

**TENNESSEE DEPARTMENT OF ENVIRONMENT  
AND CONSERVATION**

**DIVISION OF UNDERGROUND STORAGE TANKS**



**CORRECTIVE ACTION PLAN  
GUIDELINES**

**January 2010**

## **Instructions**

These guidelines are intended to provide a structured outline. Any information that is not specifically requested but is relevant to the project shall also be included. The following acronyms are frequently used in the Corrective Action Plan Guidelines:

ACFM	Actual Cubic Feet per Minute
AWS	Air/Water Separator
CAC	Corrective Action Contractor
CABMR	Corrective Action Baseline Monitoring Report
CACMR	Corrective Action Closure Monitoring Report
CAMR	Corrective Action Monitoring Report
CAMR-ab	Corrective Action Monitoring Report – with as-built diagrams
CAP	Corrective Action Plan
CAS	Corrective Action System
CASDR	Corrective Action System Down Report
CASFL	Corrective Action System Field Log
CASIACL	Corrective Action System Installation and Activation Check List
CASRL	Corrective Action System Repair Log
CAT	Corrective Action Technology
COC	Chemical of Concern
ExA	Exposure Assessment
EFO	Environmental Field Office
EAG	Environmental Assessment Guidelines
GAC	Granular Activated Carbon
GPM	Gallons per minute
HNR	Hazard Notification Report
MSL	Mean Sea Level
NEMA	National Electric Manufacturers' Association
O&M	Operation and Maintenance
OSLRP	Oil Sealed Liquid Ring Pump
OWS	Oil/Water Separator
OVD	Organic Vapor Detector
PAR	Person Assuming Responsibility
PID	Photoionization Detector
PPM	Parts Per Million
PM	Performance Measures
RBCL	Risk Based Cleanup Level
SEL	System Entry Log
SSCL	Site-Specific Cleanup Level
SVE	Soil Vapor Extraction
TGD	Technical Guidance Document
XP	Explosion Proof

Unless otherwise directed by the Division, any confirmed release of petroleum product that results in concentrations of a Chemical of Concern (COC) above the applicable Risk-Based Cleanup Level (RBCL) or the applicable Site-Specific Cleanup Level (SSCL) requires

corrective action. As directed by the Division, an Exposure Assessment (ExA) shall be conducted prior to the submittal of a Corrective Action Plan (CAP) to determine the applicable RBCL or the applicable SSCL for each COC. Unless otherwise directed by the Division, if soil or ground water contamination is above the applicable RBCLs or SSCLs, then complete the relevant portions of the CAP.

All geologic work specified in this document shall be directed by a licensed professional geologist in accordance with the Tennessee Geologist Licensure Act of 2007 (T.C.A. §62-36-101 et seq.), or a registered professional engineer under the Tennessee Architects, Engineers, Landscape Architects, and Interior Designers Law and Rules (T.C.A. §62-2-101 et seq.). Unless otherwise directed by the Division, a registered professional engineer shall oversee all non-Fund covered release corrective action design specifications. This plan shall describe in detail the specifications of the corrective action technology chosen along with a detailed, itemized cost proposal of the chosen technology. A cost proposal is not required for state or federal owned release sites. Proposed corrective actions shall remediate and prevent further migration of the contaminant plume(s).

If the CAP will not be submitted by the established deadline, then a written request, justifying the extension shall be submitted before the deadline to the appropriate Environmental Field Office (EFO). An extension is not automatic and enforcement actions may be taken to insure prompt compliance with established deadlines.

**IMPORTANT: Approved CAP technologies consist of soil excavation and/or dual phase vacuum extraction. Unapproved deviations involving technologies not consistent with soil excavation and/or dual phase high vacuum extraction will not be reimbursable for fund covered releases and may result in enforcement action. If other technologies are being considered, a CAP shall not be completed and/or submitted without prior evaluation and approval from the Division central office technical section and applicable field office.**

The CAP shall include the provided notarized signature page indicating the Person Assuming Responsibility (PAR) and Corrective Action Contractor (CAC) shall comply with the CAP. **An incomplete signature page is considered a violation of Rule 1200-1-15-.06(10) and will result in an unapproved CAP.**

The CAP shall be prepared and submitted in accordance with the guidelines set forth in this document and shall include the site-specific proposal for the CAP. Each section of the CAP and all related subsequent reports shall be prepared and assembled in the order presented within these guidelines and each page, including all appendices, shall be numbered consecutively through the entire report. Text shall be provided explaining the associated tables, figures and maps. All tables, figures and maps shall be in the appropriate sections, not in appendices. All table and log formats are included in the Corrective Action Workbook and shall be used to complete the CAP or the applicable monitoring reports. All maps shall be drawn on 8.5 x 11 or 11 x 17 inch paper and contain at a minimum, the UST Facility Identification Number, the date the map was drawn, a north arrow, a legend, a scale bar, a vertical scale, if applicable, and a figure number. The preparer shall assemble the information in each section to provide a comprehensive final document. Each section and subsection heading shall be clearly printed in the report. A table of contents shall be

provided listing the page number and/or location of all sections, maps, tables, figures and appendices.

All correspondence, reports, laboratory analysis sheets, etc. shall contain the UST Facility Identification Number. All original correspondence and reports shall be submitted to the appropriate UST EFO and copied to the central office.

### **Modification or Termination of the CAP**

Unless instructed to do otherwise in writing by the Division, the approved CAP shall remain in effect until replaced by an approved modified CAP or until the existing CAP is terminated.

Causes for modification of the approved CAP may include, but are not limited to:

1. Limited reduction of or an increase in contamination, free product and/or plume size;
2. Excessive down time of the CAS; and/or
3. Risk to human health, safety and/or the environment may have changed as a result of the discovery of new receptors or the elimination of existing receptors to such an extent that a new ExA may be required by the Division.

Causes for termination of the approved CAP may include, but are not limited to:

1. Whenever **all** of the following criteria have been met:
  - a. No petroleum vapors have been detected in above ground and/or subsurface structures for at least two (2) years;
  - b. Levels of COCs are below the applicable RBCLs or SSCLs for the site; and
  - c. No receptor has been impacted by contamination for the past two (2) years, or
2. The regulations in effect at the time that the CAP was approved have been amended and such amendments require modification or termination of the CAP; or
3. The CAS is not achieving the cleanup levels (applicable RBCLs or SSCLs) in accordance with the performance measure criteria; or
4. An engineering/institutional control has been approved by the Division; or,
5. The corrective actions have accomplished the goal of adequate protection of human health, safety and the environment at the site and there is no longer a need for remediation.

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## **Corrective Action Plan Cover Page**

**Date of CAP:**

**UST Facility Identification Number:**

**UST Facility Name:**

**UST Facility Address:**

**Case Number:**

**Current or Last Business Name of Location:**

**Name of the tank owner and/or operator at the time of the release:**

**Name of the PAR for implementation of the CAP (This is the individual such as the tank owner, tank operator, property owner, or a specific representative of the business authorized to act on behalf of that business):**

**Name of the CAC company and individual(s) who prepared the CAP including applicable license/registration type and number:**

## **CORRECTIVE ACTION PLAN**

### **I. Executive Summary**

Provide an Executive Summary describing the progress of the project to date. Identify the source, type, and amount of petroleum released and the date the release was discovered. Include a brief discussion of all hazard management activities performed to date. Identify all impacts resulting from the release. Discuss the conclusions and interpretations of data derived from the environmental assessment and exposure assessment activities.

### **II. Applicable RBCLs or SSCLs**

Provide a table “Applicable Cleanup Levels for Chemicals of Concern”, located in the “Corrective Action Workbook”, for soil and ground water that includes the following:

- A. The applicable RBCLs or the applicable SSCLs for each COC [in parts per million (ppm)] in soil and ground water as determined in the ExA ;
- B. The soil and ground water concentrations for each COC identified during the last comprehensive monitoring event; and
- C. Identify which COCs have exceeded the applicable RBCLs or SSCLs by shading the appropriate box.

### **III. Proposed Corrective Action Technology (CAT) - Soil**

If soil contamination above the applicable RBCLs or the applicable SSCLs exists on-site, then state the proposed CAT that will most expeditiously and cost effectively result in a risk-based approved closure. **The proposed CAT of choice shall be or include excavation.** If excavation is not feasible at this site, then provide a justification for the proposed alternative soil treatment method in this section and proceed to Section III.B, “Other Soil Remediation Technologies”. If soil and/or ground water contamination require remediation, and excavation is not possible, then refer to Section IV. “Proposed Corrective Action Technology (CAT) – Ground Water” to address both soil and ground water treatment. If the Division has determined the release to be non-fund covered, then in addition to this section, refer to Section V. for additional requirements.

#### **A. Excavation**

Excavation shall be the preferred method for soil remediation, **unless the integrity of a structure would be compromised or other physical limitations will not allow excavation.** In accordance with Rule 1200-1-15-.06(7), when considering excavation measures, if it is determined that a fixture on the property is preventing or impeding the utilization of a more cost effective approach to remediation at the site, then fixture removal and subsequent restoration or disposal of the original fixture may be considered.

If applicable, then provide a cost comparison for the removal of any fixture including, but not limited to, tanks, lines, dispenser islands, dispensers, canopies, buildings, signage, asphalt and/or concrete related to the excavation, fixture disposal and/or restoration. In those cases in which fixture removal and restoration is approved by the Division in accordance with Rule 1200-1-15-.09(8)(a), then the restoration will be considered to be integral to site rehabilitation. A Fixture Removal/Restoration Cost Worksheet is available from the Division.

The following outline shall be used in evaluating the applicability of excavation to the site.

1. Excavation plan

Provide a detailed description of the excavation plan which includes the following:

- a. Estimated volume of soil to be excavated;
- b. Method of excavation of soil;
- c. Removal of piping, dispensers, canopy, etc., if applicable;
- d. Site surface coverage (i.e. grass, gravel, concrete, asphalt, etc.);
- e. Disposal and/or treatment methods for all excavated material that will be screened and sampled in accordance with the current TGD – 005 and/or TGD - 009;
- f. Backfill material;
- g. A Corrective Action Plan Implementation Schedule (CAPIS). Scheduling of these activities shall be planned and prepared in accordance with the CAPIS located in the “Corrective Action Workbook”; and,
- h. Any other pertinent information.

2. Scaled plan view site map

Provide a scaled plan view site map depicting the layout of the proposed excavation zone. The horizontal extent of free product and/or the contaminant plume(s) for each of the applicable RBCLs or SSCLs shall be depicted. The scaled plan view map shall also include, but not be limited to, existing and/or former tank(s), line and dispenser locations, underground utilities, soil borings and monitoring wells. Proposed excavation depth(s) shall be depicted and former tank systems shall be indicated with a dashed line. This map shall also include a cross section line A-A’, which shall be parallel to the direction of ground water flow and a cross section line B-B’, which shall be perpendicular to the direction of ground water flow. These lines shall intersect as many wells as possible and shall represent the widest areas of the soil and ground water contaminant plumes. These lines shall be used for all subsequent cross section maps.

3. Scaled cross section maps

Provide scaled cross section maps representing cross section lines A-A' and B-B' respectively and showing the extent of the excavation zone overlaid on a depiction of the vertical extent of the contaminant plume(s) for free product and/or each of the applicable RBCLs or SSCLs.

4. Sampling plan

Provide a sampling plan describing the field screening and sampling that will be conducted in accordance with the current EAG to verify the in-situ concentrations of the COCs after excavation (Additional soil removal beyond the approved CAP shall require written Division approval). The plan shall include the number, locations and depth of the samples to be collected. Provide a scaled plan view site map depicting the sampling points.

5. Self-initiated soil cleanup measures

If applicable, then provide a detailed description of any self-initiated soil cleanup measures not previously approved by the Division.

**B. Other Soil Remediation Technologies**

**A CAP proposing other soil remediation technologies shall not be completed and/or submitted without prior Division central office and applicable field office approval.**

**IV. Proposed Corrective Action Technology (CAT) – Ground Water**

**The proposed CAT of choice shall be or include dual phase high vacuum extraction unless another method of extraction is approved by the Division. For fund covered releases, a CAS will be provided by the Division based on the specifications provided in the approved CAP. If the Division has determined the release to be non-fund covered, then refer to Section V. for additional requirements.**

If vacuum enhanced ground water extraction is not feasible at this site, then do not complete the CAP and immediately provide a written justification for a proposed alternative ground water remediation method. **If other ground water remediation technologies are being considered, a CAP shall not be completed and submitted without Division central office and applicable field office approval.**

**A. Equipment Provided By The Division For Fund Covered Releases**

Provide a statement indicating whether the release is Fund covered or not. If the release is not Fund covered, then proceed to Section V.

1. Available CAS equipment

The following available CAS equipment will be provided by the Division. Based on sizing criteria listed in this Section, one of these systems will be selected for installation. The three standard CAS units are:

- a. 25-hp Oil Sealed Liquid Ring Pump (OSLRP) capable of extracting total fluids and air with a minimum of twenty (20) inches of mercury vacuum capacity and a minimum air flow rate of three-hundred (300) Actual Cubic Feet per Minute (ACFM). This unit includes an Air/Water Separator (AWS) with a capacity of eighty (80) gallons.
- b. 30-hp OSLRP capable of extracting total fluids and air with a minimum of twenty (20) inches of mercury vacuum capacity and a minimum air flow rate of three-hundred seventy five (375) ACFM. This unit includes an AWS with a capacity of one-hundred fifty (150) gallons.
- c. 40-hp OSLRP capable of extracting total fluids and air with a minimum of twenty (20) inches of mercury vacuum capacity and a minimum air flow rate of four-hundred seventy-five (475) ACFM. This unit includes an AWS with a capacity of two hundred (200) gallons.

2. Standard CAS components

All CAS units are equipped with the following:

- a. An Oil/Water Separator (OWS) with a minimum flow-through capacity of fifteen (15) gallons per minute (gpm);
- b. An air stripper with a minimum flow-through capacity of fifteen (15) gallons per minute (gpm);
- c. Intra-system transfer pumps with a minimum 1.5 hp pump to transfer extracted fluids between major system components;
- d. Schedule 80 Poly Vinyl Chloride (PVC) piping, fittings and cleanouts including unions and PVC ball valves. Explosion proof (XP) systems are equipped to meet local requirement provisions for above ground carbon steel piping and fittings.
- e. A National Electric Manufacturers' Association (NEMA) 4, intrinsically safe, master control panel. Standard units are equipped with Class 1 Division 2. For XP units, a Class 1 Division 1 unit is available;

- f. A digital telemetry system equipped with eight (8) inputs and expansion capacity, battery backup with remote restart and shutdown capability;
- g. A 12,000 BTU XP heater and thermostat;
- h. A skid-based building (8' x 12') with structural steel base and supporting steel cross members and locking steel door. The base includes forklift pockets and lifting rings for crane use. An XP interior light, ventilation, and fire extinguisher are included;
- i. Two (2) bag filter stainless steel housing units in parallel with integrated bypass piping;
- j. Two (2) granular activated carbon (GAC) canister assemblies in series with integrated bypass and backwashing piping;
- k. A mechanical totalizing flow meter;
- l. A 1.5 hp discharge transfer pump; and,
- m. Division 1, XP, City of Memphis package systems will be the same as above, except: installed with Class 1, Division 1 interior motor and building wiring, steel secondary containment under building, 4 inch curb around the interior of the building, leak detection in building, ball valve drain and NFPA 704 placard.

**B. Optional CAS Equipment**

Only when approved by the Division, additional CAS equipment may be provided. A justification shall be provided for each situation.

- 1. Free product

If free product is present, then provide a discussion of any additional equipment requirements (i.e. necessity for a 300 gallon free product tank).

- 2. Odor concerns

If occupied residences and/or active businesses are within close proximity of the proposed CAS location, then identify the type of structure(s). Provide a discussion of any additional equipment requirements (i.e. necessity for a catalytic oxidizer, etc.).

### C. Parameters to Properly Size the CAS

Using all available MEME results data, provide the rationale to justify the size of the system based on air flow, vacuum, lithology, number of extraction wells, groundwater extraction rate per well and depth to water (i.e. if additional measures are required to lift the water such as air assist, etc.). Provide a detailed description including:

#### 1. CAS sizing criteria

##### a. Effective radius of influence

Using the MEME event data for vacuum and ground water, provide a scaled plan view map depicting the radius of influence of the proposed extraction system. The scaled plan view map shall illustrate the predicted ground water drawdown and vacuum influence overlaid on maps of the horizontal and vertical extent of free product and/or contaminant plumes for any COCs exceeding the applicable RBCL or SSCL.

##### b. Extraction rates - air and ground water

Provide the total MEME event extraction air flow volume (ACFM) and ground water extraction rates (in gpm) required for the proposed system.

##### c. Extraction well number and placement

Provide the rationale used for the proposed number and placement of ground water extraction wells.

##### d. Extraction well layout

Unless otherwise approved by the Division, all extraction wells shall be constructed of four (4) inch inside diameter (I.D.) pre-cleaned, flush threaded, Schedule 40 PVC and installed in accordance with the current EAG. If an inside diameter larger than four (4) inches is proposed, then justification shall be provided.

Provide the rationale used for the proposed extraction well layout (follow the CAS Figure Packages using the applicable "Wellhead Manifold and Well Vault" figure). Discuss total well depths, observed potentiometric fluctuations, lithology, sand pack, screened interval and screen slot size.

##### e. Recoverability determination (limit of vacuum lift)

Provide the elevation difference in feet between the lowest ground water elevation (potentiometric surface) and the CAS inlet manifold (refer to the CAS Figure Packages using the applicable “CAS Inlet Piping Manifold” figure). Based on this elevation difference, discuss if air assistance is necessary to improve ground water extraction rates.

2. Other

Provide any other pertinent CAS sizing criteria. This includes, but is not limited to, local ordinances, codes, and/or regulations that would influence the CAS sizing.

**D. Permitting Requirements**

Granular activated carbon (GAC) canisters and bag filters are standard equipment on each Division provided system and shall be used at start-up [considered to be the first three (3) months of CAS operation]. System performance will determine when these components may be bypassed.

A Tennessee General Contractors License is required for any CAC to perform construction activities in accordance with rule 1200-1-.09(15)(b)2.(xi). Provide a copy of the Tennessee General Contractors License of the company/individual installing the CAS in an appendix.

1. Discharge and emissions

Provide a detailed description of the proposed effluent water discharge and air emissions methods including required permits. Describe why these proposed discharge methods are best suited to this site. If applicable, the Division shall be copied on air permit applications at the time of permit application submittal. Permits may require up to 90 days for some local agencies to process.

2. Applicable permits

Provide a detailed list of all applicable state and local permits (i.e. building, electrical, plumbing, etc.) for the CAS and the permitting agency involved. Obtain applicable state and local permits prior to construction, installation, and discharge. Permits may require up to 90 days for some local agencies to process. Indicate the anticipated amount of time needed to receive approved permits in the CAPIS located in the “Corrective Action Workbook”.



**E. CAS Implementation Schedule and Project Life Expectancy**

1. Corrective Action Plan Implementation Schedule (CAPIS)

Provide a CAPIS for the CAS installation activities that are planned. This schedule shall be site specific and prepared in accordance with the CAPIS, located in the Corrective Action Workbook.

2. Project life expectancy

Provide the calculated life expectancy of the project up through case closure. The length of time required to reduce current ground water COC concentrations to below the approved SSCLs shall be calculated utilizing industry accepted models. Known site specific data such as plume size and MEME event derived well extraction rates shall be utilized in these models. Unknown data such as porosities and fractional organic carbon shall be derived from reference tables provided in Technical Guidance Document (TGD) – 017. The life expectancy of the project includes the length of time to reduce ground water COC concentrations below the applicable clean-up levels and the length of time to complete closure monitoring with the CAS offline. The calculated life expectancy shall be used to develop an accurate cost proposal and may also be used to develop performance measures. A cost proposal is not required for state or federal owned release sites.

**F. CAS Site Preparation Requirements**

1. CAS layout

Positioning of the CAS shall include, but not be limited to, the following considerations:

- a. Exhaust fan location;
- b. Liquid ring discharge and air stripper venting system in proximity to buildings (indicate distance to nearest occupied residence and commercial building);
- c. Proximity to overhead utility lines;
- d. Obstructions (accessibility of CAS system delivery vehicle to concrete pad location and access to removable panels and door); and/or
- e. State and local codes (i.e., setbacks, right of ways, easements, etc.)

Provide a scaled plan view site map depicting the layout of the extraction system. The map shall include, but not be limited to the concrete pad, power supply, telephone line, CAS, piping trenches, CAS inlet piping manifold, extraction wells, and well vaults. The map

shall also include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.

2. Concrete pad

Provide a scaled concrete pad diagram. Unless otherwise approved by the Division, a concrete pad shall be installed prior to CAS shipment in accordance with the dimensions and material specifications depicted in the CAS Figure Packages using the applicable "Concrete Pad" figure. Bollards shall be proposed around the CAS in high traffic areas.

3. Electric power supply

Provide the local power utility's name, contact information, available voltage, phase (3-phase is preferred) and amperage at the release site. Describe the power connection process including scheduling. If only single phase is available, then a phase converter will be required.

4. Telephone line

Provide the name and contact information of the local telephone service, and long distance provider, if applicable. A dedicated land line is required for telemetry system operation and reporting.

5. Potable water needed to wet test the CAS

Provide a description of how potable water will be supplied and managed. Five-hundred (500) gallons of potable water will be needed to initially wet test the CAS.

6. Crane or forklift for CAS delivery

Provide a discussion of the proposed off loading equipment and justification for equipment selection. The CAC is responsible for securing a crane with a minimum lifting capacity of ten thousand (10,000) pounds and a spreader bar, with a minimum spreader length of eight (8) to ten (10) feet, to off load the CAS from the delivery trailer. Alternatively a forklift with a minimum lifting capacity of ten thousand (10,000) pounds may be used to off load the CAS from the delivery trailer. If a forklift is proposed, justification shall be provided.

**G. Extraction Wells and Piping Installation Requirements**

Prior to installing any piping or well vaults, utilities shall be located by contacting Tennessee One-Call system.

1. Wellhead manifold and extraction well vault layout

Provide a discussion and diagram of the extraction well manifold and extraction well vault layout. Unless otherwise approved by the Division, all extraction well manifolds and extraction well vaults shall be constructed using the dimensions and materials specified located in the CAS Figure Packages using the applicable “Wellhead Manifold and Well Vault” figure. All extraction wellheads shall be properly sealed to maintain the designed vacuum and shall be enclosed within the extraction well vault. The metal vault shall be able to withstand traffic consistent with the type of facility and shall be secured with a lock or bolt down mechanism.

2. Extraction well tubing

Provide the diameter of tubing that is proposed and how many feet of tubing are planned for each extraction well. One (1) inch to one and a quarter (1.25) inch diameter flexible PVC, petroleum resistant, vacuum rated (28 inches of Hg), reinforced tubing shall be used down well as an extraction drop tube (stinger) during CAS operation. The total length of the tubing required shall extend to the total depth of the extraction well (including a few extra feet for adjustment). Follow the CAS Figure Packages using the applicable “Wellhead Manifold and Well Vault” figure. The end of the tubing shall be adjusted at start-up to optimize CAS free product removal, ground water extraction and vacuum influence.

3. CAS inlet piping manifold layout

Provide a discussion and diagram of the CAS piping manifold layout. The CAS inlet piping manifold is to be installed outside the CAS concrete pad. The manifold shall be connected to the CAS using 4-inch PVC piping, unless otherwise required by local code. Unless otherwise approved by the Division, the CAS piping manifold shall be constructed in accordance with the dimensions and construction materials specified in the piping manifold layout located in the CAS Figure Packages using the applicable “CAS Inlet Piping Manifold” figure.

4. Trench and piping layout

Provide a discussion of the trench and piping layout, as well as, a scaled plan view site map and scaled cross-section of the extraction and contingent piping trench. Unless otherwise approved by the Division, all piping trenches shall be installed in accordance with the

dimensions and construction materials specified in the CAS Figure Packages, using the applicable “Wellhead Manifold and Well Vault” figure. All extraction (or “recovery”) and contingent piping shall be a minimum of two (2) inches in diameter. All trenches installed for extraction piping shall include a single truncated contingent piping into each extraction well vault. If simple vacuum extraction is not sufficient based on MEME data [i.e. elevation difference between inlet pipe for CAS and ground water is greater than forty (40) feet], then a minimum three quarter (3/4) inch air assist line shall be included within the piping trenches to each extraction well. Alternatively, if submersible electric pumps are proposed for deep ground water extraction [i.e. elevation difference between inlet pipe for CAS and ground water is greater than seventy (70) feet], then PVC electrical conduit with leads and extraction PVC piping sufficiently sized for submersible electric pumps shall be included within the piping trenches to each extraction well.

5. Excavated soil and/or soil cuttings management

Provide a discussion of how all excavated soil will be managed. Treatment and/or disposal of soil cuttings and/or excavated material shall be screened and sampled in accordance with the current TGD – 005 and/or TGD – 009.

**H. Additional Information**

1. If applicable, then provide a detailed description of any self-initiated ground water cleanup measures not previously approved by the Division. Provide the results of any Division approved pilot projects. Describe how this will affect the proposed extraction system. If any self-initiated ground water cleanup measures are currently in operation (e.g., free product removal, etc.), then explain how the implementation of the extraction system will enhance or alter the current system. If the system is currently in operation, then show the actual measured radius of influence.
2. Provide any additional information that may be pertinent to the CAS sizing, site preparation and installation not previously requested. If applicable, then provide the information in tables or maps.

**I. Summary of CAS recommendations for this site**

Provide the following information:

Site parameter	Feet
Average depth to ground water	
Average depth of extraction wells	
Measured drawdown*	
Vacuum radius of influence*	
Distance to closest residence from CAS	
Distance to closest business from CAS	
Site parameter	Number
Number of proposed extraction wells	
Number of proposed extraction wells with free product	

\* = Measured from most recent MEME event

Site parameter				
Capillary fringe soil type	<input type="checkbox"/> karst	<input type="checkbox"/> sand	<input type="checkbox"/> clay	<input type="checkbox"/> silt
Effluent discharge type	<input type="checkbox"/> NPDES	<input type="checkbox"/> POTW	<input type="checkbox"/> reinjection	

Site electric supply		
Voltage	Phase	
<input type="checkbox"/> 120/208 (will work)	<input type="checkbox"/> single (not recommended)	<input type="checkbox"/> three (recommended)
<input type="checkbox"/> 120/240 (recommended)	<input type="checkbox"/> single (not recommended)	<input type="checkbox"/> three (recommended)

NEMA classification	25 HP OS-LRP Package	30 HP OS-LRP Package	40 HP OS-LRP Package
Class I, Division 2, standard system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Class I, Division 1, XP system (City of Memphis only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional Comments:

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FOR STATE USE: DO NOT WRITE IN THIS AREA	
Facility Name:	Facility ID #:
Approved By:	Approval Date:

## **V. Non-Fund Covered Release Additional Requirements**

If the release is determined to be Fund covered, then do not complete Section V. Excavation and dual phase high vacuum extraction are the preferred technologies. However, other CATs may be proposed for non-Fund covered releases. In addition to the information listed in the previous sections, if the Division has determined the release to be non-Fund covered, then provide the following information in the CAP.

### **A. Capital Equipment**

The minimum operational component specifications for a dual phase high vacuum extraction and groundwater treatment system shall include the following. If any component listed below is excluded from the CAP, then justification shall be provided:

1. Vacuum pump capable of extracting total fluids and air with a minimum of twenty (20) inches of mercury vacuum capacity and a minimum air flow rate of two-hundred (200) ACFM;
2. Air/water separator capable of handling the anticipated maximum flow;
3. Oil/water separator capable of handling the anticipated maximum flow;
4. Air stripper capable of handling the anticipated maximum flow;
5. Intra-system transfer pumps with a minimum capacity as needed to transfer extracted fluids between major system components;
6. Interconnected piping and material of construction including all fittings and cleanouts. Include sampling ports, unions and valves. For explosion proof systems, include local requirement provision for above ground carbon steel piping and fittings;
7. National Electric Manufacturers' Association (NEMA) 4 intrinsically safe master control panel;
8. Digital telemetry system with eight (8) inputs and expansion capacity. Battery backup with remote restart and shutdown capability shall be included. Provide a description of all programmed alarm codes and settings;
9. System building including, but not limited to, fire extinguisher, ventilation, explosion proof (XP) interior light and intrinsically safe switches;
10. Two (2) bag filter units in parallel with integrated bypass piping;
11. Two (2) granular activated carbon canister assemblies in series with integrated bypass piping;
12. Mechanical totalizing flow meter;
13. Discharge transfer pump with a flow capable of handling the anticipated maximum discharge;
14. Any additional equipment necessary to address free product;
15. Any additional equipment necessary to address noise and/or odor concerns; and
16. Other equipment not requested above.

**B. Capital Costs**

Provide a discussion of the capital costs. Prepackaged systems should not be broken into individual components. Include capital equipment costs in the applicable worksheets located in the “Corrective Action Cost Proposal Workbook”. A cost proposal is not required for state or federal owned release sites.

**C. Winterization for the CAS**

Provide a discussion of the steps that will be taken to address winterization issues.

**D. Iron Sequestering Process for the CAS**

Provide a discussion of the steps that will be taken to address iron sequestering issues.

**E. Process Flow Diagram Including all Components of the Proposed CAS**

Provide a process flow diagram.

**F. CAS Compound Layout Diagram**

Provide a compound layout diagram.

**G. Equipment Brochures and Manufacturers’ Design Specifications**

Provide all equipment brochures and manufacturers’ design specifications in Appendix A, “Equipment Brochures and Manufacturers’ Design Specifications”.

**H. Additional Information**

Provide any other pertinent information.

**VI. Operation and Maintenance (O&M)**

Provide a detailed discussion of the planned O&M requirements of the proposed CAS. Costs for performing these activities shall be provided by completing the applicable worksheets located in the “Corrective Action Cost Proposal Workbook”. The cost estimate shall be included in Appendix B. “Corrective Action Cost Proposal”.

**A. Start-up Activities and Schedule**

Provide a description and schedule of start-up system O&M for the proposed CAS. If necessary, then provide a stepped start-up rationale, which includes,

but is not limited to, which extraction wells will be initially placed online, which intervals along the well screen(s) will dual phase high vacuum extraction be conducted from (where the drop tube inlets will be initially placed) and the length of time for the stepped start-up process. The rationale shall take into consideration variables which include, but are not limited to, groundwater levels, anticipated extraction rates, number of extraction wells with free product, total volume of free product, CAS capabilities and effluent discharge restrictions.

Provide a description of the start-up activities including system monitoring and adjustment activities and why they are required. The description shall include the number and type of personnel and equipment that are required to perform the installation and start-up activities, completion of all field logs and review of telemetry reports as listed below.

**IMPORTANT: Initial CAS start-up is not approved for any Thursday through Sunday, state or federal holiday, or any day before a state or federal holiday. If a CAS is started up on any of these days, then the start-up activities will not be Fund reimbursed.**

1. Corrective Action System Installation/Activation Checklist (CASIACL)

A CASIACL located in the “Corrective Action Workbook”, shall be completed during the CAS installation and start-up activities. The CASIACL, completed CAS manufacturer's factory checklist and the completed CAS manufacturer's field start-up checklist shall be submitted with the CAMR-ab (with as-built diagrams).

CAS start-up period is defined as the first three (3) months after the CAS has initially been placed on line.

For Fund covered releases, CAS start-up activities shall, at a maximum, include daily activities during the first week of CAS operation and then weekly activities (once per week) for the first three (3) months of CAS operation. If during the first three (3) month monitoring period, additional site visits are justified, then a proposal including costs shall be submitted for Division approval.

On-site personnel shall inspect and document system performance. This includes, but is not limited to, the tabulation of gauge and meter readings, inspection for leaks, excessive equipment heat and noise, and equipment wear. On-site personnel shall perform routine and scheduled repairs during the site visit. Other routine activities may include but are not necessarily limited to: checking extraction well pumps and components, checking filters, hoses, compressor oil, cleaning stripper (monthly), backwashing Granular Activated Carbon (GAC) vessels to remove fouling and iron buildup, and the



replacement of gauges, lubricants, and belts. The maximum cost includes all personnel and equipment to service and maintain the system equipment. Price does not include major repairs or extensive troubleshooting, which may be covered by the manufacturer. Only the actual time spent on-site is to be reimbursed. Routine operation and maintenance shall not exceed one (1) workday (maximum 10-hour workday) without prior approval from the appropriate field office. All field work shall be completed by a senior technician. If a routine repair is needed but the CAS is still running, then the repair shall be completed during the next scheduled O&M visit.

For Fund covered releases, an additional technician may be requested, but prior Division approval shall be obtained. If a technician leaves the site during the 10-hour workday to obtain repair materials, then the time shall be included in the reimbursement application as on-site time for routine O&M.

Documentation of these activities shall be prepared in accordance with the “Corrective Action System Field Log” (CASFL) located in the “Corrective Action Workbook” and submitted with the appropriate monitoring report in an appendix.

2. CAS Entry Log

A “Corrective Action System Entry Log” located in the “Corrective Action Workbook”, shall document all personnel that are on site to repair, service or observe the CAS. The log shall remain in the CAS at all times and be accessible. The log may be reviewed by Division staff for reimbursement verification purposes.

3. Corrective Action System Field Log (CASFL)

A CASFL shall be completed during each site visit. This log shall be prepared in accordance with the CASFL located in the “Corrective Action Workbook” and submitted with the appropriate monitoring report in an appendix, unless directed to do otherwise by the Division. Any additional information unique to a system may be attached. The CASFL may be expanded to accommodate additional extraction wells.

4. Telemetry

After CAS start-up, continuous telemetry monitoring shall be used to monitor system operation.

**B. Routine System O&M and Schedule**

After CAS start-up, routine CAS activities shall, at a maximum, be performed monthly. Routine O&M shall be defined as:

1. Scheduling site visits as required to inspect and document system performance, as well as perform routine repairs or scheduled repairs;
2. Inspecting for leaks, excessive equipment heat and noise, and/or equipment wear;
3. Checking extraction well pumps and components, checking filters, hoses, compressor oil, cleaning stripper (monthly), backwashing GAC vessels to remove fouling and iron buildup, and the replacement of gauges, lubricants, and belts.;
4. A “Corrective Action System Entry Log” shall be maintained in accordance with the log located in the “Corrective Action Workbook”. The log shall document all personnel that are on site to repair, service or observe the CAS. The log shall remain in the CAS at all times and be accessible. The log may be reviewed by Division staff for reimbursement verification purposes; and,
5. A CASFL shall be completed during each site visit. This log shall be prepared in accordance with the CASFL located in the “Corrective Action Workbook” and submitted with the appropriate monitoring report in an appendix, unless directed to do otherwise by the Division. Any additional information unique to the CAS may be attached.

Provide a description and schedule of routine system O&M for the proposed CAS. The description shall include the number and type of personnel and equipment required to perform routine system O&M. The description shall not include major repairs or extensive trouble-shooting, which may be covered by the manufacturer. If site visits are scheduled for more than once per month, then provide justification for additional visits. Routine operation and maintenance shall not exceed one (1) workday (maximum 10-hour workday) without prior approval from the appropriate field office.

For Fund covered releases, an additional technician may be requested, but prior Division approval shall be obtained. If a technician leaves the site during the 10-hour workday to obtain repair materials, then the time shall be included in the reimbursement application as on-site time for routine O&M.

### **C. CAS Repairs and/or Maintenance**

Provide a description and anticipated schedule of all CAS repairs and maintenance. The logs listed below shall be included in the description. Repairs to and/or maintenance of the CAS shall be performed in a manner that neither results in, nor contributes to, the spread of contamination or increases the risk to human health, safety and/or the environment. Repairs shall be completed the day they are observed if at all possible. **However, if the total cost for the repair will exceed \$2,000.00, then a cost proposal for the**

**repair shall be completed in accordance with the applicable worksheets located in the “Corrective Action Cost Proposal Workbook”. The worksheets shall include, but not be limited to itemizing personnel time, installation costs, and capital equipment costs. The completed cost proposal shall be submitted with the CASDR and approved by the Division prior to making the repair.**

1. Corrective Action System Down Report (CASDR)

The appropriate UST EFO shall be notified by submitting a CASDR within three (3) business days of any system downtime that exceeds seventy-two (72) hours in length (continuous downtime). A schedule for when the system will be operational shall also be included. The CASDR shall be prepared and submitted in accordance with the CASDR located in the “Corrective Action Workbook”. The appropriate UST EFO shall be notified within five (5) calendar days of returning the CAS to operation.

2. Corrective Action System Repair Log (CASRL)

A CASRL shall be completed during each site visit related to CAS repair. The log shall be prepared and submitted in accordance with the CASRL located in the “Corrective Action Workbook” and submitted with the appropriate monitoring report.

## **VII. Types of Monitoring Events**

Provide a discussion of the monitoring events that will be conducted during corrective action and provide a schedule for the events.

Monitoring events shall consist of one of the following and as designated in the “Schedule for Monitoring Reports and Tasks” located in the “Corrective Action Workbook”:

**A. Corrective Action Baseline Monitoring Event - (soil and/or ground water)**

Consists of sampling all monitoring and extraction wells and other Division approved sample locations within thirty (30) days prior to CAS start-up;

**B. Corrective Action Comprehensive Monitoring Event**

Consists of sampling all monitoring and extraction wells and other Division approved sample locations;

**C. Corrective Action Monitoring Event**

Consists of sampling only Division approved sample locations; or

**D. Corrective Action Closure Monitoring Event**

Consists of sampling only Division approved sample locations.

**VIII. Environmental Samples, Analyses and Monitoring**

Environmental samples shall be collected, handled, stored and transported in accordance with Rule 1200-1-15-.06 (1)(b)3. and any prerequisites for the laboratory method(s) to be applied to the sample. Sampling tasks shall also be performed in accordance with the current EAG. Samples shall be tested using laboratory methods acceptable to the Division at the time of sample collection.

**All new impacts identified during sampling shall require written 72 hour notification to the Division by submittal of a Hazard Notification Report (HNR) form. All measurements and samples shall be collected while the CAS is in operation.**

**A. Soil Monitoring and Sampling**

This task shall consist of the installation of one boring in Division approved location(s) where the highest level(s) of soil contamination was (were) known to exist through previous site assessment activities. The soil sample(s) shall be collected every two (2) years from the implementation of the CAP, unless otherwise directed by the Division. The sample(s) shall be collected and analyzed in accordance with the current EAG for the appropriate COCs.

Provide a monitoring and sampling plan discussing the type and frequency to be conducted. The plan shall include the numbers and locations (including depth) of the samples to be collected. A list of all applicable COCs that will be analyzed in accordance with the sampling plan shall be provided.

**B. Ground Water Monitoring and Sampling**

This task shall be completed while the CAS is operating and shall consist of:

1. Obtaining water level measurements from all monitoring and extraction wells;
2. Obtaining free product measurements from all monitoring and extraction wells, if applicable;
3. Obtaining free product level measurements from any release detection wells and/or observation wells, if applicable; and
4. Sampling all Division approved monitoring wells and extraction wells in accordance with the current EAG for the appropriate COCs.

Provide a monitoring and sampling plan discussing the type and frequency to be conducted. The plan shall include the numbers and locations of the samples to be collected. A list of all applicable COCs that will be analyzed in accordance with the sampling plan shall be provided.

**C. Free Product Monitoring**

This task shall consist of obtaining and documenting free product level measurements during each routine O&M site visit, if any well has a history of free product. All measurements shall be documented in the “Potentiometric Data Table” located in the “Corrective Action Workbook” for the applicable report. This task also includes the removal of free product, by hand bailing, when encountered in a well during monitoring. The bailed free product shall be introduced into the product compartment of the CAS oil/water separator or product storage tank, if available.

Provide a plan describing the frequency of monitoring to be conducted for free product, if applicable.

**D. Drinking Water Supply Monitoring and Sampling**

This task shall consist of collecting all Division approved drinking water supply samples in accordance with the current EAG for the applicable COCs.

Provide a sampling plan describing the type and frequency of sampling to be conducted of all drinking water receptors identified during the assessment activities and a list of all COCs that will be analyzed. The plan shall include the number and locations of the samples to be collected. These locations shall be depicted on a color topographic map. If any receptor abatement measure (i.e. filtration system, GAC unit, etc.) is ongoing, then provide a discussion of the scheduled maintenance of the receptor abatement measure.

**E. Surface Water Monitoring and Sampling**

This task shall consist of collecting all Division approved surface water samples in accordance with the current EAG for the applicable COCs.

Provide a sampling plan describing the type and frequency of sampling to be conducted of surface water locations identified during the assessment activities and a list of all COCs that will be analyzed. This task shall consist of collecting all Division approved surface water samples in accordance with the current EAG for the applicable COCs. The plan shall include the number and locations of the samples to be collected. A site map or color topographic map (whichever is more appropriate) shall be provided depicting the location where surface water samples will be collected.

If any receptor abatement measure (i.e. booms, pads, skimmer, etc.) is ongoing, then provide a discussion of the scheduled maintenance of the receptor abatement measure.

**F. Vapor Monitoring and Sampling**

This task shall consist of monitoring of all subsurface structures (i.e., basements, utility vaults, sewers, etc.) for petroleum vapors within three hundred (300) feet of known contamination. Known contamination shall be defined as all sampling locations where analytical results document contamination above the applicable RBCLs or SSCLs or where free product has been observed. All above ground structures that have been previously impacted by petroleum vapors shall also be monitored.

Provide a sampling plan describing the type and frequency of monitoring events to be conducted of any vapor monitoring that will be performed. The plan shall include the number and locations of the samples to be collected. These locations shall be depicted on a map. The type of monitoring instrument, make and model number, and calibration procedure, and frequency to be followed shall be provided.

If any receptor abatement measure (i.e. ventilation fan, etc.) is ongoing, then provide a discussion of the scheduled maintenance of the receptor abatement measure.

**G. CAS Monitoring and Sampling**

1. Vacuum

This task shall consist of obtaining and documenting vacuum measurements during each routine O&M site visit. All measurements shall be documented in the CASFL for the applicable report.

Provide a monitoring plan describing the type and frequency of measurements to be collected of any vacuum monitoring from the proposed CAS, if applicable. The plan shall include the number and locations of the measurements to be collected. Provide the type of monitoring instrument, make and model number, and calibration procedure and frequency, if applicable.

2. Emissions

This task shall consist of obtaining and documenting emission measurements during each routine O&M site visit. All measurements shall be documented in the CASFL for the applicable report.

Provide a sampling plan describing the type and frequency of sampling to be conducted of any emissions monitoring from the proposed CAS,

if applicable. The plan shall include the number and locations of the samples to be collected. Provide the type of monitoring instrument, make and model number, and calibration procedure and frequency.

3. System influent sampling

This task shall consist of obtaining CAS influent samples (must be collected prior to the air stripper at the base of the AWS) in conjunction with any required effluent sampling.

Provide a sampling plan describing the type and frequency of sampling to be conducted from the proposed CAS. The plan shall include the number and locations of the samples to be collected and shall directly correspond with the discharge permit requirements for effluent sampling.

**H. Permit Monitoring and Sampling**

This task shall consist of obtaining all samples required by local and/or state permits. The frequency and sampling requirements for water discharge and/or air emission permits shall be performed according to the approved federal, state, and/or local government agency requirements.

Provide a plan describing the type and frequency of monitoring to be conducted to meet permit requirements, if applicable.

**I. Land, Water Use and Receptor Monitoring and Sampling**

This task shall evaluate changes in land, surface, and/or ground water usage surrounding the site. The discovery, addition and/or removal of receptors may change the basis upon which the applicable RBCLs or SSCLs were developed. The Division shall be notified of any receptor change within seventy two (72) hours.

Provide a plan describing the type and frequency of monitoring to be conducted of all changes in land, surface water, and ground water use, and current receptors surrounding the site as determined in the EA.

**IX. Notification**

**A. Public Participation**

For each confirmed release for which a CAP has been required or allowed, notice shall be provided to the public which is designed to reach the members of the public most directly affected by the release and planned corrective action. This notice may include, but is not limited to:

1. Public notice in local newspapers;

2. Block advertisements;
3. Public service announcements;
4. Publication in a state register;
5. Letters to individual households; and/or
6. Personal contacts by field staff.

Documentation of public participation shall be submitted in accordance with a schedule established by the Division.

**B. Notification of Field Activities**

Notice shall be given to the appropriate UST EFO in accordance with rule 1200-1-15-.06(1)(b)1., which states:

“Notice of Field Activities.

(i) Tank owners and/or operators shall notify the division at least one (1) working day in advance of any routine field activity. Routine field activities include, but are not limited to, placement of soil borings, construction of monitoring wells, sample collection events, field surveys, such as water use surveys or land use surveys, installation and/or start-up of treatment systems.

(ii) Tank owners and/or operators shall notify the division by no later than one (1) working day after any non-routine field activity, such as emergency response activities.”

Provide a statement of agreement that the Division will be notified of all field activities in accordance with this section.

**C. Conditions that Warrant a Seventy-two (72) Hour Notification**

The local UST EFO case manager shall be notified within seventy-two (72) hours if one or more of the following occurs:

1. An impact occurs or reoccurs to any receptor;
2. Changes in land, surface, and/or ground water use are discovered that would require a re-evaluation of the ExA upon which the applicable RBCLs or the applicable SSCLs are based;
3. Free product is discovered and has not been previously identified during any other assessment activity;



4. Free product thickness increases above historic levels in any monitoring well;
5. The CAS is down for seventy-two (72) consecutive hours.

Provide a statement of agreement that the Division will be notified of seventy-two (72) hour notification situations.

## **X. Types of Corrective Action Monitoring Reports**

**Failure to submit reports using the following report titles may result in the loss or delay of reimbursement for the report.** Monitoring reports shall apply to soil and/or ground water and consist of the following in addition to performing any other tasks required in Section VIII:

### **A. Corrective Action Baseline Monitoring Report - (CABMR)**

A onetime report that contains the sampling results for all monitoring and extraction wells and other Division approved sample locations and the data obtained from performing any other tasks. The report is to be submitted within thirty (30) days after baseline sampling.

### **B. Corrective Action Monitoring Report (CAMR-ab) with as-built diagrams**

A onetime report after CAS start-up that contains the sampling results for only Division approved sample locations and the data obtained from performing any other tasks.

### **C. Corrective Action Monitoring Report (CAMR)**

A report that contains the sampling results for only Division approved sample locations and the data obtained from performing any other tasks. The CAMR shall be submitted quarterly for the first year of corrective action and semi-annually thereafter, unless otherwise directed by the Division.

### **D. Corrective Action Closure Monitoring Report (CACMR)**

A report that contains the sampling results for only Division approved sample locations and the data obtained from performing any other tasks. The CACMR shall be submitted quarterly for the closure monitoring period, unless otherwise directed by the Division.

Provide a statement of agreement that the above listed monitoring reports will be submitted in accordance with the “Schedule for Monitoring Reports and Tasks” located in the “Corrective Action Workbook”.

## **XI. Performance Measures, Triggers and Contingency Actions**

**A. Performance Measures (PM) of Site Remediation**

An evaluation of the CAT shall be conducted by the PAR upon receipt of new field and analytical data. The PMs of the approved CAP shall be the basis upon which to evaluate the effectiveness of the CAT. If the PMs indicate that the CAT is not accomplishing its goals, then the Division shall be notified within thirty (30) days of the PM evaluation in the appropriate monitoring report and consideration shall be given to the possible need for modification of the CAP.

PMs shall include, but not be limited to, the following:

1. An estimate of down time for the CAS expressed as a percentage of total operating time;
2. If free product exists at the site at the time of CAP approval or modification and free product removal is one of the remediation goals of the CAP, then both the long and short term objectives of free product extraction at this site shall be compared to actual site conditions at least annually. As long as free product is present at the site, PMs related to these objectives shall be compared to the actual free product monitoring data after each monitoring event; and,
3. An annual evaluation of the COC concentration trends in comparison to the approved RBCLs or SSCLs.

Provide a list of PMs that, if accepted by the Division, will be used to evaluate the effectiveness of the proposed CAT and make determinations as to when modifications to and/or termination of the CAP would be appropriate. In describing the PM, be sure to specify the type of data to be gathered, the frequency or schedule for gathering data, and set a predicted trend line for comparison over time. Some PMs may deal with receptor, land or ground water use instead of physical measurements. In these cases, propose a method and frequency for evaluating changes that may affect the basis upon which the applicable RBCLs or SSCLs were set. For example, if a new building with a basement is built immediately adjacent to the site, then the risk shall be re-evaluated to determine if the applicable RBCLs or SSCLs should be changed.

**B. Triggers and Contingency Actions**

In addition to setting PMs, propose triggers and contingency actions that would occur if the proposed CAT did not perform as predicted. The following are examples of how PMs with a trigger and a contingency should be constructed:

PM 1 - Benzene concentrations (or specify which COC) in each ground water monitoring well will decline (x%) in 24 months. If the percent

reduction is (x%) less than predicted, then the Division shall be notified via the CAMR. A meeting may be requested at which time modifications to the system and/or the CAP will be proposed to address the less than predicted reduction in contaminant concentration.

PM 2 - The system runtime shall be a minimum of 85%. If the percent of time the system has actually operated is less than 85%, then the Division shall be notified via the CAMR. A meeting may be requested to discuss the problems with the system that are adversely affecting runtime.

PM 3 - The efficiency of the air stripper shall be x%. If the efficiency is less than x%, then the Division shall be notified via the CAMR. A meeting may be requested at which time modifications to the system and/or the CAP may be discussed and possibly proposed to address system efficiency.

### **C. CAS Performance Evaluation Meeting**

A performance evaluation meeting may be held between the PAR, CAC, and Division personnel as deemed necessary by the Division. Topics for discussion shall include, but not be limited to the following:

1. COC concentration reduction (i.e., have applicable RBCLs or SSCLs been achieved);
2. Plume dynamics (spreading, shrinking or stability of aqueous, non-aqueous and adsorbed phases);
3. System operational performance;
4. System operation, maintenance and repair history; and
5. Recommendations for system and/or CAP modifications to increase system performance.

Provide a statement of agreement that the PAR and/or CAC will attend all performance evaluation meetings if required by the Division.

## **XII. Additional Information**

Provide any additional information that may be pertinent to the corrective action not previously requested. If applicable, provide the information in tables or maps.

## **XIII. Cost Proposal**

Complete the applicable worksheets located in the "Corrective Action Cost Proposal Workbook" and provide a detailed breakdown of the estimated costs for each

proposed CAT. All cost proposals and vendor bids shall represent current market prices and be included in Appendix B “Corrective Action Cost Proposal”. A cost proposal is not required for state or federal owned release sites. All cost proposals for Fund covered releases shall be in accordance with the reasonable rates established by the Division in the current Reimbursement Guidance Document (RGD -002).

#### **XIV. Signature Page**

Provide a signature page as attached.

#### **Appendices**

**The following workbooks and figure packages to be included in the CAP and subsequent monitoring reports are available from the Division’s website for download:**

**Corrective Action Workbook (i.e., logs, checklists, tables, schedules, etc.);  
Corrective Action Cost Proposal Workbook; and,  
CAS Figure Packages (i.e., figures, diagrams, layouts, etc.).**

- A. Equipment Brochures and Manufacturers’ Design Specifications (Non-Fund Covered Releases only)**
- B. Corrective Action Cost Proposal (Not required for state or federal owned release sites)**



**TENNESSEE DEPARTMENT OF ENVIRONMENT  
AND CONSERVATION**

**DIVISION OF UNDERGROUND STORAGE TANKS**



**CORRECTIVE ACTION MONITORING  
REPORT GUIDELINES**

**January 2010**

## **Instructions**

Monitoring reports shall be prepared within thirty (30) days of completion of each monitoring event identified in Section VII of the CAP. The monitoring report shall cover site activities and events since the previous monitoring report. Each section of the CAMR shall be prepared and assembled in the order presented within these guidelines and each page, including all appendices, shall be numbered consecutively through the entire report. Text shall be provided explaining the associated tables, figures and maps. All table and log formats (worksheets) are included in the "Corrective Action Workbook" and shall be used to complete all monitoring reports. The preparer shall assemble the information in each section to provide a comprehensive final document. Each section and subsection heading shall be clearly printed in the report. A table of contents shall be provided listing the page numbers and/or location of all sections, maps, tables, figures and appendices.

Unless otherwise specified, all tables, figures and maps shall be in the appropriate sections, not in appendices. All maps shall be drawn on 8.5 x 11 or 11 x 17 inch paper and contain at a minimum, the UST Facility Identification Number, the date the map was drawn, a north arrow, a legend, a scale bar, a vertical scale, if applicable, and a figure number. Additionally, each scaled site map shall depict the location of the tank(s), product and vent line(s), dispensers, buildings, subsurface structures, underground and overhead utilities, soil borings, extraction and monitoring wells, and CAS and associated piping. Identify the release point, if known. Former tank pits shall be indicated with a dashed line.

## Corrective Action Monitoring Report Cover Page

**Date of CAMR:**

**Type of Monitoring Report:**

- Corrective Action Baseline Monitoring Report (CABMR)
- Corrective Action Monitoring Report – with as-built diagrams (CAMR-ab)
- Corrective Action Monitoring Report (CAMR)
- Corrective Action Closure Monitoring Report (CACMR)

**Dates of Monitoring Period (from/to):**

**UST Facility Identification Number:**

**UST Facility Name:**

**UST Facility Address:**

**Case Number:**

**Name of the PAR for implementation of the CAP (This is the individual such as the tank owner, tank operator, property owner, or a specific representative of the business authorized to act on behalf of that business):**

**Name of the CAC company and individual(s) who prepared the CAMR including applicable license/registration type and number:**



## **I. Monitoring Progress, Problems, and Results**

Provide the most current information in accordance with the requirements set forth below:

### **A. Progress**

#### **1. System installation or modification information**

Provide a description of CAS installation or modification activities. Upon system installation and/or after any modification directed by the Division, the following information shall be submitted in the CAMR-ab. Supporting documentation shall be included in an appendix.

- a. "As built" equipment and site diagrams for each CAT. The "as built" diagrams shall include at a minimum: a process and flow diagram, a site map including the extraction wells, CAS trenches, monitoring wells or extraction points, and system compound layout. If "as built" diagrams are provided in other types of reports (i.e., reports subsequent to the Corrective Action Baseline Monitoring Report that do not follow a major modification, etc.) then the cost of those diagrams will not be reimbursed from the Fund;
- b. A CASIACL (located in the "Corrective Action Workbook");
- c. All boring logs for extraction wells or extraction points completed in accordance with TGD-006, "Standard Drilling Log"; and,
- d. Copies of approved discharge and/or emission permits or permit renewals.

#### **2. Site remediation progress**

Provide a summary of remediation progress including, but not limited to, changes to receptors, analytical result trends, free product thickness trends, CAS performance trends, etc.

#### **3. CAS progress**

Provide the progress and effectiveness of the CAS since the last report. Information in the report shall include, but not be limited to, a discussion of the following:

- a. CAS performance relative to the performance measures (PMs) established in the approved CAP.
  - i. CAS adjustments affecting performance. This includes, but is not limited to, drop tube adjustments and changes

- in the number and designation of extraction wells online and/or offline;
  - ii. CAS runtime (% uptime);
  - iii. For DPVE systems, air stripper efficiency (%);
  - iv. Contaminant removal efficiency (%);
    - (a) Free product extraction [current thickness versus thickness at the time of installation (%)], if applicable;
    - (b) Ground water concentration reduction [current concentration (ppm) versus concentration at the time of installation (% reduction)], if applicable; and,
    - (c) Soil concentration reduction [current concentration (ppm) versus concentration at the time of installation (% reduction)], if applicable; and,
  - v. CAS effluent evaluation with applicable permit requirements and to determine the continued use of GAC and bag filter components.
- b. Additional information

Provide any additional information that was not included in the approved CAP or required by the Division. If applicable, then provide this additional information in tables and/or maps.

## **B. Problems**

Provide a detailed summary of any problem(s) that have been encountered since the previous report, actions taken to resolve the problem(s), and any complaints received or reported impacts from the release. If the CAS was non-operational when the CAC left the site for the day, then a detailed description shall be provided. If the CAS has been non-operational or down for extended periods of time greater than seventy-two (72) consecutive hours, then detailed documentation and an explanation for the delay shall be provided. An appendix shall contain the CASDR for each seventy-two (72) hour documented occurrence and each CASRL completed during the monitoring period.

If the CAS is operating for less than eighty-five percent (85%) of the reporting period, then detailed documentation of the reason for the downtime and efforts to reactivate the CAS shall be submitted.

## **C. Results**

### **1. Soil analytical data**

If no soil contamination exists above the applicable RBCLs or SSCLs, then the report shall state that this section is not applicable. If soil

sampling was not required for this reporting period, then, if applicable, provide the date of the next scheduled soil sampling event.

- a. Provide soil analytical results from all events in the “Soil Analytical Results Table” located in the “Corrective Action Workbook” for the applicable COCs. A summary of any new soil investigation activities shall be included with the report. A detailed boring log shall be prepared in accordance with TGD-006 for each new boring and included in an appendix.
  - b. All original laboratory analysis and chain of custody sheets for this monitoring period shall be provided in an appendix. All laboratory analysis sheets shall include the following:
    - i. UST Facility Identification Number;
    - ii. Boring number or location of additional sampling points;
    - iii. Date sample was collected;
    - iv. Date sample was analyzed;
    - v. Parameter analyzed (i.e., the appropriate COCs);
    - vi. Analytical method;
    - vii. Detection limit;
    - viii. Dilution factor;
    - ix. Unit of measurement (ppm); and
    - x. Authorized laboratory signature - the signature page shall indicate the number of pages within the laboratory report
2. Potentiometric data
- a. Provide water level data for all sampling events in the “Potentiometric Data Table” located in the “Corrective Action Workbook”. All measurements shall be recorded to 0.01 feet.
  - b. Provide two (2) scaled site maps including potentiometric data collected at least thirty (30) days apart during the last two (2) monitoring periods. If multiple aquifers were investigated and sufficient data is generated, then potentiometric maps shall be included for each aquifer. Each map shall also include an arrow depicting the interpreted direction(s) of ground water flow.
3. Free product data
- Provide a description of the method for management and disposal of the free product.
4. Water analytical data

If no ground water contamination exists above the applicable RBCLs or SSCLs, then the report shall state that this section is not applicable, unless water receptors are being monitored as directed by the Division.

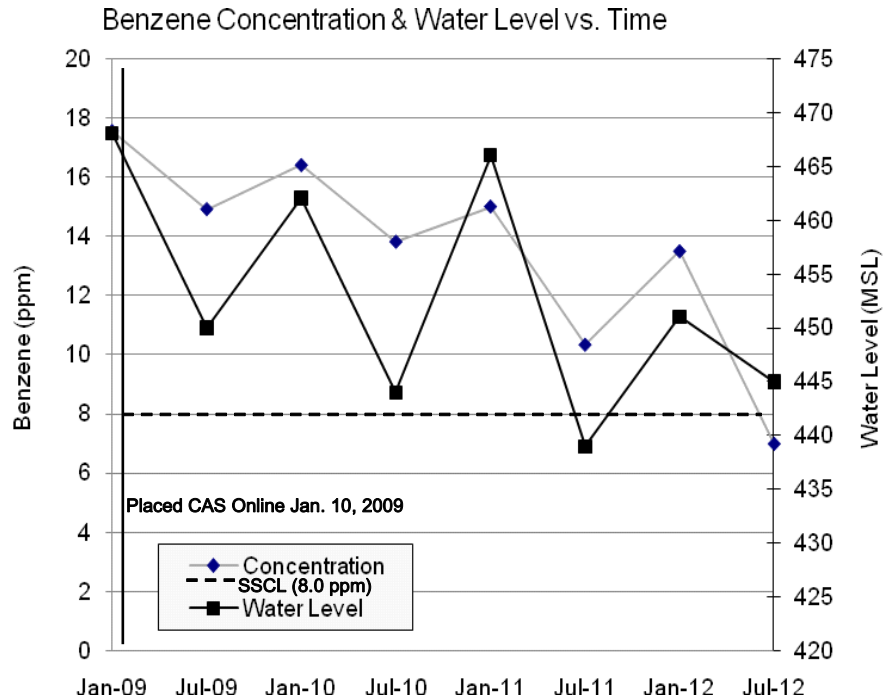
a. Tables

- i. Provide water analytical results from all events in the “Water Analytical Results Table” located in the “Corrective Action Workbook” for the applicable COCs, including all ground water, drinking water supply, and surface water analytical results. A summary of any new water investigation activities shall be included with the report.
- ii. Provide water analytical results from all events in the “Influent/Effluent Analytical Results Table” located in the “Corrective Action Workbook” for the applicable permit required COCs.
- iii. Provide all original laboratory analysis and chain of custody sheets for this monitoring period in an appendix. All laboratory analysis sheets shall include the following:
  - (a) UST Facility Identification Number;
  - (b) Monitoring well number or location of additional sampling points;
  - (c) Date sample was collected;
  - (d) Date sample was analyzed;
  - (e) Parameter analyzed (i.e., the appropriate COCs);
  - (f) Analytical method;
  - (g) Detection limit;
  - (h) Dilution factor;
  - (i) Unit of measurement (ppm); and
  - (j) Authorized laboratory signature - the signature page shall indicate the number of pages within the laboratory report

b. Graphs

- i. Provide a graph for each well sampled during the monitoring event showing ground water contaminant concentrations for all applicable COCs detected above the applicable RBCLs or SSCLs and ground water levels versus time. A dashed line shall indicate the applicable cleanup level for RBCLs or SSCLs. Only one COC shall be shown on any one graph. All ground water data shall be used and the point in time when the

CAS became operational shall be indicated. Graphs shall indicate the information as shown in the example:



- ii. Provide a graph showing the influent and effluent contaminant concentrations for each monitoring event for all COCs that exceed the applicable RBCL or SSCL for the site.

c. Maps

Provide a separate, plan view scaled site map showing the horizontal extent and most recent concentration for each COC that exceeds the applicable RBCL or SSCL **in more than one well**. All contaminant plumes shall be defined to the applicable RBCL or SSCL. The horizontal extent and thickness (in feet) of any free product shall be depicted on each map.

5. Vapor monitoring results

- a. Provide a description of all vapor monitoring of above ground and/or subsurface structures (i.e., basements, utility vaults, sewers, etc.) that have been previously impacted by petroleum vapors. Any new petroleum vapor impacts shall also be discussed. Provide all vapor monitoring data collected during

the monitoring period in the “Vapor Monitoring Results Table” located in the “Corrective Action Workbook”.

- b. Provide a scaled site map depicting and labeling the locations of the vapor monitoring points of all subsurface structures (i.e. basements, utility vaults, sewers, etc.) within 300 feet of known contamination above the applicable RBCL or SSCL. Indicate the 300 foot line with a dashed line.

6. Vacuum monitoring data

- a. Provide all vacuum monitoring data collected during the monitoring period in the “Vacuum Monitoring Results Table” located in the “Corrective Action Workbook”. **Vacuum shall be measured while the CAS is operating.**
- b. Provide a scaled site map depicting measured vacuum influence from the most recent data collected during ground water sampling. The map shall depict the vacuum in inches of water (H<sub>2</sub>O) measured at each extraction and monitoring well. If sufficient data is available, then contour vacuum influence.

7. CAS performance and supporting data

- a. CAS performance data

The following tables shall be completed and provided in this section of the monitoring report. These tables are located in the “Corrective Action Workbook”.

- i. CAS Monthly Runtime Table
- ii. CAS Air Emissions Monitoring Table
- iii. CAS Performance Data Table
- iv. Extraction Well Performance Data Table
- v. System Status and Inspection Table

- b. CAS supporting data

Provide the following information in chronological order in separate appendices for the monitoring period:

- i. First and last telemetry facsimile daily report for the monitoring period and any alarm facsimile received during the period (including an alarm code key);
- ii. CASFLs;
- iii. CASRL(s), if applicable; and
- iv. CASDR(s), if applicable.

## **II. Additional Information and Recommendations**

Provide a discussion of any additional information and/or recommendations concerning the site remediation activities.

## **III. Monitoring Report Signature Page**

Provide a signature page as attached.

## **Appendices**

