



**ANALYSIS OF BROWNFIELDS CLEANUP
ALTERNATIVES (ABCA)**

**REPORT REVISION 1.0
August 18, 2010**

**FORMER MASON STREET GAS STATION
216 MASON STREET
CAPE GIRARDEAU, MISSOURI**

**Missouri Brownfields Revolving Loan Fund
EPA Region 7 Brownfields Grant Program
EWI Project No. 100277**

Prepared for:

**ENVIRONMENTAL IMPROVEMENT AND
ENERGY RESOURCES AUTHORITY
Jefferson City, Missouri**

Prepared by:

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August 18, 2010

Kristin Allan Tipton
Development Director
EIERA
P.O. Box 744
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RE: Analysis of Brownfields Cleanup Alternatives – Report Revision 1.0
Former Mason Street Gas Station – 216 Mason Street
Cape Girardeau, Missouri

Dear Ms. Allan Tipton:

Environmental Works, Inc. (“EWI”) is pleased to submit this Analysis of Brownfield Cleanup Alternatives (ABCA) Report under our existing Environmental Consulting Agreement. This document has been developed consistent with the EWI Environmental Services Proposal dated July 9, 2010 and the Scope of Services presented therein.

The content and format of the enclosed ABCA is comparable to cleanup planning documents developed and approved in connection with previous EPA Region 7 Brownfields Grant programs. Specific cleanup alternatives and associated recommendations are presented in applicable sections of this report.

EWI appreciates the opportunity to support EIERA and the Missouri Brownfields Revolving Loan Fund. Please contact me at (417) 890-9500 or at brian@environmentalworks.com if you have questions regarding enclosed report wish to discuss the project in more detail. We look forward to a continued relationship with you and EIERA.

Regards,
ENVIRONMENTAL WORKS, INC.

Brian M. Conrad
Brownfields Contract Manager

Enclosure

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1.0 INTRODUCTION AND BACKGROUND

This Analysis of Brownfields Cleanup Alternatives (ABCA) Report documents brownfield cleanup planning related to prospective roadway, city infrastructure, and greenspace improvements surrounding and including real property located at 216 Mason Street in Cape Girardeau, Missouri, referred to herein as “Site”, “subject site”, or “subject property”. These efforts were implemented under the Missouri Brownfields Revolving Loan Fund administered by the Environmental Improvement and Energy Resources Authority (EIERA). Project funding is provided by the U.S. Environmental Protection Agency (EPA) through a Brownfields Revolving Loan Fund Grant.

Environmental Works Inc. (EWI) implemented project work consistent with our existing Environmental Consulting Agreement with EIERA (“Agreement”) and the associated Environmental Services Proposal dated July 9, 2010 (“Proposal”). Report content and format is comparable to cleanup planning documents developed and approved in connection with previous EPA Region 7 Brownfields Grant projects.

Cleanup alternatives were evaluated in accordance with EPA Region 7 protocols and general guidance required prior to implementation of a cleanup design using EPA Brownfields Grant funding. More specifically, this ABCA has been developed to present viable cleanup alternatives based on site-specific conditions, technical feasibility, and preliminary cost/benefit analyses. Specific cleanup alternatives and associated recommendations are presented in applicable sections of this report.

Phase I and Phase II Environmental Site Assessments (ESAs) of the property were completed in January 2009. Phase I research identified previous auto repair and service station operations as a recognized environmental condition (REC) in connection with the Site. Potential underground storage tanks (USTs) associated with these operations was the primary basis for ABCA evaluations and cleanup recommendations presented herein. Additional details regarding previous assessment activities and findings are further summarized in the following introductory sections.

1.1 Site Location and Description

The subject site includes a 0.36-acre vacant parcel at the intersection of Chestnut Street and Mason Street in Cape Girardeau, Missouri. County records list the property as 216 Mason Street – Parcel ID No. 167200002002000000. A legal property description and Warranty Deed is filed with Cape Girardeau Recorder of Deeds as Document No. 2010-05954.

Previous site improvements have reportedly been demolished with some gravel and brick remnants in the southwest portion of the site. Available Phase I / Phase II records provide additional details regarding previous land use and current site conditions including historical maps and site diagrams.

1.2 Site History and Prospective Use

According to Phase I research provided by others, the subject property operated as a service station for an unspecified period through the 1970s. Additional commercial/industrial use of the property is not documented in available Phase I / Phase II reports. Previous building structures were reportedly demolished in 2008.

EWI understands the property remains vacant with no designated use. Prospective land use reportedly includes roadway and general infrastructure improvements in support of the Mason Street realignment, associated developments, and preservation and enhancement of surrounding greenspace.

1.3 Previous Assessment Findings

Aquaterra Environmental Solutions, Inc. (Aquaterra) completed a Phase I Environmental Site Assessment of the property in January 2009. This assessment identified previous auto repair and service station operations as a Recognized Environmental Condition (REC) in connection with the Site, as defined by ASTM Standard E 1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*.

In response to Phase I findings, Aquaterra completed a Phase II Assessment the same month. Phase II sampling did not identify petroleum or petroleum-related impacts to soil or groundwater above applicable MRBCA cleanup standards. Although elevated contaminant levels were not identified, available records suggest petroleum USTs remain on site, based on interviews, observed site conditions (e.g. apparent vent pipes), and loan application records.

Specific information regarding the number of petroleum USTs, tank dimensions, tank contents, or other pertinent UST information was not provided in the referenced Aquaterra reports. Loan application documents indicate two abandoned USTs remain on site – one 150-gallon and one 250-gallon. Specific tank contents are not indicated. EWI assumes this information remains accurate for the purposes of this report and the cleanup evaluations contained herein.

1.4 Project Scope and Objectives

The project Scope of Services includes evaluation of reliable UST removal/closure strategies based on technical relevance, property redevelopment objectives, and estimated cost. Applicable cleanup technologies were outlined and evaluated in response to existing Phase I / Phase II information and supporting data, loan application documents, and EWI experience with similar site conditions.

The quality objective was to provide technical analysis of demonstrated and documented quality, usable for site redevelopment/improvement determinations and development of a more definitive remedial design. Further, cleanup/removal alternatives are presented and assessed with specific consideration of applicable Missouri Department of Natural Resources (MDNR)

requirements for petroleum storage tank removal and closure. Cleanup strategies therefore consider the specific measures necessary to receive formal closure and “No Further Action” status through the Missouri Risk-Based Corrective Action (MRBCA) Program. Specific project tasks to meet these goals and objectives are summarized below:

- Initial inventory of applicable cleanup strategies based on reported site conditions, potential risk, and established remedial technologies;
- Petroleum UST removal/closure evaluations generally based on the following:
 - Site conditions and potential risks
 - Anticipated tank conditions, locations, and other ancillary components (e.g. buried piping)
 - General advantages and disadvantages of the removal/closure approach
 - Overall protection of human health and the environment
 - Ability to close tanks and mitigate to MRBCA cleanup standards
 - Compliance with federal, state, and local laws and regulations
 - Long-term and short-term effectiveness
 - Technical and administrative feasibility
 - Capital cost and subsequent expenses (if applicable)
 - Community and regulatory acceptance
- Selection of a preferred alternative using the evaluation criteria outlined above; and
- General assessment of planning and redevelopment considerations based on environmental conditions, preferred cleanup alternatives, and prospective land use.

1.5 General Assumptions and Scope Limitations

The planning discussions provided herein are primarily in response to site conditions documented through previous Phase I / Phase II activities performed by others. These evaluations are based exclusively on existing information and data obtained without EWI oversight or previous technical reviews. As such, this ABCA Report does not account for site conditions that may remain undocumented due to incomplete site characterization, technical oversights, or other variable conditions yet to be identified or accurately reported. Such conditions may warrant planning efforts and/or additional cleanup evaluations not specifically described in this report.

Consistent with EPA Brownfields Cleanup requirements, planning discussions assume tank removal/closure activities and related soil and/or groundwater remediation (if required) would be planned and implemented under the MDNR Hazardous Waste Program. Accordingly, cleanup alternatives are presented consistent with MRBCA Technical Guidance and specific MRBCA closure requirements for petroleum storage tanks. Yet EWI cannot predict or guarantee the specific MDNR requirements that may arise through subsequent planning, removal/closure, and

remediation procedures. Site-specific MDNR requirements or technical requests may therefore warrant additional planning considerations beyond the scope of this report.

1.6 Report Limitations

EWI implemented and documented project work consistent with our existing Environmental Consulting Agreement and the associated Environmental Services Proposal dated July 9, 2010. Professional services remain contractually bound by the specific terms, conditions, and limitations outline in these documents and the Scope of Services presented therein.

The findings, conclusions, and EWI recommendations presented in this report are based solely upon the data and information obtained and reviewed through the authorized Scope of Services. Such information is subject to change over time and EWI cannot represent any conditions beyond those specifically identified through client-authorized work. EWI makes no warranties, express or implied, with regard to cleanup planning determinations or any third party information used in connection with this project. These limitations must be considered by the user of this report for any associated planning or land use determinations.

1.7 Reliance

This project was funded through a federal Brownfields Grant awarded under the EPA Region 7 Brownfields Program. Project documents submitted to EPA, MDNR, or any other government agency may therefore become public record pursuant the Freedom of Information Act. Contractual use and reliance on the ABCA Report, however, is limited to the Environmental Improvement and Energy Resources Authority (EI ERA) through our current Environmental Consulting Agreement. Project work was also performed on behalf of the Cape Girardeau Municipal Development Foundation in support of local brownfield redevelopment. Contractual reliance by any other party is prohibited without the written authorization of the EI ERA and Environmental Works, Inc. Reliance on the ABCA Report by the Client and all authorized parties is subject to the terms, conditions, and limitations stated in the existing Agreement, our Environmental Services Proposal, and this report.

2.0 EVALUATION OF CLEANUP ALTERNATIVES

2.1 General Cleanup Evaluation Approach

Brownfield cleanup alternatives were selected for expanded evaluation based on technical considerations specific to UST removal/closure, potential environmental impacts and associated risk, and related cost/benefit analysis. This approach included further review of applicable petroleum UST removal/closure alternatives using the following evaluation criteria:

- Previous assessment findings and documented site conditions
- Industry standards and practice specific to petroleum UST removal and closure
- Specific removal, closure, and site characterization requirements outlined in MRBCA Technical Guidance
- Ability to address human health and environmental risks in accordance with MRBCA Technical Guidance and other related risk assessment tools
- Current and prospective land use – both on-site and adjoining properties
- Technical and economical feasibility
- Professional judgment and experience working under the MDNR Hazardous Waste Program

2.2 Cost Estimate Assumptions and Limitations

The cost summaries provided in this report are presented as general order of magnitude estimates due to various unknowns regarding suspect UST conditions, including residual contents, UST construction details, and associated piping and other ancillary UST components. Further, pending removal/closure work plans, removal specifications, Remedial Action Plans, etc., may present remedial alternatives and technical procedures beyond the scope and intent of this report. Preliminary costs presented in this ABCA may therefore vary significantly from actual removal, UST closure, or other associated environmental cleanup expenses. These estimates do not represent EWI cost proposals, fee schedules, or other cost warranties related to pending work performed consistent with ABCA recommendations and related technical evaluations.

Several assumptions were made specific to each UST removal/closure alternative, generally based on information provided in previous assessment reports prepared without EWI oversight. It should be noted that these assumptions may or may not accurately reflect final cleanup plans or other pending specifications. Accordingly, budget-level cost determinations would require more detailed site investigation, buried tank evaluations, and related planning beyond the current phase of this project. Preliminary ABCA cost estimates are intended solely for planning purposes and should be considered accurate for relative comparison only.

2.3 Preliminary Cleanup Evaluations

EWI evaluated three environmental cleanup/closure alternatives in response to the Phase I / Phase II findings noted in previous sections of this report. These alternatives include the following:

- Cleanup Alternative 1 – Tank Removal**
- Cleanup Alternative 2 – Tank Closure in Place**
- Cleanup Alternative 3 – No Action**

Buried storage tanks (petroleum or otherwise) are generally addressed through direct removal and off-site disposal of the abandoned tanks, associated piping and other ancillary components, and residual materials and waste that remain inside the tanks. Certain conditions demand in-place closure due to restricted tank access, structural concerns close to buildings, or other complicated logistical scenarios.

The following subsections provide further analysis of these cleanup alternatives in relation to planned roadway improvements and typical brownfield redevelopment considerations. Associated cost estimates are provided with each alternative.

2.3.1 Alternative 1: Storage Tank Removal

Approach Summary – Alternative 1 includes conventional excavation/removal of the petroleum USTs, associated piping, and other ancillary components that may remain below ground. The tanks would be excavated, cut open for access, and cleaned prior to disposal off site. A blower system would provide continuous ventilation to mitigate combustion and VOC inhalation hazards. Interior tank conditions and potentially explosive conditions would be continuously monitored using a combustible gas meter. Interior tank cleaning may also require Level B or modified Level C personal protective equipment (PPE). Excavated tank structures and surrounding soils (if necessary) would be disposed off site at a permitted Subtitle D landfill for non-hazardous waste.

The open UST excavation, piping runs, and former fuel dispenser locations (where identifiable) will be sampled according to MRBCA Technical Guidance prior to backfilling the excavation. Backfill and compaction specifications would be applied as required for site redevelopment. MDNR closure criteria would be demonstrated through laboratory analysis of UST excavation base and sidewall samples obtained through conventional grab sampling procedures. Over-excavation of the UST basin, associated fill, and surrounding soils may be required to meet specific MRBCA cleanup standards.

The following Cost Estimate and Technical Summary outlines UST removal activities, related assumptions and technical specifications, and projected costs in greater detail. These details may or may not accurately reflect the final removal/closure design and conditions encountered in the field.

**Table 1a. Cost Estimate and Technical Summary
Brownfield Cleanup Alternative 1 – Storage Tank Removal**

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
A1	Mobilize Heavy Equipment	\$650	\$1,250
A2	Site Access & Loading - clear/grub, construct gravel drive/loading areas as needed, traffic controls	\$650	\$1,250
A3	Remove Petroleum USTs – Two (2) tanks with volume not to exceed 500 gallons - includes equipment, labor, cleaning of tank and disposal of UST and related components; excludes tank contents & residual waste	\$3,000	\$3,500
A4	Contain, Characterize & Dispose Tank Contents and Residual Waste	\$600	\$1,800
A5	Backfill Tank Void - assumes up to 12 cubic yards (CY); delivery to site, compaction and grading	\$500	\$1,000
A6	Field Sampling & Laboratory Testing - field labor and subcontract laboratory services	\$1,100	\$2,200
A7	Work Plans Removal Specifications, Closure Report & General Field Documentation	\$2,500	\$3,000
A8	Temporary Fencing, Erosion Controls & Seeding	\$ 250	\$500
A9	Miscellaneous Expenses & Permitting	\$250	\$500
PROJECTED BASE TOTALS:		\$9,500	\$15,000

Advantages – The UST, piping and other potential contaminant sources are permanently removed. Direct and low-tech approach with well established and field-proven procedures accepted and preferred by MDNR. Tank removal (and soil if required) addresses exposure risk and owner/operator liabilities. Land use is not restricted following demonstration of MRBCA closure criteria. Most accelerated path to MDNR No Further Action status.

This alternative is also the most cost effective removal/closure approach when properly executed in the field. Qualified contractors are abundant and accessible throughout the state. This increases price competitiveness through the bid process and provides the owner/operator with multiple options. Cleaned steel tanks and piping can be scrapped for cash, further reducing associated costs.

Disadvantages – Tank removals generate potentially hazardous waste streams and expose field personnel to challenging and potentially dangerous conditions if strict measures are not followed. Excavations to expose old USTs often encounter contaminated soils and other unforeseen subsurface conditions such as additional tanks. Yet these conditions would need to be addressed regardless of cleanup alternative applied. Equipment operators must be experienced and careful

not to damage buried UST and release contaminants that were previously contained. Tank bottoms, sludge, and other potentially hazardous residual wastes are difficult to quantify prior to exposure of the tank, which can complicate and delay UST cleaning and waste disposal determinations.

General Contingencies – Buried tank details are difficult to assess without reliable documentation such as registration records and as-built drawings. Reliable assessments become even more difficult when dealing with older “orphan” sites and historical operations that pre-date most environmental regulations. Accordingly, the following tables outline contingency costs related to typical conditions that can delay brownfield redevelopment and significantly escalate cleanup costs, including additional tank removals and cleanup of petroleum-contaminated soils.

**Table 1b. Summary of Potential Contingency Costs
Brownfield Cleanup Alternative 1 – Removal of Additional USTs & Increased Tank Volumes**

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
PROJECTED BASE COST		\$9,500	\$15,000
A10	CONTINGENCY #1: Third UST encountered; volume ≤ 500 gallons; includes all applicable base line items consistent with Table 1a	\$1,600	\$ 2,400
A11	CONTINGENCY #2: Larger tank volume(s) encountered - additional volume (total all tanks) not to exceed 1,500 gallons; includes all applicable base line items consistent with Table 1a	\$2,400	\$ 3,100
EXPANDED TOTALS WITH ALL CONTINGENCIES:		\$13,500	\$20,500

**Table 1c. Summary of Potential Contingency Costs
Brownfield Cleanup Alternative 1 – Removal of Petroleum-Impacted Soils**

ACTIVITY DESCRIPTION		Time & Materials Unit Rate Estimates		
		Units	Low Range Estimate	High Range Estimate
A12	Excavate, Load, Transport & Dispose Petroleum-Impacted Soils - soils characteristically non-hazardous; assumes direct loading without temporary staging	Ton	\$ 75.00	\$ 95.00
A13	Dewatering - containment and disposal options vary and are excluded from estimate	Hour	\$ 160.00	\$ 190.00
A14	Backfill Soil Excavation - delivery to site, compaction and grading	Cubic Yard	\$ 40.00	\$ 48.00
A15	Site Restoration - additional restoration efforts for expanded soil excavation(s)	Lump Sum	\$ 450.00	\$ 900.00

2.3.2 Alternative 2: Storage Tank Closure in Place

Approach Summary – Alternative 2 includes in-place closure of the existing USTs using flowable fill technologies. This approach would not significantly disturb or remove the buried tanks. Reasonable efforts to uncover and access the interior of the tank would still be applied to remove any remaining product and residual wastes for disposal off site. Specific UST access and monitoring would be applied as discussed for Alternative 1 – e.g. air quality monitoring, ventilation / supplied air, PPE, etc.

This alternative would generally entail application of an inert, flowable material to fill and seal the buried storage tanks within existing locations. Competent fill materials vary based on existing UST and subsurface conditions. These materials include concrete slurries, sand, ash and other granular mixtures, and foaming agents. Flowable fills could be applied using ready-mix trucks with flow shoots or other pump/injection systems workable for the specific material used. Physical properties should be carefully evaluated to ensure density, permeability, and sealing capabilities compatible with the final closure design. An accurate buoyancy and water table assessment is critical if a foaming agent is applied.

Excluding preliminary efforts to access and clean the UST, in-place closure will not produce an open excavation for confirmation sampling. To address this gap and meet MRBCA closure criteria, alternative sample collection methods are required. EWI has included direct-push (Geoprobe®) sampling within the Alternative 2 scope for this reason.

The following Cost Estimate and Technical Summary outlines in-place closure activities, related assumptions and technical specifications, and projected costs in greater detail. These details may or may not accurately reflect the final removal/closure design and conditions encountered in the field.

Table 2. Cost Estimate and Technical Summary
Brownfield Cleanup Alternative 2 – Storage Tank Closure in Place

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
B1	Mobilize Heavy Equipment	\$650	\$1,250
B2	Site Access & Loading - clear/grub, construct gravel drive/loading areas as needed, traffic controls	\$650	\$1,250
B3	Uncover/Access Petroleum UST - assumes use of excavation and torch/cutting equipment to access tank interior	\$2,000	\$2,500
B4	Contain, Characterize & Dispose Tank Contents and Residual Waste	\$600	\$1,800
B5	Backfill UST In-Place with Inert, Flowable Fill - material options vary: concrete slurry, sand/ash, and foaming agents; cost based on backfill of 6,000 gallon UST to maximum capacity; includes all associated equipment and labor	\$900	\$1,400
B6	Direct-Push (Geoprobe®) Investigation - direct-push sampling required for collection of confirmation samples consistent with Item B7; excavation samples not attainable due to in-place closure; includes all direct-push equipment, supplies operator labor	\$1,100	\$1,600
B7	Field Sampling & Laboratory Testing - field labor and subcontract laboratory services; sample collection labor included in Item B6	\$1,100	\$2,200
B8	Work Plans Removal Specifications, Closure Report & General Field Documentation	\$2,500	\$3,000
B9	Miscellaneous Expenses & Permitting	\$250	\$500
PROJECTED TOTALS:		\$9,750	\$15,500

Advantages – Advantages are limited. This approach is typically applied when structural considerations prevent access and excavation around tank due to proximity to building foundations, footings, or other critical structures.

Disadvantages – Does not remove petroleum USTs and potential source of subsurface contamination. Liability remains for owner/operator and may restrict brownfield redevelopment potential. MDNR may not recognize as sufficient closure unless extreme conditions, structural concerns, or other technical complications are clearly demonstrated. No Further Action status may not be attainable as a result. Fill materials will likely require follow-up inspections and maintenance, or simply fail due to unforeseen conditions.

General Contingencies – Additional cost and technical contingencies were not evaluated for this cleanup alternative. Specific technical limitations and preliminary cost evaluations suggest minimal benefit to application of this approach in connection with the project.

2.3.3 Alternative 3: No Action

This cleanup alternative would not include any specific efforts to remove or maintain existing USTs in place. There would be no direct cleanup costs associated with this alternative; however, potential environmental and financial liabilities would not be addressed.

2.4 Recommended Cleanup Alternative

EWI recommends planned removal of the documented USTs consistent with the procedures and technical specifications presented for Cleanup Alternative 1, *Storage Tank Removal*, and Section 2.3.1 of this report. In-place closure or the No Action alternative would not address petroleum UST liabilities, potential contaminant sources, or potential limitations on future land use and brownfield redevelopment potential. In contrast, UST removal via Alternative 1 would effectively address these issues using a direct and proven technical approach that is cost effective and routinely applied by the MDNR Hazardous Waste Program to address similar situations.

3.0 ADDITIONAL CONSIDERATIONS

3.1 Unforeseen Subsurface Conditions

Available information regarding existing USTs and other associated conditions is limited and does not specifically document tank removal and scope requirements. Despite previous Phase II findings, subsurface conditions beneath and immediately surrounding buried tanks may require expanded removals, waste containment, and disposal efforts. Based on extensive experience with similar UST removal projects, EWI recommends appropriate contingency planning to address the following:

- Larger and/or more tanks than anticipated
- Residual tank contents and associated waste volumes higher than anticipated
- Expanded soil removals to address petroleum contamination
- Tank pit dewatering, containment, and disposal
- Access and excavation restrictions, buried utilities, other subsurface obstructions

3.2 Missouri Voluntary Cleanup Program

Cleanup projects implemented with EPA Brownfields Cleanup funding generally require participation in the state Voluntary Cleanup Program (or general equivalent) to verify specific environmental cleanup procedures. Accordingly, this ABCA Report has been developed with specific consideration to MNR Brownfields / Voluntary Cleanup Program (B/VCP) procedural requirements and MRBCA Technical Guidance, the primary tool used to design, implement, and verify environmental remediation by the State of Missouri.

EWI recommends property enrollment in the Missouri B/VCP prior to subsequent phases of this project. The enrollment process includes completion of a three-page application submitted with a non-refundable application fee of \$200.00. Program enrollment also requires execution of a property access agreement with the agency. MDNR will subsequently request a refundable oversight deposit usually not to exceed \$5,000.00. This is an eligible expense covered by EPA Cleanup or Revolving Loan Fund Grants.

Project completion under the B/VCP allows MDNR to issue a Certificate of Completion, No Further Action (NFA) letter, or other equivalent site closure documentation, which verifies regulatory closure and provides an additional level of liability protection. This protection applies to both state and federal regulation through a Memorandum of Agreement between EPA and MDNR. Required steps prior to receiving the closure certificate or NFA status generally include the following:

- Full characterization of the nature and extent of environmental impact
- MDNR approval of a UST Closure / Remedial Action Plan
- Demonstrated implementation of the approved Plan
- Clearance sampling following UST removal (specific closure criteria apply)
- Associated documentation and reporting

3.3 Missouri Tanks Section

Excluding specific circumstances, petroleum storage tank removal/closure, associated remediation, and subsequent monitoring and reporting efforts are primarily managed and overseen by the MDNR Tanks Section. Due to the nature of the project – i.e. Brownfields funding to address petroleum USTs – EWI anticipates joint coordination under both programs to ensure specific technical and programmatic procedures are implemented to meet all applicable MDNR requirements for petroleum UST removal and regulatory closure. This would include verification testing and other related documentation as outlined in applicable sections of this report.

EWI recommends primary oversight by the Missouri B/VCP as discussed above; however, formal or informal Tank Program reviews may be required by the agency. Additionally, updates and revisions to MRBCA Technical Guidance have resulted in variable requirements and cleanup standards for B/VCP sites versus Tank Section projects – e.g. different cleanup standards for benzene. EWI therefore recommends that applicable MRBCA standards and oversight procedures be clearly communicated by MDNR prior to follow-up planning and related field work.

Previous “liable/viable” evaluations were performed by the MDNR Hazardous Waste Program to verify Brownfields Grant eligibility. This eligibility determination is documented via MDNR email correspondence dated June 2, 2010. EWI understands information obtained through the eligibility determination precludes coverage and reimbursement under the Missouri Petroleum Storage Tank Insurance Fund (PSTIF). Consequently, EWI recommends further evaluation of petroleum UST funding options if more extensive impacts are identified during tank removal.

3.4 Demonstration of Tank Closure Criteria

UST closure criteria are generally demonstrated through excavation base and sidewall sampling within the former tank basin. Additional sampling may be required along associated piping runs and former fuel dispenser locations, if identified during the removal. A specific laboratory sampling and analysis program should be outlined in the approved Work Plan.

In-place closure would require a sampling program within/surrounding the closed tanks through a soil boring investigation approach – i.e. drilling or direct-push (Geoprobe®) sampling. The same laboratory analytical requirements would apply. Additionally, specific efforts to define tank locations and general dimensions may be required for formal closure. EWI recommends geophysical (e.g. ground-penetrating radar) or other non-intrusive measures to prevent damage to buried tanks.

In-place closure may also warrant institutional controls – such as excavation, construction, and other land use restrictions – and implementation of a site inspection or maintenance program to ensure specific closure procedures remain effective. Lastly, MDNR may require filing of deed notices or deed restrictions to further ensure required institutional controls are maintained according to approved specifications. EWI anticipates required follow-up measures would remain minimal, yet continued MDNR oversight costs would likely apply.

Demonstration of UST closure criteria will require a final Closure Report and supporting documentation, including laboratory results, disposal records/manifests, photograph logs, and other pertinent records related to the tank removal/closure process. Based on laboratory confirmation results, expanded soil removals and/or a formal Risk Assessment may be required by the agency. More extensive contamination (e.g. groundwater) may warrant expanded site characterization in support of the Risk Assessment process.

3.5 Contractor Evaluation and Selection

EWI recommends development of a Solicitation for Bid package to evaluate and select a qualified UST removal/closure contractor. Completion of a bid walk prior to contractor submittals will allow for more reliable technical and cost determinations. This approach, particularly if issued as a pre-bid requirement, may also bias the solicitation towards local contractors. Technical considerations may be further outlined and evaluated through a Field Execution Plan (or technical equivalent) to be submitted with the bid packages.

EWI recommends evaluation of the following line-item costs in connection with the bid package. Line items may vary based on subsequent ABCA revisions and specific UST removal/closure procedures.

- Project mobilization (lump sum)
- UST removal/closure per tank
- Containment and disposal of residual tank contents/wastes
- Removal and disposal of contaminated soil, if encountered
- Dewatering, containment, and disposal of contaminated water, if encountered
- Site restoration – e.g. backfill & grading
- Work plan and reporting costs
- Contingency items and associated costs consistent with Table 1b, Table 1c, and Section 3.1 of this report

In addition to the above, EWI strongly recommends selection of a UST removal/closure contractor experienced in the MRBCA tank closure process and other general sampling, field documentation, and reporting procedures required by the MDNR Hazardous Waste Program. A third-party oversight consultant is often used for verification sampling and reporting to further ensure compliance with MDNR requirements and increase general liability protection.

3.6 Phase I Updates

Certain components of the previous Phase I report developed by Aquaterra are outdated pursuant to the EPA All Appropriate Inquiries (AAI) Rule [40 CFR Part 312] and ASTM Standard E 1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. Although EPA and ASTM requirements generally allow use of Phase I reports for up to one year, specific Phase I information must be updated if acquired more than 180 days prior to acquisition of the property. Future property transactions will therefore require a Phase I update to main federal liability protection for prospective purchasers or other authorized users of the Phase I report.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Project Summary & Background

The subject site includes a 0.36-acre vacant parcel at the intersection of Chestnut Street and Mason Street in Cape Girardeau, Missouri. Previous site improvements have been demolished with some gravel and brick remnants in the southwest portion of the site. According to Phase I research provided by others, the subject property operated as a service station for an unspecified period through the 1970s. Previous building structures were reportedly demolished in 2008.

EWI understands the property remains vacant with no currently designated use. Prospective land use reportedly includes roadway and general infrastructure improvements in support of the Mason Street realignment, associated developments, and preservation and enhancement of surrounding greenspace.

Aquaterra completed a Phase I Assessment of the property in January 2009. This assessment identified previous auto repair and service station operations as a Recognized Environmental Conditions (REC) in connection with the Site. In response to Phase I findings, Aquaterra completed a Phase II Assessment the same month. Phase II sampling did not identify petroleum or petroleum-related impacts to soil or groundwater above applicable MRBCA cleanup standards. Although elevated contaminant levels were not identified, available records and accounts indicate suggest petroleum USTs remain on site.

Cleanup Planning Objectives and Findings

The project objective was to provide a thorough evaluation of reliable cleanup strategies consistent with technical feasibility, property redevelopment initiatives, and cost. Applicable cleanup technologies were outlined and evaluated based on EWI experience with similar UST removal/closure projects, local planning objectives, and professional judgment.

Based on EWI review of previous site assessment reports and the additional considerations discussed herein, EWI has developed the following conclusions and recommendations regarding subsequent measures to address documented USTs and related subsurface conditions:

1. Brownfields Cleanup evaluations were performed consistent with EPA Cooperative Agreement requirements and the EWI Environmental Services Proposal dated July 9, 2010. EWI reviews of previous Phase I / Phase II assessment activities indicate historical information and data usable for continued brownfield cleanup planning; however, certain data and information gaps are apparent as discussed in applicable sections of this report.

2. EWI estimated costs for three (3) individual UST removal/closure alternatives in response to documented site conditions. Associated cost estimates range from zero direct costs for No Action (Alternative 3) to \$15,500 for in-place closure (Alternative 2). Including all projected contingencies for UST removal (Alternative 1), existing cost estimates range up to \$20,500. These costs do not account for removal, containment, or disposal of contaminated soil or groundwater that may be encountered during UST removals. Specific cost details are outlined in the cost summary tables provided under Section 2.3 of this report.
3. The Recommended Cleanup Alternative – *Storage Tank Removal* (Alternative 1) – would effectively address petroleum USTs and related subsurface conditions using a direct and proven technical approach. This approach is practical and cost effective when implemented with the appropriate planning and contingency measures as discussed in applicable sections of this report. Further, tank removal is the most common practice accepted by the MDNR Hazardous Waste Program to address abandoned petroleum USTs. Estimated cost for the Recommended Alternative range from \$9,500 to \$15,000, excluding related contingency measures that may apply.
4. Tank removals may encounter unforeseen conditions including but not limited to: 1) tank volumes and residual contents that exceed planning estimates; 2) additional USTs, ancillary piping, and other buried components; and 3) contaminated soil and groundwater. Tank removals consistent with the Recommended Cleanup Alternative may therefore demand specific contingencies and additional costs as presented in Table 1b and Table 1c of this report.
5. In-place closure or No Action alternatives would not address petroleum UST liabilities, potential contaminant sources, or potential limitations on future land use and brownfield redevelopment potential. In-place closure may actually escalate costs beyond permanent removal as outlined in Table 2 of this report.

Recommendations

Property reuse and redevelopment without specific measures to address documented petroleum USTs would likely increase exposure risks and associated liabilities. Due to the restrictions associated with in-place closure, EWI recommends tank removals consistent with the Recommended Cleanup Alternative – *Storage Tank Removal* (Alternative 1) – presented under Section 2.3.1 of this report. Recommended measures in support of this cleanup alternative include the following:

- Prior coordination with the MDNR Hazardous Waste Program to determine specific regulatory oversight procedures and applicable MRBCA cleanup standards – i.e. use of Departmental Guidance versus Storage Tank Guidance.

- Development of a UST Closure Work Plan, Remedial Action Plan, or other general Work Plan equivalent to further support the Recommended Cleanup Alternative as presented above. This Plan should specifically outline the selected removal/closure approach, specific waste removal and disposal requirements, and verification sampling and analysis program to be applied.
- Development of a Solicitation for Bid package for contractor selection and implementation of project work. This process may occur before or following Work Plan development based on the desired selection approach – e.g. contractor with oversight verses consultant/contractor to manage all aspects of subsequent work.
- Development of a site-specific Health and Safety Plan to be used in conjunction with the approved Work Plan.
- Clear communication of previous Phase I / Phase II and ABCA Report findings and recommendations between all project stakeholders. These efforts will help prevent unforeseen encounters with USTs or other ancillary components that may increase environmental impacts and associated exposure risks.

General Contingencies

This report has been prepared as a general planning document and is not intended to provide the engineering or bidding specifications required to pursue specific UST removal/closure measures. EWI therefore recommends subsequent development of a UST Closure Work Plan, Remedial Action Plan, or other general work plan equivalent as discussed above.

The conclusions and recommendations provided herein are primarily based on limited Phase I / Phase II assessments performed by others. This analysis assumes site conditions remain consistent with those previously documented. Future discoveries may warrant further investigation and/or UST closure evaluations not specifically described herein.

5.0 REFERENCES

- Aquaterra Environmental Solutions, Inc (Aquaterra). 2009. Phase I Environmental Site Assessment – Mason Street Gas Station, Cape Girardeau, Missouri. Aquaterra Project No. 3145.10. Aquaterra, Fairview Heights, Illinois.
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