



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

January 24, 2012

**ALLIANCE MEDICAL WAREHOUSE
13206 RAILROAD AVENUE, RUSSELLVILLE, MISSOURI**

**Missouri Brownfields Revolving Loan Fund
EPA Region 7 Brownfields Grant Program
EWI Project No. 120014**

Prepared for:

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

Prepared by:

**ENVIRONMENTAL WORKS, INC.
Springfield, Missouri**

Prepared by:

**Mark E. Burton, RG
Senior Project Manager**

Reviewed by:

**J. Kevin Cassil
Regional Manager**

Corporate Headquarters
1455 E. Chestnut Expy
Springfield, MO 65802
P: 417.890.9500
F: 417.823.9659

13100 Kansas Ave, Suite K
Bonner Springs, KS 66012
P: 913.422.3555
F: 913.422.3611

24-Hr. 877.827.9500
www.environmentalworks.com



January 24, 2012

Kristin Allan Tipton
EIERA Development Director
P.O. Box 744
Jefferson City, MO 65102

RE: Analysis of Brownfields Cleanup Alternatives
Alliance Medical Warehouse
13206 Railroad Avenue, Russellville, MO 65074

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.

EWI evaluated cleanup alternatives consistent with our Environmental Services Proposal dated August 24, 2010 and the Scope of Services presented therein. Specific cleanup evaluations 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 direct at (816) 285-8416 or at mburton@environmentalworks.com if you have questions regarding the enclosed report or wish to discuss the project in more detail. We look forward to a continued relationship with you and EIERA.

Regards,
ENVIRONMENTAL WORKS, INC.

Mark Burton, RG
Senior Project Manager

Enclosure

Corporate Headquarters
1455 E. Chestnut Expy
Springfield, MO 65802
P: 417.890.9500
F: 417.823.9659

13100 Kansas Ave, Suite K
Bonner Springs, KS 66012
P: 913.422.3555
F: 913.422.3611

24-Hr. 877.827.9500
www.environmentalworks.com

TABLE OF CONTENTS

1.0	INTRODUCTION AND BACKGROUND	1
1.1	SITE LOCATION AND DESCRIPTION	1
1.2	SITE HISTORY AND PROSPECTIVE USE	2
1.3	PREVIOUS ASSESSMENT FINDINGS	2
1.4	PROJECT SCOPE AND OBJECTIVES	4
1.5	GENERAL ASSUMPTIONS AND SCOPE LIMITATIONS	5
1.6	REPORT LIMITATIONS	5
1.7	RELIANCE	6
2.0	EVALUATION OF CLEANUP ALTERNATIVES	7
2.1	GENERAL CLEANUP EVALUATION APPROACH	7
2.2	COST ESTIMATE ASSUMPTIONS AND LIMITATIONS	7
2.3	MISSOURI VOLUNTARY CLEANUP PROGRAM	8
2.4	MISSOURI TANKS SECTION	8
2.5	PRELIMINARY CLEANUP EVALUATIONS	9
2.5.1	Alternative A: Storage Tank Removal, Soil Excavation	9
	Table 1a. <i>Cost Estimate and Technical Summary – Building Demolition</i>	11
	Table 1b. <i>Cost Estimate and Technical Summary – Alternative A</i>	12
	Table 1c. <i>Summary of Potential Contingency Costs</i>	13
2.5.2	Alternative B: Storage Tank Closure in Place, No Soil Excavation	13
	Table 2. <i>Cost Estimate and Technical Summary – Alternative 2</i>	15
2.5.3	Alternative C: No Action	15
2.6	RECOMMENDED CLEANUP ALTERNATIVE	16
3.0	ADDITIONAL CONSIDERATIONS	17
3.1	UNFORESEEN SUBSURFACE CONDITIONS	17
3.2	DEMONSTRATION OF TANK CLOSURE CRITERIA	17
3.3	CONTRACTOR EVALUATION AND SELECTION	18
3.4	PHASE I UPDATES	18
4.0	CONCLUSIONS AND RECOMMENDATIONS	19
5.0	REFERENCES	22

1.0 INTRODUCTION AND BACKGROUND

This Analysis of Brownfields Cleanup Alternatives (ABCA) Report documents brownfield cleanup planning related to prospective site redevelopment of real property located at 13206 Railroad Avenue in Russellville, 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 EWI Environmental Services Proposal dated August 24, 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.

Documentation of 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 summarized in the following introductory sections.

1.1 Site Location and Description

Based on Phase I / Phase II Site Assessment records provided by EIERA, the subject site is located at 13206 Railroad Avenue in Russellville, Cole County, Missouri (Site). The Site is currently used as a storage facility. Specific improvements include a one-story concrete block building with a canopy, an office, two service bays and a wooden shed. Surrounding land use is documented as mixed residential and commercial. The property is located in township 43 north, range 14 west, in portions of sections 2 and 3. The parcel number provided by the Cole County Assessor's Office is 17-02-03-001-003-016. Topography is relatively flat over most of the Site, sloping gently downward towards a residence located adjacent to the west. Along the northern portion of the Site, topography slopes downward to a northern residence. Residential properties are located north and west of the Site. Railroad Avenue is located along the southern portion of the Site while Johnston Road is located along the eastern portion of the

Site. Commercial properties (including a former gas station located east of the Site) are located east of Johnston Road and south of Railroad Avenue.

1.2 Site History and Prospective Use

The Site operated as a service station from approximately 1933 to 1979. Two underground storage tanks (USTs) have been removed from the Site while a third UST remains on-Site. EWI understands the property is currently being used as a storage facility.

1.3 Previous Assessment Findings

Tetra Tech, Inc. (Tetra Tech) completed a Phase I Environmental Site Assessment (ESA) of the property in May 2009. The Tetra Tech report stated the following regarding Phase I recognized environmental conditions (RECs) in connection with the Site:

- The Site was used as a service station from approximately 1933 until 1979;
- Two underground storage tanks (USTs) were removed from the Site and one UST possibly remains on-Site;
- The potential presence of petroleum impacted soil as a result of a prior release from a former on-Site UST;
- The presence of a former gas station up-gradient and adjacent to the Site; and
- Suspect asbestos-containing materials (ACMs), lead-based paint (LBP) and mold were observed during Site reconnaissance.

Based on subsequent information obtained for the Site, it appears that petroleum impact could be a result of years of continual use of unconfirmed amounts of petroleum product. Further, the petroleum impact could be from the UST remaining on-Site or a combination of the three USTs associated with the Site.

Tetra Tech performed a Phase II ESA in November 2009 to confirm the presence or absence of petroleum impacted groundwater. Results from the Phase II ESA included the following:

- Total Petroleum Hydrocarbon (TPH) Gasoline Range Organics (GRO) and naphthalene were detected in one soil sample at concentrations above their respective default target levels (DTLs);
- Benzene concentrations exceeded the DTL and risk-based target level (RBTL) for the protection of groundwater use pathway in a second boring. TPH-GRO and naphthalene concentrations in a groundwater sample collected from the same location exceeded the DTL and RBTL for domestic water use;
- Results from the magnetometer survey indicated the presence of one anomaly similar in size to a small tank on the eastern side of the warehouse near an external fill port;
- Results of the asbestos survey conducted at the Site revealed no evidence of ACMs on-Site; and

- Results of the lead-based paint survey revealed lead-based paint on the driveway canopy wood ceiling and the driveway canopy wood frame at the ceiling level.

Based on these results, Tetra Tech recommended further Site characterization and submitted a Phase I ESA Update for the Site on June 4, 2010. Tetra Tech found no new evidence of RECs for the Site.

Tetra Tech submitted a Final Phase II ESA Addendum on June 2, 2010. Results from the Phase II ESA Addendum included the following:

- TPH-GRO was detected in subsurface vadose zone soil above the DTL and RBTL for residential indoor inhalation of vapor;
- Benzene was present in subsurface soil in concentrations exceeding the DTL and RBTL for the residential indoor inhalation of vapor pathway and protection of groundwater use pathway;
- Naphthalene was detected in vadose zone soil in concentrations exceeding the DTL and RBTL for the protection of groundwater use pathway;
- Xylene was present in concentrations exceeding the DTL and RBTL for the residential indoor inhalation of vapor pathway;
- Concentrations of TPH-GRO above the residential indoor inhalation RBTL was encountered at the property line;
- TPH-GRO, ethylbenzene, toluene, xylene, and naphthalene were present in groundwater samples in concentrations exceeding DTLs and the RBTLs for domestic groundwater use;
- The extent of benzene and xylenes in soil and groundwater was limited to the footprint of the building; and
- Concentrations of TPH-GRO above indoor inhalation criteria extend to the Site boundary.

On September 4, 2010, Tetra Tech submitted a Final Additional Phase II ESA. The results of the Additional Phase II ESA include the following:

- The historical location of the pump island and auto repair shop are believed to be the source for petroleum-impacted soil;
- TPH-GRO and naphthalene are present in groundwater in concentrations exceeding domestic use RBTLs within the immediate source area;
- Subsurface soil impacted with TPH-GRO, benzene, and naphthalene extends from the former UST and pump island area westward off-site.

Based on these results, Tetra Tech recommended:

- Enrolling the Site into the Missouri Department of Natural Resources (MDNR) Voluntary Cleanup Program (VCP);

- Performing additional site characterization and the preparation of a Tier 1/Tier 2 risk assessment;
- Source area removal;
- Institution of an activity use limitation (AUL) to limit the Site to non-residential use;

The analytical results from Phase II activities suggest that the contents of the USTs, while in use, were likely gasoline. In January 2011, EWI performed a Site visit prior to preparing this ABCA report. During the Site visit, the EWI representative had a discussion with the tenant regarding the UST currently in place. The tenant indicated that, after fuel distribution was discontinued at the site, the UST had been used for storage of waste oil.

The Phase II findings noted above are the primary basis for the cleanup evaluations provided in the following sections of this Report. EWI assumes this information remains reasonably accurate for cost/benefit analysis and the specific cleanup planning recommendations provided herein. Cleanup evaluations in addition to the documented petroleum UST, soil impacts, and lead-based paint are considered beyond the scope and intent of this proposal.

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, and EWI experience with similar site conditions.

The quality objective is 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 risk-based closure. Cleanup strategies therefore consider the specific measures necessary to receive formal closure and "No Further Action" status under MRBCA Technical Guidance. 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); and
 - 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 August 24, 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 to the Freedom of Information Act.

Contractual use and reliance on the ABCA Report is limited to the EIERA through our current Environmental Consulting Agreement. Project work was also performed on behalf of the City of Russellville, Missouri, in support of local brownfield redevelopment. Contractual reliance by any other party is prohibited without the written authorization of the EIERA and EWI. 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; and
- 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 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 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 MNDR 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. This process verifies regulatory closure and provides an additional level of liability protection. Environmental liability 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); and
- Associated documentation and reporting.

2.4 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 alternative 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.

EWI understands previous “liable/viable” evaluations were performed by the MDNR Hazardous Waste Program to verify Brownfields Grant eligibility. Brownfields grant funding generally precludes coverage and reimbursement under state Petroleum Storage Tank Trust Fund programs; however, EWI recommends further evaluation of petroleum UST funding options if more extensive impacts are identified during tank removals. Joint funding may be an option given specific site conditions and owner/operator status that does not specifically exclude Trust Fund participation.

2.5 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 A – Tank Removal, Soil Excavation and Disposal**
- Cleanup Alternative B – Tank Closure in Place Without Soil Excavation**
- Cleanup Alternative C – 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. Under certain conditions, regulatory agencies allow 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 improvements and typical brownfield redevelopment considerations. Associated cost estimates are provided with each alternative.

2.5.1 Alternative A: Storage Tank Removal, Soil Excavation

Approach Summary – Alternative A includes conventional excavation/removal of the petroleum UST, associated piping, and other ancillary components that remain below ground. The UST would be excavated, cut open for access, and cleaned prior to disposal off site. An ambient air blower or other inert gas system would provide continuous ventilation to mitigate combustion and volatile organic compound (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 would be disposed off site at a permitted Subtitle D landfill for non-hazardous waste.

Alternative A also includes excavation and disposal of petroleum-impacted soil. Based on previous Phase II activities, the likely area for excavation would be approximately 100 feet long, 40 feet wide, and 8 feet deep. The total amount of excavated material is estimated to be 1185 cubic yards (CY). Contaminated soil (soil with concentrations of chemicals of concern (COCs) above Tier 1 residential risk-based target levels (RBTLs)) would then be disposed off-site at a permitted Subtitle D landfill for non-hazardous waste. Surficial soil impact is localized, meaning that much of the surficial soil removed could be re-used as backfill. The remainder of the backfill would be backfilled with clean fill. Impacted subsurface soil extends off-site to the west. As such, property access would be necessary in order to complete soil excavation activities off-site. Based on the estimated extent of contamination in soil provided in previous Phase II reports, a total of 750 to 1,000 CY of contaminated soil will need to be removed and disposed. The amount of surficial soil that can be re-used as backfill is estimated to be from 185 to 435 CY.

The open excavation, piping runs, and former product dispenser locations (where applicable) 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 for both the UST closure and soil excavation would be demonstrated through laboratory analysis of UST excavation base and sidewall samples obtained through conventional grab sampling procedures.

Since contaminated soil extends underneath the on-site building, it will be necessary to demolish and remove the on-site building and wooden shed to access the UST for removal and to excavate petroleum impacted soil. Previous Phase I and Phase II activities have identified lead-based paint on the driveway canopy wood ceiling and the driveway canopy wood frame at the ceiling level. The following Cost Estimate and Technical Summary outlines Building demolition activities, related assumptions and technical specifications, and projected costs in greater detail. A cost estimate for building demolition is included as Table 1a. A cost estimate to implement Alternative A (assuming that the building and wooden shed have been demolished) is included as Table 1b. Table 1b outlines UST removal and soil excavation activities, related assumptions and technical specifications, and projected costs in greater detail. The details outlined in Tables 1a and 1b may or may not accurately reflect the final removal/closure design and conditions encountered in the field.

Advantages – The UST, piping and other potential contaminant sources are permanently removed. This provides a simple, direct approach with well established and field-proven procedures accepted and preferred by MDNR. Tank and soil removal addresses exposure risk and owner/operator liabilities. Land use will not be restricted following demonstration of MRBCA closure criteria. This approach will provide the most readily acceptable path to MDNR No Further Action status. Natural attenuation of any remaining impacts to groundwater will also be enhanced by removing the source of groundwater contamination.

This alternative is a cost effective, reasonable, and efficient removal/closure approach. 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 overall costs.

**Table 1a. Cost Estimate and Technical Summary
 Building Demolition**

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
A1	Project Health & Safety Plan	\$550	\$650
A2	Field Mobilization & Demobilization – heavy equipment, personnel travel and other related field expenses	\$2,100	\$2,500
A3	Abate Lead-Based Paint	\$1,700	\$2,000
A4	Demolish and Remove Building and Wooden Shed	\$2,500	\$3,000
A5	Disposal of Building Debris	\$1,700	\$2,000
		\$8,550	\$10,150

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 the cleanup alternative applied. Equipment operators must be experienced and careful not to damage buried USTs 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. Inability to demonstrate closure criteria to residential standards may require institutional controls such as a deed restriction, which could limit possible future uses.

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 table outlines 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 soil and groundwater.

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

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
Building Demolition Cost		\$8,550	\$10,150
A1	Project Health & Safety Plan	\$550	\$650
A2	Remedial Action Plan for MDNR Review & Approval	\$1,400	\$1,700
A3	Field Mobilization & Demobilization – heavy equipment, personnel travel and other related field expenses	\$2,100	\$2,500
A4	Site Access, Loading & Excavation Stabilization - clear/grub, construct gravel drive/loading areas as needed, traffic controls and excavation stabilization and/or shoring as needed to safely remove UST and components.	\$1,300	\$1,500
A5	Remove Petroleum USTs – Remove, clean, and dispose one (1) petroleum UST, product lines, and ancillary UST components. Cost estimate based in petroleum-based residual contents and individual tank volumes no greater than 1,000 gallons. Residual contents including hazardous industrial chemicals – e.g. chlorinated solvents – would likely require revised estimates.	\$2,500	\$3,000
A6	Contain, Characterize & Dispose Tank Contents and Residual Waste – assumes total waste volume not-to-exceed 6 to 10 55-gallon drums.	\$2,100	\$2,500
A7	Excavate & Dispose Contaminated Soil – Estimate assumes characteristically non-hazardous waste profiles based on previous Phase II results. Includes costs to excavate, load, transport & dispose petroleum-impacted soils without temporary staging or stockpiling on or off site. Cost estimate accounts for up to 1,000 CY of contaminated soil removal.	\$42,500	\$50,000
A8	Tank Pit Dewatering & Disposal – Estimate assumes characteristically non-hazardous waste profiles based on previous Phase II results. Includes costs to remove/pump, transport & dispose petroleum-impacted groundwater without temporary staging or containment on or off site. Cost estimate accounts for up to 5,000 gallons of contaminated groundwater removal.	\$1,700	\$2,000
A9	Field Sampling Program – Includes field labor and laboratory expenses to collect and submit samples for laboratory testing for petroleum, petroleum-related, and VOC contaminants of concern. Estimate based on up to 30 samples with accelerated 3 to 5 business day laboratory turnaround.	\$5,100	\$6,000
A10	Backfill & Site Restoration – Backfill using compacted clay or other suitable fill material. Includes up to 1,000 CY; delivery to site, compaction and grading	\$8,500	\$10,000
A11	Miscellaneous Controls – erosion controls, site security, permitting and other miscellaneous expenses related to UST removal and soil excavation work.	\$550	\$650
A12	UST Closure Report for MDNR Review & Approval	\$3,400	\$4,000
A13	MRBCA Risk Assessment – Development Tier 1 Risk Assessment for MDNR review & approval in the event residual petroleum impacts is not practical or economically viable	N/A	\$5,000
PROJECTED BASE TOTALS:		\$80,250	\$99,650

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

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
PROJECTED BASE COST		\$76,850	\$92,950
ALT-1	CONTINGENCY #1: Additional UST encountered; volume generally between 1,000 and 2,000 gallons; includes all applicable base line items consistent with Table 1a	\$2,100	\$ 2,500
ALT-2	CONTINGENCY #2: Larger tank volume encountered - additional volume (total all tanks) not to exceed 2,000 gallons; includes all applicable base line items consistent with Table 1a	\$1,300	\$ 1,500
ALT-3	CONTINGENCY #3: Increased residual waste volumes encountered – includes potential for added residual tank bottom waste, contaminated soil and/or contaminated pit water	\$425	\$500
ALT-4	CONTINGENCY #5: Expanded Risk Assessment and monitoring to address residual groundwater impacts that may remain following UST removals.	\$13,000	\$15,000
EXPANDED TOTALS WITH ALL CONTINGENCIES:		\$93,675	\$112,450

2.5.2 Alternative B: Storage Tank Closure in Place, No Soil Excavation

Approach Summary – Alternative B includes in-place closure of the existing UST using flowable fill technologies. This approach would not remove or significantly disturb the buried tank. 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 tank in its existing location. 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 chutes 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. This process will prevent "floating" tank scenarios during high water table conditions.

Excluding preliminary efforts to access and the clean the UST, in-place closure will not produce an open excavation for confirmation sampling. The MDNR will require that the nature and extent of contamination be determined along with any long term impacts to human health and the environment. 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 B 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.

Advantages – Advantages are limited. This approach is typically applied when structural considerations prevent access and excavation around a tank due to proximity to building foundations, footings, or other critical structures. Certain site conditions may suggest in-place closure as a cheaper and more practical UST closure alternative, given specific closure criteria can be effectively demonstrated.

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. Use of flowable fill materials will likely require follow-up inspections and maintenance. Long term failure is possible due to unforeseen conditions. Land use restrictions and long-term monitoring may be required by MDNR to assess site conditions and potential risk over time. Indirect costs may significantly escalate over time as a result.

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.

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

ACTIVITY DESCRIPTION		Estimate of Probable Cost	
		Low Range Estimate	High Range Estimate
B1	Project Health & Safety Plan	\$550	\$650
B2	Remedial Action Plan for MDNR Review & Approval	\$1,400	\$1,700
B3	Field Mobilization & Demobilization – heavy equipment, personnel travel and other related field expenses	\$1,300	\$1,500
B4	UST Access & Stabilization – construct gravel drive/loading areas as needed, traffic & safety controls. Uncover and provide safe access petroleum USTs in place; localized demolition may be required for UST access without comprising other structural conditions	\$1,300	\$1,500
B5	Contain, Characterize & Dispose Tank Contents and Residual Waste – assumes total waste volume not-to-exceed 6 to 10 55-gallon drums	\$2,100	\$2,500
B6	Backfill UST In-Place with Inert, Flowable Fill – material options vary: concrete slurry, sand/ash, and foaming agents; cost based on flowable fill volume of approximately 1,000 gallons; includes all associated equipment and labor	\$850	\$1,000
B7	Direct-Push (Geoprobe®) Investigation - direct-push sampling required for collection of site characterization and confirmation samples; excavation samples not attainable due to in-place closure; includes all direct-push equipment/supplies, operator labor, and laboratory testing expenses	\$10,000	\$12,000
B8	Address Residual Contamination – In-place closure likely to prevent removal of residual soil and/or groundwater impacts surrounding USTs; additional corrective measures may be required; potential options vary	\$20,000	\$25,000
B9	Backfill & Site Restoration – Cover tanks following in-place closure with compacted clay or other suitable fill material for pending construction work. Includes up to 50 CY; delivery to site, compaction and preliminary grading with temporary gravel cover	\$1,300	\$1,500
B10	Miscellaneous Controls – erosion controls, site security, permitting and other miscellaneous expenses related to UST closure in place	\$550	\$650
B11	UST Closure Report & Risk Assessment – Submit for MDNR review and approval include risks assessment component due to in-place closure and high probability for residual impacts following completion of work	\$8,000	\$12,000
B12	Follow-up Inspections & Monitoring – In-place closure likely to require institutional controls and subsequent groundwater sampling to monitor risk	\$25,000	\$40,000
PROJECTED TOTALS:		\$72,350	\$100,000

2.5.3 Alternative C: No Action

This cleanup alternative would not include any specific efforts to remove or maintain the existing UST in place or to address soil and groundwater contamination observed during previous Phase II activities. As such, the MDNR would not provide a no further action determination for the Site should this cleanup alternative be selected. There would be no direct cleanup costs associated

with this alternative; however, potential environmental and financial liabilities would not be addressed. These liabilities would remain, leaving the potential for future regulatory, financial, and/or civil impacts. In addition, EWI understands that costs to demolish on-Site structures will not be included in project funding unless the costs are part of a cleanup effort. Therefore, exercising this option could adversely affect project funding and execution.

2.6 Recommended Cleanup Alternative

EWI recommends removal of the documented petroleum UST consistent with the procedures and technical specifications presented for Cleanup Alternative A, *Storage Tank Removal and Soil Excavation* as described in Section 2.5.1 of this report. In-place closure and the No Action Alternatives would not address petroleum UST liabilities, potential contaminant sources, or potential limitations to future land use and brownfield redevelopment potential. In contrast, UST removal via Alternative A 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; and
- Access and excavation restrictions, buried utilities, structural building components, and other subsurface obstructions.

3.2 Demonstration of Tank Closure Criteria

UST closure criteria are generally demonstrated through excavation base and sidewall sampling within the former tank basin and excavation area to remove impacted soil. 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 included 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 as a supplement to existing geophysical data 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.

Regardless of the cleanup approach used to address the UST, 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 removal 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.

3.3 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. Technical considerations may be further outlined and evaluated through a Field Execution Plan (or technical equivalent) to be required 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
- UST removal/closure
- Containment and disposal of residual tank contents/wastes
- Removal and disposal of contaminated soil
- 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 and other applicable sections 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 the 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.

3.4 Phase I Updates

Certain components of the previous Phase I report developed by Tetra Tech, Inc. (Tetra Tech) 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 Site is located at 13206 Railroad Avenue in Russellville, Missouri. The Site is currently used as a storage facility. Past use of the facility included a service station in operation from approximately 1933 to 1979. Specific improvements include a one-story concrete building with a canopy, an office, two service bays and a wooden shed. Surrounding land use is documented as mixed residential and commercial. Prospective Site redevelopment includes demolition of the former service station and wooden shed on-Site and conversion of the Site into a park. Residential developments on site are not anticipated.

Tetra Tech performed Phase I and Phase II activities on the Site from November 2009 to June 2010. The assessment activities identified the following RECs:

- lead-based paint was found on the driveway canopy wood ceiling and the driveway canopy wood frame at the ceiling level;
- One small UST was found on the eastern side of the warehouse near an external fill port;
- Soil contamination was found on-Site, primarily in the subsurface. Soil contamination extends from the former UST and pump islands (source area) west onto the adjacent residential property.

Cleanup Planning Objectives and Findings

The project objective is 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 August 24, 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 cleanup alternatives in response to documented site conditions. Associated cost estimates range from zero direct costs for No Action (Alternative C) to \$112,450 for tank removals and all reasonable

contingencies evaluated in this study (Alternative A). 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 A) – would effectively address petroleum UST 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, soil excavation and disposal is the most common practice accepted by the MDNR Hazardous Waste Program to address abandoned petroleum USTs. Estimated costs for the Recommended Alternative range from \$80,250 to \$99,650, excluding related contingency measures that may apply. Application of certain contingency measures may escalate Alternative A costs to \$112,450 as presented in Conclusion Item #2.
4. Unforeseen conditions may be encountered during cleanup including but not limited to: 1) tank volume and residual contents that exceed planning estimates; 2) additional USTs, ancillary piping, and other buried components; and 3) contaminated soil and groundwater in volumes greater than estimated. Tank removal consistent with the Recommended Cleanup Alternative may therefore demand specific contingencies and additional costs as presented in Table 1b of this report. These contingency items include reasonable estimates based on common subsurface conditions related to abandoned USTs. Regardless, users of this report must recognize that certain conditions cannot be fully quantified prior to detailed planning and execution of cleanup activities.
5. In-place closure or No Action alternatives would not address petroleum UST liabilities, contaminant sources, or potential limitations on future land use and brownfield redevelopment potential. In-place closure may actually escalate costs beyond permanent removal if additional contingency items are required.

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 removal, soil excavation and disposal consistent with the Recommended Cleanup Alternative – *Tank Removal, Soil Excavation and Disposal* (Alternative A) – presented under Section 2.6.1 of this report. Recommended measures in support of this cleanup alternative include the following:

- Prior coordination with the MDNR VCP 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 and Soil Excavation/Disposal 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 versus consultant/contractor to manage all aspects of subsequent work; and

- 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 remediation of Site conditions. 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

- EWI. 2009. Proposal for Missouri Brownfields Revolving Loan Fund. Prepared for Environmental Improvement and Energy Resources Authority (EIERA). EWI Corporate Office, Springfield, MO.
- Missouri Department of Natural Resources (MDNR). 2006. Missouri Risk-Based Corrective Action (MRBCA) Technical Guidance. MDNR, Jefferson City, MO.
- Missouri Department of Natural Resources (MDNR). 2004. Missouri Risk-Based Corrective Action (MRBCA) UST Closure Guidance – Final Draft, Section 4.0. MDNR, Jefferson City, MO.
- Tetra Tech, Inc. 2009. Final Phase II Environmental Site Assessment – Alliance Medical Warehouse, 13206 Railroad Avenue, Russellville, MO 65074. Tetra Tech, Clayton, Missouri
- Tetra Tech, Inc. 2010. Phase I Environmental Site Assessment Update, Alliance Medical Warehouse, Inc. and Warehouse, 13206 Railroad Avenue, Russellville, Missouri 65074-0128. Tetra Tech, Clayton, Missouri
- Tetra Tech, Inc. 2010. Final Phase II Environmental Site Assessment of Alliance Medical Warehouse, 13206 Railroad Avenue, Russellville, Missouri 65074. Tetra Tech, Clayton, Missouri
- Tetra Tech, Inc. 2010. Final Additional Phase II Environmental Site Assessment – Alliance Medical Warehouse, 13206 Railroad Avenue, Russellville, MO 65074. Tetra Tech, Clayton, Missouri
- U.S. Environmental Protection Agency. 1998. Quality Assurance Guidance for Conducting Brownfields Site Assessments. Publication EPA 540/R/98/038. EPA Office of Solid Waste and Emergency Response, Washington DC.