indicate that a four to ten foot layer of fill material extends across the Site, underlain by four to ten feet of silty sand and clay, underlain by bedrock. Generally, two soil samples were collected from each soil boring and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and total cyanide. One soil sample was collected from soil borings SB-5 and SB-13, and three soil samples were collected from SB-20. COCs including benzene, benzo(a)-anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene constituent concentrations were detected in soil samples SB-13, SB-14, and SB-20. Slug Testing. A Slug Testing Site Inspection was conducted by RETEC in February 1995 addressing additional hydrogeologic data from the upper-most-water-bearing unit at the Site.

- **Additional Site Investigation.** An Additional Site Investigation was completed by RETEC in October 1995 to evaluate the lateral extent of soil and groundwater impacts toward the Whitewater River. During the investigation, two soil boring/monitoring wells were installed (MW-101 and MW-102). Constituents detected included PAHs in soil, and ethylbenzene, total xylenes, PAHs, and total cyanide in groundwater.
- **Surface Soil Sampling.** In 1996, RETEC completed a surface soil investigation to assess the impact of MGP residuals at the Site. Samples were collected at twelve locations across the Site (SS-1 through SS-12).
- **Ground Water Monitoring.** In 1996, RETEC collected a groundwater sample from monitoring well MW-102. The remaining wells were not sampled due to the presence of product observed during collection of static water levels.
- **Remediation of Purifier Parcel.** In 2005, RETEC completed a soil remediation on the Purifier parcel located adjacent to the eastern boundary of the Site. During the remediation, three test pits were completed within the northwest portion of the subject Site in the area of the tar well. The first two test pits (TP-01 and TP-02) were completed to a depth of approximately 15 feet. Both test pits found no indications of a tar well. The soil from the test pits had no visual staining and the PID readings of screened soil were 0.0 ppm. The third test pit, TP-03, located approximately 20 feet west of TP-01 and TP-02, was completed to a depth of approximately 9 feet. At 9 feet a large piece of concrete, approximately 4 feet by 3 feet and a thickness of 6 inches, was exposed and lifted by the excavator. Under the exposed piece of concrete was a structure containing water and a tar-like material. The concrete appeared to be covering the structure; however, only a portion of the structure was exposed, and no estimate of structure size could be determined. The concrete was put back in place and the soil replaced into the test pit. Visual staining was observed on the soil from TP-03 at a depth of approximately 7 feet.
- **Supplement Subsurface Investigation.** In 2007 Burgess and Niple conducted a subsurface investigation was conducted to: investigate and define the former 65,000 and 10,000 cubic foot (cf) gas holders, delineate subsurface tar byproduct left from historical manufactured gas plant operations, and evaluate potential groundwater impact on the Site due to historical manufactured gas plant operations. The investigation included completion of two test pits, installation of two monitoring wells (MW-05 and MW-06) and

completion of seven soil borings. Soil samples were collected from test pits completed in each holder. No other samples were collected.

- Phase II Investigation. A Phase II Site Investigation (Phase II) was conducted by Keramida Inc. in May 2011. The investigation activities included soil borings, monitoring well installation, monitoring well gauging and sampling of soil and groundwater. Surface soil and subsurface soil samples were collected for analysis of BTEX, PAHs, total cyanide, weak acid dissociable (WAD) cyanide, and select metals. Groundwater samples were collected for analysis of BTEX, PAHs, WAD cyanide, and select metals.

Previous Reports

The following documents have been prepared to summarize investigation activities described above at the Site:

- Preliminary Assessment, Former Manufactured Gas Plant Site, Richmond, Indiana. August 15, 1994 [PA] (RETEC, 1994).
- Site Inspection Report, Former Manufactured Gas Plant Site, Richmond, Indiana. March 31, 1995 [SI] (RETEC, 1995a).
- Slug Testing Report, Site Inspection, Former Manufactured Gas Plant Site, Richmond, Indiana. March 31, 1995 (RETEC, 1995b).
- Additional Site Investigation Report, Former Manufactured Gas Plant Site, Richmond, Indiana. January 12, 1996 (RETEC, 1996a).
- Surface Soil Sampling Report, Former Manufactured Gas Plant Site, Richmond, Indiana. May 31, 1996 (RETEC, 1996b).
- Ground Water Monitoring Summary, April 1996, Former Manufactured Gas Plant, Richmond, Indiana. June 21, 1996 (RETEC, 1996c).
- Soil Boring and Analytical Summary – December 2004, Former MGP Site – Richmond, Indiana, RETEC Project Number # IGC20-18598. Letter Report. February 16, 2005.(RETEC, 2005a).
- Supplemental Site Investigation Work Plan, Former Manufactured Gas Plant Site, Western Parcel (Main Process Area), Richmond, Indiana. May 26, 2005. (The RETEC Group, Inc., 2005b).
- State of Indiana Department of Natural Resources Division of water, Early Coordination/Environmental Assessment. DNR# ER-11607. Letter Correspondence. July 13, 2005. (IDNR, 2005).
- Remediation Completion Report, Purifier Parcel – Richmond MGP, Richmond, Indiana. August 18, 2005. (RETEC, 2005c).
- Supplement Subsurface Investigation, Former Manufactured Gas Plant, Richmond, Indiana. Letter Report. April 20, 2007. (Burgess and Niple, 2007).

- Phase II Investigation Report, Former Manufactured Gas Plant, 77 Johnson Street, Richmond, Indiana. June 11, 2011. (Keramida Inc., 2011).

Remedial Action Objectives

The Site currently is vacant and its cover is predominately fill material and dense vegetation. See Figures 1 and 2. Current Site use is designated industrial with anticipated future use designated as recreational. The remedial objective for the Site is to ensure that exposure to affected media is controlled sufficiently to protect future receptors: construction workers and recreational patrons.

Remedial action needed to protect potential receptors within the Site by reducing the source area contaminant levels to below IDEM RISC levels should include the following:

- Removal of MGP source material that is present in onsite areas that could potentially migrate into offsite media; and
- Eliminate or control potential exposure pathways for site workers, construction workers, and recreational patrons.

An analysis of alternatives to achieve these objectives is presented below followed by the selected remedial recommendation for the Site.

Analysis of Alternatives

Cleanup alternatives considered to mitigate exposure to affected **soil** included the following:

4. Alternative 1 – Institutional control to restrict future land use to recreational.
5. Alternative 2 – Stabilization with soil additive material to encapsulate and immobilize contaminants.
6. Alternative 3 – Source material removal and disposal.

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 action options.*
- b. *Capital costs, including both direct and indirect costs; b. Initial costs, including design and testing costs.*
- c. *Annual operation and maintenance costs.*

Alternative 1 – Institutional Controls

Institutional Controls; the City does not directly address impacted soil and groundwater on the Site, other than complying with Environmental Restrictive Covenants (ERCs) to limit land use to commercial/industrial and installing a permanent fence to isolate the impacted Site.

1. Effectiveness – If soils exceeding the IDEM Industrial Default Closure Levels (IDCL) and/or recreational exposure levels are encountered, then this alternative would not protect construction workers during subsurface excavation work or the general public utilizing the Site for its intended recreational purposes. Fencing the Site would help mitigate this exposure. However, due to the continued exposure potential, this alternative is not an effective stand-alone remedial alternative.
2. Implementability- Easy to implement in the short term. No long-term protection of construction workers or public.
3. Cost – less than \$10,000. All capital costs. No operation and maintenance (O&M) costs.

Alternative 2 – In-situ Solidification

In-situ solidification (ISS) is the process of solidifying the COCs by mixing in Portland cement and other additives, if needed. By solidifying the COCs and reducing the permeability, groundwater will flow around the solid soil area rather than through it helping to prevent the spread and movement of contamination. Mixing can be completed with the use of augers, injection rakes or with an excavator bucket, depending on depth and soil conditions.

1. Effectiveness – Contaminant mass would be sequestered but not destroyed. This alternative is very effective as COCs would no longer be mobile in the soil and not be able to impact groundwater.
2. Implementability – The mixing of solidification agent with the impacted soil is relatively easy. There may be an airborne dust issue during mixing operations which could be controlled with the addition of dust suppressant during mixing activities.
3. Cost – In-situ Solidification (\$450,000) is more costly than taking no action and for excavation and offsite disposal of source material soils. It would be comparable in cost to capping the Site. All capital costs. No O&M costs.

Alternative 3 – Source Material Removal and Disposal

Removal and disposal of all impacted soil above IDEM RISC levels.

1. Effectiveness – This option would permanently remove potential COC sources in excess of the construction worker limits.
2. Implementability – The removal action is relatively simple, although some preliminary investigation will be necessary to delineate the source materials.
3. Cost – Source material removal (\$160,000) would be the most cost effective option with the exception of institutional controls. All capital costs. No O&M costs.

Recommendation for Site Remedy

Alternative 1 (Institutional Controls) is a cost effective and accepted measure to manage risk by limiting future Site use to a narrow receptor group. Alternative 2 (In-situ Solidification) in conjunction with some form of capping and institutional control would adequately prevent exposure and off-site migration but would be significantly more expensive than source removal and may limit future development opportunities due to the remaining monolith. Alternative 3 (Source Material Removal and Disposal) is the most cost effective option and permanently removes the potential direct contact with source material(s) and the potential for migration to groundwater. Therefore, the recommended remedy is a combination of institutional controls (Alternative 1) and contaminant removal (Alternative 3).

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 view, along with this Site ABCA and other Site-related documents for public view.

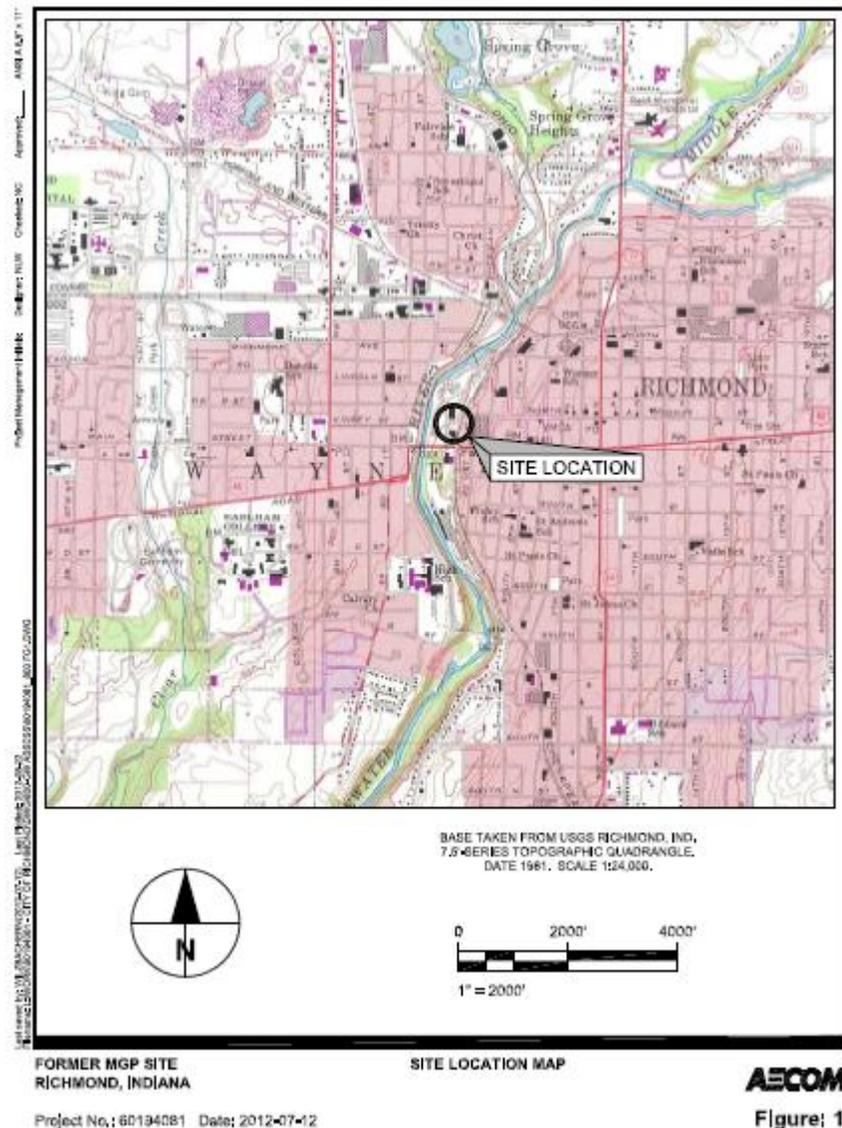


FIGURE 1

