# State of Arkansas

## Arkansas Department of Environmental Quality

# Remedial Action Decision Document

Cedar Chemical Company
West Helena, Phillips County, Arkansas

February 2010

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Arkansas Department of Environmental Quality

# REMEDIAL ACTION DECISION DOCUMENT

Cedar Chemical Corporation
EPA ID No.: ARD990660649
AFIN: 54-00068

## 1. INTRODUCTION

It is the Arkansas Department of Environmental Quality's (ADEQs) purpose by issuance of this Remedial Action Decision Document (RADD) to ensure that Cedar Chemical Corporation (hereinafter Cedar Chemical or the Facility) is remediated using the most protective remedies for on-site soils, groundwater, and the water supply. This RADD contains justification for ADEQs decision on all applicable remediation activities, including the rationale for preferred remedy and all additional remedies considered. This RADD includes the opportunity for the public to comment on the selected remedies, and serves as a companion to the documents found in the administrative record

The Facility is located just to the south of the city of Helena-West Helena, in Phillips County, Arkansas. The Facility consists of approximately 48 acres located within the Helena-West Helena Industrial Park, approximately 1.25 miles southwest of the intersection of U.S. Highway 49 and State Highway 242. A site location map is included as **Figure 1.** The Facility is bordered by farmland, State Highway 242, the Union-Pacific Railway, and industrial park properties. Of the 48 acres, approximately 40 acres comprise the abandoned manufacturing fenced area of the Facility. The current wastewater treatment ponds are located on an additional 8 acres of the property. An undeveloped, wooded area west of the wastewater treatment ponds and south of Industrial Park Road is part of the Facility property, but does not appear to have historically been part of the manufacturing Facility.

On March 22, 2007, ADEQ, pursuant to the authority of the Arkansas Remedial Action Trust Fund Act ("RATFA"). issued a Consent Administrative Order (CAO) LIS 07-027 to Tyco Safety Products-Ansul Incorporated, formerly known as Wormald US, Inc. (Ansul), Helena Chemical Company (Helena Chemical), and ExxonMobil Chemical Co., a division of ExxonMobil Corporation (ExxonMobil) regarding Cedar Chemical. The basic objective of the CAO was to "address environmental concerns at the Facility to ensure protection of human health and the environment."

Public involvement is an important process for ultimately selecting the final remedies to be employed at the Facility for remediating releases to the environment of hazardous constituents to the media of concern. The RADD is subject to public notice and comment to allow the public and interested parties to raise all ascertainable issues concerning the remedies proposed at the Facility, including options not addressed.

## 2. SITE BACKGROUND

Prior to 1970, the land where the Facility now exists was used for agriculture purposes (EnSafe, 1996). The plant was constructed and initially operated by Helena Chemical. The construction date of the Facility is not documented in available records; however, several reports state that operations began at the Facility around 1970 with the manufacture of methoxychlor. The following companies or individuals also owned, operated or had an ownership interests in the plant prior to its conveyance to the Cedar Chemical Corporation in 1986: Jerry Williams, Ansul Corporation, Eagle River Chemical and Vertac, Inc.
In 1986, the plant was sold to Cedar Chemical (A.T. Kearney, Inc. 1988).

During its operational life, the Facility manufactured various agricultural chemicals, including insecticides, herbicides, polymers, and organic intermediates. Plant processes were batch operations, with seasonal production fluctuations and the frequent introduction of new products.

During operation, the Facility consisted of six (6) production units which are described below and are identified in **Figure 2**:

- Unit 1 was utilized for formulation of various custom chemicals such as permethrin and permethrin acid chloride, for other companies.
- Unit 2 was the propanil production unit.
- Unit 3 known as the Expansion Area was destroyed in a fire and explosion on September 26, 1989.
- Unit 4 was used for production of various custom products such as orfom D-8 and orfom CO300. Unit 4 was also contracted from time to time for the production of methyl 2-benzamide carbonate (MBC) and methyl ethyl sulfide (MES) and the mixing of Metam Sodium.
- Unit 5 primarily used to manufacture nitroparaffin derivatives.
- Unit 6 began producing dichloroaniline in 1991used in the production of Propanil Regulatory History.

The ADEQ, formally know as the Arkansas Department of Pollution, Control, and Ecology (ADPC&E), initially became involved with the Facility shortly after production began at the plant in the early 1970s. This involvement was in response to citizen complaints of discharges of water and odors. There were additional regulatory actions or directives regarding the Facility during its operational history; these are summarized below.

In 1972 to 1973, Vertac began using three unlined earthen surface impoundments on the west side of the Facility for disposal of waste chemicals. The surface impoundments were constructed during the early 1970s and utilized until 1978 when the impoundments were closed by Vertac.

Closure of the impoundments was performed by draining them of water and installing a clay cap consisting of native soil and bentonite (Ecology and Environment, Inc., 1986).

In 1980, Vertac submitted a RCRA Part A Permit application to ADPC&E for a hazardous waste storage tank (T-B112), a container storage area, and the surface impoundments described above. In August 1984, Vertac submitted the Part B Permit application. Soon after the Part B application was submitted, the ADPC&E concluded that the surface

impoundments were not a hazardous waste unit, and dropped them from the permitting process in a letter dated November 1984.

On January 9, 1986, Vertac notified ADPC&E that Cedar Chemical had purchased the Facility. The Part A and Part B Applications were revised in March 1986 and November 1986 to reflect the new ownership.

On May 30, 1986, ADPC&E conducted a compliance evaluation inspection (CEI). This resulted in an issuance of a notice of violation (NOV) to Cedar Chemical on December 19, 1986, citing several violations. Subsequently, Consent Administrative Order (CAO) No. LIS 86-027 was issued to Cedar Chemical on July 16, 1987, required them to stop disposing of hazardous waste in the certain surface impoundments and to investigate potential release(s) to surrounding media.

While constructing a drainage ditch, buried drums were found near the newest production unit; Unit 6. Cedar Chemical has removed these buried drums in accordance with the approved removal workplan dated June 1990. Cedar Chemical officials obtained information from individuals who worked at the plant prior to Cedar's purchase concerning the existence and location of additional drums. A geophysical survey was conducted at the Facility and subsurface anomalies were identified in the areas where drums were suspected to have been buried. Immediate removal actions were conducted by Cedar Chemical for the additional buried drums.

In 1991, Cedar Chemical entered into CAO No. LIS 91-118 under RCRA corrective action, requiring the completion of a Facility Investigation (FI) at the Facility. Phases I, II, and III of the FI were performed by EnSafe in 1993 through 1995 to acquire information on the soil and groundwater conditions at the Facility. The EnSafe FI Report dated June 28, 1996 documents results for the FI. The FI results were then incorporated into a Human Health Risk Assessment (HHRA) which is documented in Ensafe Risk Assessment document dated March 21, 2001.

On March 8, 2002, Cedar Chemical filed for bankruptcy. Manufacturing and plant operations were shut down shortly thereafter. ADEQ assumed control of the Facility on October 12, 2002.

In January 2003, USEPA Region 6 issued a Request for Removal Action Memorandum to remove chemicals left at the Facility in tanks and containers. The removal action was conducted by EPA Emergency and Rapid Response Services (ERRS) contractor, Environmental Quality Management, Inc. (EQM) and subcontractor U.S. Environmental Services (USES), and the removal oversight was conducted by Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START-2).

The removal action included the following tasks: inventory the laboratory and other containerized chemicals on-site; conduct HazCat for the containers without labels and/or those with questionable labels; inventory the on-site containers and tanks; and separate laboratory chemicals and containers identified for off-site disposal by the ERRS contractor. START-2 was also tasked to document the removal activities; to maintain a site logbook; to contact former employees to assist in identification; to prepare a Health and Safety Plan (HASP); to prepare maps and sketches; to prepare a Quality Assurance Sampling Plan (QASP); and to disseminate EPA-approved information to the public. The Federal On-scene Coordinator (FOSC) for the Cedar Chemical Facility was Gary Moore. The removal

action was completed during the summer of 2003 and is documented in EPA Removal Action Report dated November 15, 2003. The specific chemicals and their manifests are included in **Appendix A**.

As documented in the Comprehensive Site Assessment (CSA) Report prepared by ADEQ dated April 2004, the environmental issues associated with the Facility included abandoned chemicals, buried drums, groundwater contamination, surface and subsurface soil contamination, and an abandoned stormwater treatment system.

On July 20, 2006, ADEQ issued a Civil Complaint against Ansul, Helena Chemical, and ExxonMobil (the Parties). In March 2007, ADEQ voluntarily dismissed its civil complaint and also, pursuant to the authority of the Arkansas Remedial Action Trust Fund Act ("RATFA"), issued a Consent Administrative Order (CAO) LIS 07-027 regarding environmental conditions at the Facility to the Parties. The basic objective of the CAO was to "address environmental concerns at the Facility to ensure protection of human health and the environment."

On August 8, 2007, representatives of the Parties and ADEQ met and discussed the work that should be performed under the CAO. The Parties agreed to address the Facility by conducting a Facility Investigation (FI) and to propose remedies based on the FI findings. To accomplish this, the following reports/investigations were completed:

- Current Conditions Report (CCR)
  The CCR is dated November 16, 2007. The CCR compiled all available data regarding environmental conditions at the Facility and identified any critical data gaps. The CCR also includes information regarding the Facility's setting, past environmental conditions, historical ownership, and surroundings.
- Facility Investigation (FI) Work Plan
  The report is dated March 20, 2008. The FI Work Plan was designed to fill any critical data gaps identified in the CCR. The FI Work Plan included a description of proposed sample locations and sampling and analytical methods.

Due to lack of participation by Ansul and pursuant to Paragraph V. 20 of the CAO, Helena and Exxon Mobil, acting jointly, entered into a Separate Agreement with ADEQ on March 25, 2008. Under this Separate Agreement the following investigations/reports were completed:

- Facility Investigation (FI)
  Field activities, including drilling, cone penetrometer studies, and well installation, were conducted predominantly between March and November 2008. Groundwater sampling events were performed during January, July, September and November, 2008.
- Facility Investigation (FI) Report
  The FI Report, dated February 2009, reports additional data collected during the FI and summarize findings regarding the character and extent of contamination. The FI Report includes an identification of all sample locations and analytical results.
- Feasibility Study (FS) Report
  The FS Report, dated December 15, 2009, evaluates remedial alternatives and identifies the proposed remedial measures for the Facility.

Ansul entered into a Separate Agreement with ADEQ on January 9, 2009. Ansul submitted documents as follows:

- Site Investigation (SI) Work Plan dated January 1, 2009
- Site Investigation conducted on March 5, 2009
- SI Report dated March 30, 2009
- Focused Feasibility Study Report- Site 3 dated June 2009

Presently, ADEQ acts as the caretaker of the Facility. Currently, the Facility remains abandoned while security guards provide 24 hour maintenance within the fenced area. An on-site contractor is employed by ADEQ and serves as a licensed wastewater operator to direct storm water from the Facility into the wastewater treatment system and before it is discharged to the Mississippi River.

## 3. SUMMARY OF REMEDIAL APPROACH

There was extensive investigative work performed at the Facility prior to the 2008 FI. The 2008 FI was necessary to obtain information to fill data gaps and to identify the available technologies to remediate the Facility.

The Facility Investigation (FI) conducted by AMEC-Geomatrix concluded that the following were the primary remedial action needs at the Facility:

- On-site soils in the former Process Areas are impacted by volatile organic constituents (VOCs), semivolatile organic constituents (SVOCs), pesticides and herbicides, and possibly low levels of certain metals.
- Advective groundwater flow within the shallower Perched Zone and related lateral transport of COCs in this zone's groundwater is limited by the low hydraulic conductivity of this zone.
- The deeper Alluvial Aquifer is highly transmissive, with groundwater flowing generally from the Facility toward the Industrial Park and agricultural properties to the south and southeast.
- Certain COCs are migrating vertically through leakage from the Perched Zone to the Alluvial Aquifer. Based on the contrast in COC concentrations between these two zones, most of the contaminant mass is likely being retained in the low permeability soils of the perched zone.
- The primary groundwater constituents observed above screening levels in Perched Zone groundwater were 1,2-dichloroethane (1,2-DCA), 1,2-dichlorobenzene (1,2-DCB), dinoseb, 4-chloroaniline, toluene, and acetone.
- In the Alluvial Aquifer, the primary groundwater constituents observed above screening levels were 1,2-DCA, 1,2-DCB, bis(2-chloroethyl) ether, and 4-chloroaniline.
- With the exception of on-site or nearby off-site areas within the Industrial Park, the primary Alluvial Aquifer groundwater COC that exceeds its screening level was 1,2-DCA. 1,2-DCA has been documented to be present at least 2,700 feet downgradient of the Facility boundary, beyond the southern end of the Industrial Park. Updated delineation of the boundary of 1,2-DCA beyond the Industrial Park was not undertaken during the FI because of litigation filed by the subject property owner.
- The most significant source areas for Perched Zone and Alluvial Aquifer COCs are Process Areas and waste disposal areas, especially the vicinity of the Former

Dinoseb Disposal Ponds.

- The Drum Vault contains highly dilapidated drums of unknown products or wastes; the vault also contains sand backfill and water. The backfill and water exhibit elevated levels of various VOCs, SVOCs, pesticides, and herbicides.
- Agricultural supply wells have been identified downgradient of the property. No downgradient water supply wells have been identified near the Facility that would be used for drinking water or domestic supply.

The purpose of the FI was to expand upon information gathered from previous investigations in order to better characterize the site. Previous investigations identified certain areas that warranted examination and are listed in **Table 1** below (also see **Figure 3** for Solid Waste Management Unit (SWMU) locations):

| Table 1:<br>Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) Identified by USEPA Region 6 During the RCRA Facility Assessment (RFA)<br>Cedar Chemical Corporation Facility Helena-West Helena, Arkansas | | |
|---|---|---|
| **SWMU No. and AOC** | **Name** | **Conclusions Reached by USEPA Region 6** |
| SWMU 1 & 2 | Railroad Loading and Unloading Sumps | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the Visual Site Inspection (VSI). However, the integrity of the sumps could not be verified during the VSI. No further action is recommended. |
| SWMU 3 | Railroad Loading and Unloading Sump | There is no documented release history for this unit. Despite severe deterioration of the unit, there was no visible sign of release from this unit observed during the VSI. An RFI appears warranted for this unit. |
| SWMU 4 | Production Areas #1 and #2 Drainage System and Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 5 | Production Area #3 Drainage System and Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 6 | Production Area #4 Drainage System and Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 7 | Production Area #5 Drainage System and Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 8 | Boiler Blowdown Area Sump #1 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the Visual Site Inspection (VSI). However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 9 | Boiler Blowdown Area Sump #2 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 10 | Laboratory Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 11 | Sump near main Tank Farm | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. Deterioration of the adjacent concrete pad was observed during the VSI. No further action is recommended. |
| SWMU 12 | Maintenance Shop Drainage System and Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 13 | Truck Scale Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 14 | Packaging Building Sump | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 15-17 | Air Emissions Scrubbers #01, #02 and #03 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 18 | Air Emissions Scrubber #4 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 19 | Sump in Main Tank Farm Diked Area #1 (North) | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 20 | Sump in Main Tank Farm Diked Area #1 (South) | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 21 | Sump in the Main Tank Farm Diked Area #2 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 22 | Sump in the Main Tank Farm Diked Area #3 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 23 | Waste Storage Tank PE-209 in Main Diked Area #4 | There is no documented release history for this unit. However, the unit appeared stained and discolored liquid was observed in the secondary containment area. The integrity of the unit could not be verified during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 24 | Waste Storage Tank 002 in Main Tank Farm Diked Area #5 | There is no documented release history for this unit. Severe staining of the unit and associated piping was noted during the VSI. Standing discolored water was observed in the containment area for this unit, and additional staining of the outside of the containment unit was noted. These stains appeared to be located directly under the associated piping and could not be attributed to overtopping of the unit. No further action is recommended. |
| SWMU 25 | Sump in Main Tank Farm Diked Area #6 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, there were visible signs of deteriorated concrete observed during the VSI. No further action is recommended. |
| SWMU 26 | Sump in Main Tank Farm Diked Area #7 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, there were visible signs of deteriorated concrete observed during the VSI. No further action is recommended. |
| SWMU 27 | Tank B-109 in main Tank Farm Diked Area #7 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 28 | Waste Storage Tank B-112 in the Main Tank Farm Diked Area #8 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the unit appeared corroded and the concrete diked area showed signs of deterioration. No further action is recommended. |
| SWMU 29 | Sump in Main Tank Farm Diked Area #9 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 30 | Waste Water Storage Tank B-102 in the Main Tank Farm Diked Area #10 | There is no documented release history for this unit. However, staining was noted on the tank during the VSI. No further action is recommended. |
| SWMU 31 | Sump in Main Tank Farm Diked Area #11 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, there were visible signs of deteriorated concrete observed during the VSI. No further action is recommended. |
| SWMU 32 | Sump in Main Tank Farm Diked Area #12 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 33 | Tank N-204 in main Tank Farm Diked Area #13 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 34 | Tank N-201 in Main Tank Farm Diked Area #14 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, there were visible signs of deteriorated concrete in the diked area observed during the VSI. No further action is recommended. |
| SWMU 35 | Tank N-205 in Main Tank Farm Diked Area #15 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 36 | Tank N-206 in Production Area #4 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 37 | Sump in Main Tank Farm Diked Area #16 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 38 | Sump in Main Tank Farm Diked Area #17 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 39 | Tank M-105 in Main Tank Farm Diked Area #17 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 40 | Sump in Main Tank Farm Diked Area #18 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 41 | Sump in Main Tank Farm Diked Area #19 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 42 | Sump in Second Tank Farm Diked Area #1 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, there were visible signs of deteriorated concrete observed during the VSI. No further action is recommended. |
| SWMU 43 | Wastewater Tank 014 in Second Tank Farm Diked Area #3 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 44 | Hazardous Waste Storage Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 45 | Nonhazardous Waste Storage Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 46 | Drum Storage Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 47 | Drum Crushing Area | The history of releases at the unit could not be determined; however, staining was evident throughout the area. A RCRA Facility Investigation (RFI) appears warranted for this unit. |
| SWMU 48 | Waste Drum Staging Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 49 | Scrap Drum Storage Wagons | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 50 | Waste Drum Staging Area in Main Tank Farm Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 51 | Waste Oil Drum | Staining of the pad was evident during the VSI. No further action is recommended. |
| SWMU 52 | Drums | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 53 | Solvent Cleaner Tank | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 54 | Miscellaneous Drum Storage | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 55 | Dumpsters | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 56 | Laboratory Waste Rack Area | There is no documented release history for this unit. There was some visible evidence of staining on the rack, but no evidence of staining on the concrete pad. No further action is recommended. |
| SWMU 57 | Warehouse Drum Storage Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 58 | Loading/Unloading Dock Area | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the unit could not be verified during the VSI. No further action is recommended. |
| SWMU 59—Site 3 | Stormwater Drainage System | The unit periodically discharges off-site through the NPDES-permitted outfall during excessive rainfall events. During the VSI, an oily film was observed on the water near the control gate. A RCRA Facility Investigation (RFI) appears warranted for this unit. |
| SWMU 60—Site 3 | Stormwater Sump | In periods of excessive rainfall this unit backs up the stormwater drainage system which is then discharged through the NPDES-permitted outfall. An RFI appears warranted for this unit. |
| SWMU 61 | Wastewater Tank #1 Wastewater Treatment System | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 62—Site 1 | API Separator | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 63 | Wastewater Tank #2 Waste Water Treatment System | During the VSI, staining was noted on the soil from leaks from the sampling valve. An RFI appears warranted for this unit. |
| SWMU 64 | Flow Equalization Basin | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the clay liner could not be verified during the VSI. An RFI appears warranted for this unit. |
| SWMU 65 | Aeration Basin | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. However, the integrity of the clay liner could not be verified during the VSI. An RFI appears warranted for this unit. |
| SWMU 66 | Clarifier #1 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 67 | Clarifier #2 | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. No further action is recommended. |
| SWMU 68 | Polish Pond | Effluent from this unit is pumped 4.5 miles through an epoxy-lined pipe to an NPDES-permitted outfall to the Mississippi River. There is no other documented or visible sign of release from this unit. An RFI appears warranted for this unit. |
| SWMU 69 | Inactive Pond #1 | Releases from this unit have not been documented by sampling although surface and subsurface contamination at the location of the unit has been documented. An RFI appears warranted for this unit. |
| SWMU 70 | Inactive Pond #2 | Releases from this unit have not been documented by sampling although surface and subsurface contamination in the location of the unit has been documented. An RFI appears warranted for this unit. |

| SWMU No. and AOC | Name | Conclusions Reached by USEPA Region 6 |
|---|---|---|
| SWMU 71 | Inactive Pond #3 | Releases from this unit have not been documented by sampling although surface and subsurface contamination in the location of the unit has been documented. An RFI appears warranted for this unit. |
| SWMU 72 | Drum vault | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. An RFI appears warranted for this unit. |
| SWMU 73 | Buried Drums | There is no documented release history for this unit. There was no visible sign of release from this unit observed during the VSI. An RFI appears warranted for this unit. |
| SWMU 74 | Loading/Unloading Area (Railroad Spur) | There was visible evidence of staining along the entire length of the unit. An RFI appears warranted for this unit. |
| AOC 1 | Yellow Stained Areas | A facility representative indicated that yellow stains on the ground surface are the facility may be caused by waste associated with the manufacturing of dinitrobutylphenol conducted by Ansel Corporation while it operated the plant from 1970 until 1973. An RFI appears warranted for this unit. |
| AOC 2 | Wetland Area | None Reached |
| AOC 3 | Ditch Near Wastewater Treatment Basins | None Reached |

Inclusive of the EPA investigation, all SWMU's and AOC's that were identified remained the primary focus for the AMEC Geomatrix field investigation, 2007-2009. These areas are further referenced within the RADD as On-Site Soils, Perched Zone Groundwater, On and Off-Site Alluvial Aquifer Groundwater, Site Structures, Drum Vault, and Wastewater Treatment Ponds.

## 4. SUMMARY OF SITE RISKS

The FI findings were used to identify Constituents of Concern (COCs) in on-site soil and in on-site and off-site groundwater. Constituents consistently found in environmental media at the Facility include: volatile and semivolatile organic constituents, ketones, metals, pesticides, and herbicides. In addition, the FI further delineated the distribution and magnitude of predominant COCs in soil and groundwater; these data were used to identify likely source areas for COCs. COCs in soils ranging from surface to 17 feet below ground surface (bgs) were identified by comparing detected concentrations with industrial worker health-protective screening levels. Additionally, COCs in soil were identified based on groundwater protection-based soil screening levels. COCs in groundwater were identified by comparing detected concentrations with maximum contaminate levels or the tap water screening level for those chemicals without maximum contaminant levels.
The facility COCs are detailed in the following tables:

**Table 2A: Constituents of Concern in Soils**

| **Chemicals of Concern in Soil (exceeding health-protective screening levels)** | **Chemicals in Soils (exceeding groundwater protection-based screening levels)** |
|---|---|
| Aldrin | Acetone |
| Arsenic | Aldrin |
| Chlordane | Arsenic |
| Dichloroethane, 1,2 | Benzene |
| Dieldrin | Carbon tetrachloride |
| Dinoseb | Chlordane |
| Hexachlorocyclohexane, beta | Chloroform |
| Hexachlorocyclohexane, gamma | Chromium |
| Propanil | Dichlorobenzene, 1,4 |
| Toxaphene | Dichloroethane, 1,2 |
| | Dieldrin |
| | Dinitrophenol, 2,4 |
| | Endrin |
| | Ethylbenzene |
| | Hexachlorocyclohexane, alpha |
| | Hexachlorocyclohexane, beta |
| | Hexachlorocyclohexane, gamma |
| | Isophorone |
| | Methoxychlor |
| | Methylene chloride |
| | Selenium |
| | Silver |
| | Toluene |
| | Trichlorobenzene, 1,2,4 |

| Table 2B: Constituents of Concern in Groundwater | | |
|---|---|---|
| **Chemicals of Concern in On-Site Perched Groundwater** | **Chemicals of Concern in On-Site Alluvial Groundwater** | **Chemicals of Concern in Off-Site Alluvial Groundwater** |
| Acetaldehyde | Aldrin | bis(2-Chloroethyl) ether |
| Acetone | Aniline | bis(2-Ethylhexyl) phthalate |
| Acetonitrile | Arsenic | Chromium |
| Aldrin | Benzene | Dichloroethane, 1,2 |
| Aluminum | bis(2-Chloroethyl) ether | |
| Aniline | Chloroaniline, 4 | |
| Arsenic | Chlorobenzene | |
| Beryllium | Dichlorobenzene, 1,2 | |
| bis(2-Ethylhexyl) phthalate | Dichloroethane, 1,2 | |
| Butanone, 2- (MEK) | Dinoseb | |
| Cadmium | Hexachlorocyclohexane, beta | |
| Chloroaniline, 4 | Vinyl Chloride | |
| Chlorobenzene | | |
| Chloroform | | |
| Chromium | | |
| Dichlorobenzene, 1,2 | | |
| Dichloroethane, 1,2 | | |
| Dieldrin | | |
| Dinitrophenol, 2,4 | | |
| Dinoseb | | |
| Ethylbenzene | | |
| Heptachlor | | |
| Heptachlor epoxide | | |
| Hexachlorocyclohexane, alpha | | |
| Hexachlorocyclohexane, beta | | |
| Hexachlorocyclohexane, gamma | | |
| Iron | | |
| Isophorone | | |
| Lead | | |
| Manganese | | |
| Methoxychlor | | |
| Methyl-2-pentanone, 4- (MIBK) | | |
| Methylene chloride | | |
| 3 & 4-Methylphenol | | |
| Nickel | | |
| Nitrophenol, 4 | | |
| Propanil | | |
| Selenium | | |
| Thallium | | |
| Toluene | | |
| Trimethylbenzene, 1,3,5 | | |
| Vanadium | | |
| Xylene, m & p | | |

## A. HUMAN HEALTH RISKS

### Soils

On-site workers may directly contact chemicals in soils ranging from surface to 17 feet bgs via incidental ingestion of soil, skin contact with soil, and inhalation of chemicals in soil particles or chemicals vaporizing from soil. In addition, future construction workers installing utilities or preparing the Facility for future use may experience soil exposure. These direct contact pathways are therefore considered potentially complete for the on-site industrial worker and construction worker. Volatile organic compounds in deeper vadose zone soils may migrate through soil and infiltrate an on-site building. Therefore, the vapor intrusion pathway from soil is also considered a potential complete indirect exposure pathway for workers inside on-site buildings.

### On-site Perched Groundwater

Although direct contact with on-site perched zone groundwater is unlikely, currently there are no restrictions to prevent direct contact with perched zone groundwater. Construction workers may be exposed to perched zone groundwater during trenching or other digging activities. There are currently no restrictions to prevent well installation in the perched zone. Furthermore, the perched groundwater zone may overlay a discontinuous lithologic lense and is likely a contributing source to the underlying more transmissive zone. Therefore, future on-site workers and construction workers potentially may have direct contact with perched zone groundwater. Volatile organic compounds in perched zone groundwater may volatilize into indoor air of on-site buildings and enter indoor workers via inhalation pathways. Therefore, the vapor intrusion pathway from perched zone groundwater is also considered a potential complete indirect exposure pathway for workers inside on-site buildings.

### On- and Off-Site Alluvial Groundwater

Given the productivity and water quality of the on and off-site alluvial groundwater, direct contact with groundwater for use as a potable water supply is considered a complete pathway for on-site workers and off-site residents.

## B. ECOLOGICAL RISKS

On-site ditches that served as a storm water retention system, which is a component of the wastewater treatment system, were evaluated in the 1999 Ecological Risk Assessment. These open ditches are vegetated with various grasses and submergent plants are present in more frequently submerged portions. Arsenic, Aldrin, Dieldrin, 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE), 4,4'-dichlorodiphenyldichloroethane (4,4-DDD), 4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT), Endrin, gamma-BHC, Methoxychlor, and Toxaphene were detected in sediment in these ditches above the EPA Region 4 sediment screening values. Two potential receptors (tadpoles and piscivorus birds) were identified. However, it was concluded potential risk in was considered acceptable because the ditches are used as an integral component of the facility's wastewater treatment system. Also, due to the

function of these ditches, standing water is frequently drained and, thus, any emerging aquatic habitat is considered opportunistic.

An ecological potential pathway identified in the 1999 Risk Assessment included receptors exposed to contaminated groundwater during irrigation activities. The risk assessment indicated that only small mammals and bird species are present in this area. The risk assessment indicated that during hot summer months when irrigation is frequent, wildlife species are likely dormant during the heat of the day and seek refuge in wooded areas. Thus, exposure to contaminated groundwater during irrigation events is not anticipated to be significant for potential ecological receptors.

## 5. INSTALLED ON-SITE INTERIM MEASURES

No interim measures are installed on or off-site.

## 6. SUMMARY OF ALTERNATIVES CONSIDERED IN FEASIBILITY STUDY

The specific alternatives considered under the Feasibility Study were as outlined in **Table 3A, 3B, 3C, 3D, 3E & 3E** below:

| **Table 3A: Remedial Alternatives Considered for On-Site Soils** | |
|---|---|
| Exposure Control | Engineering and institutional controls<br>Including demolishing and capping, geotextile membrane; deed notices, ordinances, restrictive covenants |
| In Situ Physical Treatment | Stabilization thru soil mixing<br>▪ Area-wide approach→ entire process area<br>▪ Focused approach→target specific areas |
| Excavation with Off-Site Disposal as Solid Waste | Soil Removal and waste classification<br>▪ Hazardous vs. Non-hazardous |
| Soil Vapor Extraction | Utilizing wells or trenches |
| No Further Action | No additional measures |
| Tyco-Site 3- No Further Action | No additional measures |

| **Table 3B: Remedial Alternatives Considered for Perched Zone Groundwater** | |
|---|---|
| Exposure Control | Institutional controls<br>Including deed notices, ordinances, restrictive covenants, passive venting systems, vapor barriers and VOC alarm/sensor systems |
| Monitored Natural Attenuation | Natural processes, without human intervention, involving physical, chemical, or biologic, and can include biodegradation, hydrolysis, dilution, sorption, and volatilization; annual/semi-annual routine monitoring |
| In Situ Physical/Chemical Treatment | Chemical oxidation<br>▪ Injecting a chemical oxidants i.e. hydrogen peroxide, sodium persulfate, or potassium permanganate via wells |

| | |
|---|---|
| In Situ Enhanced Biodegradation | Multiple carbohydrate injections to stimulate methanogenic microbes |
| Hydraulic Control | Pumping groundwater via wells or french drain type trenches utilizing sumps |
| Permeable Reactive Barriers | Utilizing a barrier constructed of a granular medium i.e. metallic iron that reacts geochemically with COCs. |
| No Further Action | No additional measures |

| **Table 3C: Remedial Alternatives Considered for Alluvial Aquifer Groundwater** | |
|---|---|
| Exposure Control | Deed notices, ordinances, restrictive covenants |
| Monitored Natural Attenuation | Natural processes, without human intervention, involving physical, chemical, or biologic, and can include biodegradation, hydrolysis, dilution, sorption, and volatilization |
| In Situ Biodegradation | Multiple carbohydrate injections to stimulate methanogenic microbes utilizing a treatability study |
| Hydraulic Control | Two fences of extraction wells oriented north and south to pump groundwater at a rate that exceeds natural flow. Treatment would be required prior to surface discharge |
| In Situ Physical/Chemical Treatment | Chemical oxidation<br>▪ Injecting chemical oxidants; i.e., hydrogen peroxide, sodium persulfate, or potassium permanganate via wells |
| No Further Action | No additional measures |

| **Table 3D: Remedial Alternatives Considered for Site Structures** | |
|---|---|
| Removal of Site Structures | Removal of buildings, process units, tank systems; i.e., demolished or deconstructed. Sealing of sumps, storm grates, drains, and piping permanently plugged. |

| **Table 3E: Remedial Alternatives Considered for Drum Vault** | |
|---|---|
| Removal and Off-site Disposal | Demolition, slab removal, dewatering and characterization for disposal, possible stabilization, residual cleaning, and backfilling |
| Waste Stabilization | Drums, drum contents, and backfill would be mixed/stabilized as one unit |
| No Further Action | No additional measures |

| **Table 3F: Remedial Alternatives Considered for Wastewater Treatment Ponds** | |
|---|---|
| Pond Closure | Free liquids, stabilize sediments/sludge, regarding and revegetating pond area. Ancillary structures decommissioned and removed |
| Continued Use | Remain operational, as is |
| No Further Action | No additional measures |

## 7. PROPOSED/RECOMMENDED REMEDIES

Ansul recommends that the following remedy alternative be selected by ADEQ for implementation at the Facility at Site 3:

- No Action

AMEC-Geomatrix recommends that the following suite of remedy alternatives be selected by ADEQ for implementation at the Facility:

- Recommended Soil Remedy Elements
  - Exposure Controls—this would consist of the combination of engineering controls, including the soil cover and soil/geotextile cover, and institutional controls. The institutional controls would apply to the entire Facility property;
  - Soil Vapor Extraction, Focused Approach—as an active source removal effort, SVE would be implemented at the two areas overlying the highest 1,2-DCA concentrations in underlying groundwater; and
  - In Situ Soil Stabilization—Focused Approach—as a second active source removal effort, ISS would be implemented across the area of the Former Dinoseb Disposal Ponds, to stabilize soils with elevated Dinoseb, 1,2-DCA, and other compounds.
- Recommended Perched Zone Groundwater Remedy
  - Exposure Controls—this would consist of institutional controls to mitigate the risk of vapor intrusion exposures in limited areas of the property. This would likely include the inclusion of vapor monitoring or control systems in any building construction in those areas; and
  - Monitored Natural Attenuation—If the two active soil remedy elements are successful, the COC levels in the Perched Zone will gradually decline. If this decline is not observed, however, it may be necessary to expand the scope of active remediation in the soils and Perched Zone groundwater.
- Recommended Alluvial Aquifer Groundwater Remedy
  - Exposure Controls—this would consist of institutional controls to preclude the use of Alluvial Aquifer groundwater for drinking water supply within the boundaries of the 1,2-DCA plume, including both on-site and off-site areas; and
  - Monitored Natural Attenuation—some decline in COC levels has been observed over the time since Facility operations terminated in 2002, with active soil remedy elements described above, this trend is expected to continue.

- Recommendations for Removal of Site Structures
    - With the exception of the Office buildings and the large Warehouse building (requested by ADEQ to remain in place for potential future use), all aboveground portions of buildings, process units, tank systems, and related site structures at the Facility will be demolished or deconstructed (see **Figure 4**). Unless their removal is required to implement a selected remedy element (for example, excavation, or stabilization), slab foundations or similar at-grade and below-grade portions of these structures could remain in place to be incorporated into the soil cover system. In this event, the foundations and related structures should be inspected prior to their reuse. If any of these foundations or similar structures contain sumps, major failures, or other related breaches in their integrity, these will be permanently sealed as a part of the demolition/deconstruction process. In addition, storm grates, drains, and piping running beneath the demolition and soil cover area will be permanently plugged. To the extent practicable, any portion of the structures that can be readily recycled will be salvaged.

- Recommended Remedy for Drum Vault
    - The Drum Vault is located in the central area of the Facility. Based on the FI evaluation, the Drum Vault contains both crushed drums and intact drums in poor condition, and approximately 4-6 feet of water-saturated sandy backfill. Although the contents of the drums were not identified, waste materials were visibly present in the drums. Analysis of the backfill and vault water identified several COCs at concentrations that exceeded a regulatory level.

      Based on the presence of water contained in the Drum Vault at an elevation above the normal water table, the structure currently provides some degree of containment, limiting the release of COCs from within the Drum Vault. When the containment currently provided by the Drum Vault ultimately fails, however, it could result in a new release of COCs to the environment. This would reduce the effectiveness of on-going remedy efforts, and possibly result in an unacceptable exposure scenario. Given this, the recommended remedy for the Drum Vault is the removal of its contents for off-site disposal.

      This remedy would consist of:

      1. Demolition and removal of the above-grade portion of the overlying warehouse building;

      2. Removal of the concrete slab (i.e., the warehouse floor slab) that covers the Drum Vault;

      3. Dewatering of the Drum Vault backfill. All water will be stored and characterized for appropriate disposal. If its quality

permits, it may be placed into the POTW inlet at the Facility, subject to the concurrence of the POTW operator;

4. Transferring the drums or drum portions and backfill in bulk from the Drum Vault to lined transport trucks. Based on observed condition of the drums, individual drum removal is not anticipated to be feasible or necessary. If the Drum Vault contents are determined to be non-hazardous waste, they may be stabilized with flyash, Portand cement, or similar materials prior to removal;

5. Cleaning any residual drum, waste, or backfill material from the Drum Vault; and

6. Backfilling the Drum Vault with clean, low permeability fill.

The removal of the Drum Vault is considered a final remedy with good long term effectiveness, and is protective of human health and the environment.

- Recommended Remedy for Wastewater Treatment Ponds
  - The recommended remedy for the WWTP is removal of the free liquids, removal or stabilization of the sediments/sludge, regrading of the pond area to shed storm water to appropriate drainage ditches, and revegetating the regraded surface. All ancillary structures, piping, and equipment will be decommissioned and removed, unless needed for future storm water management, treated groundwater discharge, or other use.

    The decision on removal for off-site treatment and/or disposal vs. in place stabilization of the sediments/sludge will be made as a part of the Remedial Design process (Section 10.0 in the FS). This decision will be based on physical and chemical characterization of the pond sediments at the time of pond closure, as well as any bench or pilot scale testing needed to finalize design decisions. Contingent upon characterization of pond waters at the time of closure, and with the approval of the POTW operator, these waters may be placed into the inlet of the local POTW.

    The optimal timing for pond closure will depend upon the array of remedies selected for implementation at the Facility. Closure of these ponds should be performed at the conclusion of any actions taken to implement remedies, such as demolition/deconstruction, soil cover construction, and SVE system construction. While these activities are in progress, storm water from the Facility would continue to be managed in the WWTP.

## 8. EVALUATION OF THE PROPOSED REMEDY AND ALTERNATIVES

Remedial alternatives were evaluated based on the following criteria:

- Protectiveness of Human Health and the Environment
- Short-term effectiveness
- Long-term effectiveness
- Implementability
- Cost

**Tables 4A – 4F** below show the evaluation of the above selection criteria for each remedial alternative considered. Also included in these tables are modified alternatives added by ADEQ, which are summarized below and discussed further in **Section 10:**

- Soil Remedy Alternative S2c: In Situ Stabilization, Focused Approach, ADEQ RADD follows the same guidelines as Soil Remedy Alternative S2b: In Situ Stabilization, Focused Approach, FS Figure 8B found in the FS, but expands the remediation area to include significant dinoseb contamination that lies outside of the boundaries proposed in Figure 8B of the FS (see **Figure 5**).
- Soil Remedy Alternative S4c: Soil Vapor Extraction, Focused Approach, ADEQ RADD follows the same guidelines as Soil Remedy Alternative S4b: Soil Vapor Extraction, Focused Approach, FS Figure 10B, but does not include the area encompassing Units 2, 3, and 4 that will be addressed with soil stabilization (see **Figure 6**).
- Perched Zone Groundwater Remedy Alternative P8: Contaminant Mass Removal is a pilot study to test a contaminant mass removal technology for the perched zone groundwater hot spots.

## Table 4A

### Evaluation of Soil Remedy Alternatives

### SWMU-59, SWMU-60, SWMU-69, SWMU-70, SWMU-71, SWMU-72, SWMU-73, AOC-1

| Soil Remedy Alternatives | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Soil Remedy Alternative S1: Exposure Control | Excellent | Excellent | Excellent | Moderate | $3,009,573 | $5,000 | $15,000 |
| Soil Remedy Alternative S2a: In Situ Stabilization, Area-Wide Approach | Good | Good | Good | Difficult | $8,725,091 | | |
| Soil Remedy Alternative S2b: In Situ Stabilization, Focused Approach, Feasibility Study | Fair | Good | Good | Moderate | $2,144,255 | | |
| Soil Remedy Alternative S2c: In Situ Stabilization, Focused Approach, ADEQ RADD | Good | Good | Good | Moderate | $3,343,491 | | |
| Soil Remedy Alternative S3a: Excavation with Off-Site Disposal as Solid Waste, Area-Wide Approach | Excellent | Excellent | Excellent | Difficult | $50,034,669 | | |
| Soil Remedy Alternative S3b: Excavation with Off-Site Disposal as Solid Waste, Focused Approach | Fair | Excellent | Excellent | Difficult | $11,891,182 | | |
| Soil Remedy Alternative S4a: Soil Vapor Extraction, Area-Wide Approach | Good | Good | Good | Difficult | $6,150,694 | $1,412,553 | $950,789 |
| Soil Remedy Alternative S4b: Soil Vapor Extraction, Focused Approach, Feasibility Study | Good | Good | Good | Moderate | $1,431,684 | $516,715 | $374,499 |
| Soil Remedy Alternative S4c: Soil Vapor Extraction, Focused Approach, ADEQ RADD | Good | Good | Good | Moderate | $852,920 | $324,430 | $232,444 |
| Soil Remedy Alternative S5: No Further Action | Unacceptable | NA | NA | NA | NA | | |
| Tyco Soil Remedy Alternative 1: No Further Action (Site 3- SWMU's 59 & 60) | Unacceptable | NA | NA | NA | NA | | |

## Table 4B

### Evaluation of Perched Zone Remedy Alternatives

### SWMU-69, SWMU-70, SWMU-71, SWMU-72, SWMU-73

| Perched Zone Remedy Alternatives | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Perched Zone Groundwater Remedy Alternative P1: Exposure Control | Good | Good | Good | Easy | $25,000 | | $5,000 |
| Perched Zone Groundwater Remedy Alternative P2: Monitored Natural Attenuation | Fair | Poor | Fair | Easy | | $159,509 | $168,064 |
| Perched Zone Groundwater Remedy Alternative P3: In Situ Chemical Oxidation | Poor | Fair | Poor | Difficult | $3,673,685 | $3,277,173 | $1,559,330 |
| Perched Zone Groundwater Remedy Alternative P4: In Situ Enhanced Biodegradation | Good | Good | Good | Difficult | $3,214,656 | $1,777,030 | $1,651,333 |
| Perched Zone Groundwater Remedy Alternative P5: Hydraulic Control | Poor | Poor | Poor | Difficult | $1,633,432 | $166,150 | $366,799 |
| Perched Zone Groundwater Remedy Alternative P6: Permeable Reactive Barriers | Poor | Poor | Poor | Difficult | $1,167,568 | $73,952 | $209,297 |
| Perched Zone Groundwater Remedy Alternative P7: No Further Action | Unacceptable | NA | NA | NA | NA | | |
| Perched Zone Groundwater Remedy Alternative P8: Contaminant Mass Reduction | Good | Good | Good | Unknown | Unknown | Unknown | Unknown |

## Table 4C

### Evaluation of Alluvial Aquifer Remedy Alternatives

### SWMU-69, SWMU-70, SWMU-71, SWMU-72, SWMU-73

| Alluvial Aquifer Remedy Alternatives | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Alluvial Aquifer Groundwater Remedy Alternative A1: Exposure Controls | Good | Fair | Good | Easy | $50,000 | | $5,000 |
| Alluvial Aquifer Groundwater Remedy Alternative A2: Monitored Natural Attenuation | Fair | Poor | Fair | Easy | $165,286 | $161,383 | $144,713 |
| Alluvial Aquifer Groundwater Remedy Alternative A3: In Situ Enhanced Biodegradation | Good | Good | Good | Moderate | $1,183,260 | $908,850 | $946,519 |
| Alluvial Aquifer Groundwater Remedy Alternative A4: Hydraulic Control | Fair | Fair | Good | Difficult | $8,048,186 | $810,201 | $1,136,388 |
| Alluvial Aquifer Groundwater Remedy Alternative A5: In Situ Chemical Oxidation | Fair | Fair | Poor | Difficult | $8,026,158 | $3,493,653 | $1,559,330 |
| Alluvial Aquifer Groundwater Remedy A6: No Further Action | Unacceptable | NA | NA | NA | NA | | |

## Table 4D

### Removal of Site Structures

| Removal of Site Structures | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Removal of Site Structures | | | | | $4,639,000 | | |

## Table 4E

### Evaluation of Drum Vault Remedy Alternatives

**SWMU-72**

| Drum Vault Remedy Alternatives | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Drum Vault Remedy Alternative D1: Drum Vault Removal | Excellent | Excellent | Excellent | Moderate | $743,000 | | |
| Drum Vault Remedy Alternative D2: No Further Action | Unacceptable | NA | NA | NA | NA | | |
| Drum Vault Remedy Alternative D3: Waste Stabilization | Good | Excellent | Good | Not Feasible | NA | | |

## Table 4F

### Evaluation of Waste Water Treatment Pond Remedy Alternatives

**SWMU-63, SWMU-64, SWMU-65, SWMU-66, SWMU-68**

| Waste Water Treatment Pond Remedy Alternatives | Protection of Human Health and the Environment | Short Term Effectiveness | Long Term Effectiveness | Implement-ability | Capital Cost | Annual Cost | Decom-missioning Costs |
|---|---|---|---|---|---|---|---|
| Waste Water Treatment Pond Remedy Alternative WWTP1: Pond Closure | Excellent | Excellent | Excellent | Moderate | $964,000 | | |
| Waste Water Treatment Pond Remedy Alternative WWTP2: No Further Action | Unacceptable | NA | NA | NA | NA | | |
| Waste Water Treatment Pond Remedy Alternative WWTP3: Continued Use | Unknown | NA | NA | NA | NA | | |

## 9. REMEDIAL ACTION LEVELS

Soils

Chemicals in soils ranging from surface to 17 feet bgs that exceed the appropriate health protective risk-based concentrations (note: for example, if the Facilities soils are paved over then only vapor intrusion RBC would apply) will be addressed in the selected remedy for that particular area of the Facility.

Table 5A: Remedial Action Levels for Chemicals of Concern in Soils

| Chemicals of Concern in Soil | [a] Direct Contact Risk-Based Concentration (mg/kg) | [a] Vapor Intrusion Risk-Based Concentration (mg/kg) |
|---|---|---|
| Aldrin | 1.01 | [b]>solubility limit (87.4) |
| Arsenic | 16 | NA |
| Chlordane | 64.7 | NA |
| Dichloroethane, 1,2 | 22 | 0.354 |
| Dieldrin | 1.08 | [b]> solubility limit (9.16) |
| Dinoseb | 238 | NA |
| Hexachlorocyclohexane, beta | 9.58 | NA |
| Hexachlorocyclohexane, gamma | 21 | 6.6 |
| Propanil | 4765 | NA |
| Toxaphene | 15.7 | NA |

a - RBC is based on 1E-05 for carcinogens
b – calculated risk-based concentration exceeds water solubility limit; water solubility in parenthesis
NA- Not Applicable

Chemicals in soils that exceed groundwater protection screening levels will be addressed in the selected remedy for that particular area of the Facility. (The note above applies here too)

Table 5B: Remedial Action Levels for Chemicals of Concern in Soils

| Chemicals in Subsurface Soil | [a] Soil to Groundwater Protection Concentration (mg/kg) |
|---|---|
| Acetone | 16 |
| Aldrin | 0.4 |
| Arsenic | 20 |
| Benzene | 0.04 |
| Carbon tetrachloride | 0.06 |
| Chlordane | 10 |
| Chloroform | 0.6 |
| Chromium | 40 |
| Dichlorobenzene, 1,4 | 2 |
| Dichloroethane, 1,2 | 0.02 |
| Dieldrin | 0.004 |
| Dinitrophenol, 2,4 | 0.2 |
| Endrin | 0.2 |
| Ethylbenzene | 14 |
| Hexachlorocyclohexane, alpha | 0.0006 |
| Hexachlorocyclohexane, beta | 0.002 |
| Hexachlorocyclohexane, gamma | 0.01 |
| Isophorone | 0.6 |
| Methoxychlor | 160 |

Table 5B: Remedial Action Levels for Chemicals of Concern in Soils Cont.

| | |
|---|---|
| Methylene chloride | 0.02 |
| Selenium | 6 |
| Silver | 40 |
| Toluene | 12 |
| Trichlorobenzene, 1,2,4 | 6 |

a – Concentrations are based on dilution attenuation factor of 20 (DAF 20), developed for the protection of groundwater

On-Site Perched Groundwater

Chemicals in on-site perched groundwater that exceed appropriate health protective risk-based concentrations will be addressed in the selected remedy for that particular area of the Facility. The maximum contaminant level is the applicable remedial action level for those chemicals which a maximum contaminant level exists. For those chemicals without a maximum contaminant level, the industrial tap water risk-based concentration or the vapor intrusion risk-based concentration (for volatile organic compounds) will be applicable for on-site perched groundwater, according to the selected remedy. However, if any of these chemicals are detected in off-site groundwater, the residential risk-based concentration would apply. (note: if the Facility is completely paved, and institutional controls are in place, then the vapor intrusion RBC would apply if an MCL is not available)

Table 5C: Remedial Action Levels for Chemicals of Concern in On-Site Perched Groundwater

| Chemicals of Concern in On-Site Perched Groundwater | Maximum Contaminant Level (ug/L) | [a] Residential Tap Water Risk-Based Concentration (ug/L) | [a] Industrial Tap Water Risk-Based Concentration (ug/L) | [a] Vapor Intrusion Risk-Based Concentration (ug/L) |
|---|---|---|---|---|
| Acetaldehyde | na | 22 | 111 | NA |
| Acetone | na | 22,000 | 68,600 | [b]>solubility limit |
| Acetonitrile | na | 130 | 526 | NA |
| Aldrin | na | 0.004 | 0.168 | [b]>solubility limit |
| Aluminum | na | 37,000 | 102,000 | NA |
| Aniline | na | 120 | 502 | NA |
| Arsenic | 10 | NA | NA | NA |
| Beryllium | 4 | NA | NA | NA |
| bis(2-Ethylhexyl) phthalate | 6 | NA | NA | NA |
| Butanone, 2- (MEK) | na | 7,100 | 25,600 | 179,200,000 |
| Cadmium | 5 | NA | NA | NA |
| Chloroaniline, 4 | na | 3.4 | 14.3 | NA |
| Chlorobenzene | 100 | NA | NA | [b]>solubility limit |
| Chloroform | na | 1.9 | 9.56 | 8,940 |
| Chromium | 100 | NA | NA | NA |
| Dichlorobenzene, 1,2 | 600 | NA | NA | [b]>solubility limit |
| Dichloroethane, 1,2 | 5 | NA | NA | 14,840 |
| Dieldrin | na | 0.042 | 0.179 | [b]>solubility limit |
| Dinitrophenol, 2,4 | na | 73 | 204 | NA |
| Dinoseb | 7 | NA | NA | NA |
| Ethylbenzene | 700 | NA | NA | 72,000 |
| Heptachlor | 0.1 | NA | NA | NA |
| Heptachlor epoxide | 0.2 | NA | NA | NA |
| Hexachlorocyclohexane, alpha | na | 0.1 | 0.454 | NA |
| Hexachlorocyclohexane, beta | na | 0.37 | 1.59 | NA |
| Hexachlorocyclohexane, gamma | 0.2 | NA | NA | [b]>solubility limit |
| Iron | na | 26,000 | 71,500 | NA |
| Isophorone | na | 710 | 3,010 | NA |
| Lead | 15 | NA | NA | NA |
| Manganese | na | 880 | 2,450 | NA |
| Methoxychlor | 40 | NA | NA | [b]>solubility limit |
| 4-Methyl-2-pentanone (MIBK) | na | 2,000 | 6,240 | [b]>solubility limit |
| Methylene chloride | 5 | NA | NA | 534,000 |
| 3 & 4-Methylphenol | na | 180 | 180 | NA |
| Nickel | na | 730 | 2,040 | NA |
| Nitrophenol, 4 | na | 290 | 290 | NA |
| Propanil | na | 180 | 511 | NA |
| Selenium | 50 | NA | NA | NA |
| Thallium | 2 | NA | NA | NA |
| Toluene | 1,000 | NA | NA | [b]>solubility limit |
| Trimethylbenzene, 1,3,5 | na | 12 | 1,020 | NA |
| Vanadium | na | 180 | 515 | NA |
| Xylene, m- & p | na | 1,400 | 4,720 | [b]>solubility limit |

a - RBCs are based on 1E-05 for carcinogens
b - calculated risk-based concentration exceeds water solubility limit
NA – Not Applicable
na – not available

On-Site Alluvial Groundwater

Chemicals in on-site alluvial groundwater that exceed appropriate health protective risk-based concentrations will be addressed in the selected remedy for that particular area of the Facility. The maximum contaminant level is the applicable remedial action level for those chemicals which a maximum contaminant level exists. For those chemicals without a maximum contaminant level, the industrial tap water risk-based concentration will be applicable for on-site alluvial groundwater, according to the selected remedy. However, if any of these chemicals are detected in off-site groundwater, the MCL would apply if available. If not, then the residential risk-based concentration would apply.

Table 5D: Remedial Action Levels for Chemicals of Concern in On-Site Alluvial Groundwater

| Chemicals of Concern in On-Site Alluvial Groundwater | Maximum Contaminant Level (ug/L) | [a] Residential Tap Water Risk-Based Concentration (ug/L) | [a] Industrial Tap Water Risk-Based Concentration (ug/L) |
|---|---|---|---|
| Aldrin | na | 0.004 | 0.168 |
| Aniline | na | 120 | 502 |
| Arsenic | 10 | NA | NA |
| Benzene | 5 | NA | NA |
| bis(2-Chloroethyl) ether | na | 0.12 | 0.578 |
| Chloroaniline, 4 | na | 3.4 | 14.3 |
| Chlorobenzene | 100 | NA | NA |
| Dichlorobenzene, 1,2 | 600 | NA | NA |
| Dichloroethane, 1,2 | 5 | NA | NA |
| Dinoseb | 7 | NA | NA |
| Hexachlorocyclohexane, beta | na | 0.37 | 1.59 |
| Vinyl Chloride | 2 | NA | NA |

a - RBCs are based on 1E-05 for carcinogens
NA – Not Applicable
na – not available

Off-Site Alluvial Groundwater

Chemicals in off-site alluvial groundwater that exceed appropriate health protective risk-based concentrations will be addressed in the selected remedy for that particular area of the Facility. The maximum contaminant level is the applicable remedial action level for those chemicals which a maximum contaminant level exists. For those chemicals without a maximum contaminant level, the residential tap water risk-based concentration will be applicable for off-site alluvial groundwater, according to the selected remedy.

Table 5E: Remedial Action Levels for Chemicals of Concern in Off-Site Alluvial Groundwater

| Chemicals of Concern in Off-Site Alluvial Groundwater | Maximum Contaminant Level (ug/L) | [a] Residential Tap Water Risk-Based Concentration (ug/L) | [a] Industrial Tap Water Risk-Based Concentration (ug/L) |
|---|---|---|---|
| bis(2-Chloroethyl) ether | na | 0.12 | 0.578 |
| bis(2-Ethylhexyl) phthalate | 6 | NA | NA |
| Chromium | 100 | NA | NA |
| Dichloroethane, 1,2 | 5 | NA | NA |

a - RBCs are based 1E-05 for carcinogens
NA – Not Applicable
na – not available

## 10. SELECTION OF REMEDY AND JUSTIFICATION

After evaluating the alternatives based on the criteria found in Tables 4A thru 4F, the following remedies were selected:

Soil Remedy Alternative S1: Exposure Control

As seen in **Figure 7**, exposure controls will effectively encapsulate soil within the process area, which will prevent current and future direct exposure pathways from becoming complete. It would therefore be effective over both the short and long term, providing excellent protection of human health and the environment. This remedy will be used in concert with Soil Remedy Alternative S2c and Soil Remedy Alternative S4c, discussed below, to address the cross-media soil-to-groundwater pathway. This remedial alternative addresses AOC 1 (the yellow stained areas found in surface soil), SWMU-59 (the storm water runoff associated with the Stormwater Drainage System), SWMU-60 (the stormwater sump), Site 3 (from the Tyco FS Report) and the soil contamination associated with SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Soil Remedy Alternative S2c: In-Situ Stabilization, Focused Approach, ADEQ RADD

This alternative follows the same guidelines as alternative Soil Remedy Alternative S2b, In Situ Stabilization, Focused Approach, FS Figure 8B, but expands the remediation area to include significant dinoseb contamination that lies outside of the boundaries of Alternative S2b (see **Figure 5** for comparison of these areas). This alternative will address some of the highest concentrations of dinoseb found on-site and will incorporate SWMU-73 into the remedy, in addition to the areas included by Alternative S2b. Therefore, this alternative is more protective of human health and the environment and has good short-term and long-term effectiveness while costing significantly less than the excavation alternatives. This remedial alternative addresses the soil contamination associated with SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73. A cost estimate for this alternative is found in **Appendix B**.

Soil Remedy Alternative S4c: Soil Vapor Extraction, Focused Approach, ADEQ RADD

This alternative follows the same guidelines as Soil Remedy Alternative S4b: Soil Vapor Extraction, Focused Approach, FS Figure 10B, but does not include the area encompassing Units 2, 3 and 4 that will be addressed with soil stabilization (see **Figure 6** for comparison of these areas). SVE will permanently remove VOCs from soil as opposed to stabilization, which may release contaminants as the stabilized soil begins to break down over time. This alternative provides good short-term and long-term effectiveness along with providing good protection of human health and the environment. Finally, this alternative costs significantly less than the excavation alternatives. This remedial alternative addresses the soil contamination associated with SWMU-69, SWMU-70, SWMU-71, and SWMU-73. A cost estimate for this alternative is found in **Appendix B**.

Perched Zone Groundwater Alternative P1: Exposure Control

This alternative was selected because, in combination with the other alternatives selected, it provides protection from human exposures to contaminated perched zone groundwater while the other remedies are implemented and begin to take effect. This alternative will have good short-term and long-term effectiveness at a very low cost. This alternative is not

sufficient, by itself, to prevent future expansion of contaminated areas. This remedial alternative addresses the perched zone groundwater contamination associated with AOC-1, SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Perched Zone Groundwater Alternative P2: Monitored Natural Attenuation

This alternative was only selected to assist with the evaluation of the effectiveness of other selected remedies in the perched zone groundwater and in the soils overlying the perched zone. Given the extremely high concentrations in some areas of the perched zone groundwater, it is not reasonable to expect either short-term or long-term effectiveness for this alternative. After other alternatives are completed, monitored natural attenuation can be continued at a moderate cost until continued protection of human health and the environment has been documented. This remedial alternative addresses the perched zone groundwater contamination associated with AOC-1, SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Perched Zone Groundwater Alternative P8: Contaminant Mass Reduction

The Feasibility Study repeatedly indicated that the mass of contaminants left untreated in the soil and/or perched zone groundwater would continue to be a source of contamination in the alluvial aquifer. The data indicates that a large percentage of this mass is concentrated in a few relatively small hot spots. Therefore, it is the conclusion of this evaluation that a pilot study of a remedial alternative which has proven to be successful in reducing the contaminant mass in perched zone groundwater at similar Facilities should be conducted in one or more of those hot spots. A groundwater monitoring sampling program and frequency schedule for implementation of the pilot study should be submitted. If this pilot study is proven effective, the remedy should be applied Facility wide. If this pilot study is deemed inadequate, another pilot study using an alternate technology should be proposed and implemented.

Alluvial Aquifer Groundwater Alternative A1: Exposure Control

This alternative was selected because, in combination with the other alternatives selected, it provides protection from human exposures to contaminated groundwater in the alluvial aquifer while the other remedies are implemented and begin to take effect. This alternative will have good long-term effectiveness at a reasonable cost. This alternative is not sufficient, by itself, to prevent future expansion of contaminated areas. This remedial alternative addresses the alluvial aquifer groundwater contamination associated with AOC-1, SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Alluvial Aquifer Groundwater Alternative A2: Monitored Natural Attenuation

This alternative was only selected to assist with the evaluation of the effectiveness of other selected remedies in the alluvial aquifer and in the perched zone groundwater and the soils overlying the aquifer. Given the high concentrations already present in some areas of the alluvial aquifer and the fact that some concentrations have already been detected in off-site wells, it is not possible for this alternative to be effective in the short-term. After other alternatives are completed, monitored natural attenuation can be continued at a moderate cost until continued protection of human health and the environment has been documented. This remedial alternative addresses the alluvial aquifer groundwater contamination associated with AOC-1, SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Alluvial Aquifer Groundwater Alternative A3: In-Situ Enhanced Biodegradation

This alternative was selected to actively address the contaminants present in the alluvial aquifer because it has been shown to be a cost-effective treatment and because the effects of this treatment have been shown to continue down gradient of the treatment area. This alternative will have good short-term and long-term effectiveness at a reasonable cost. This alternative will, in time, prevent future expansion of contaminated areas. This remedial alternative addresses the alluvial aquifer groundwater contamination associated with AOC-1, SWMU-69, SWMU-70, SWMU-71, SWMU-72, and SWMU-73.

Removal of Site Structures:

This alternative will allow for the installation of other alternatives when an area outlined for remediation falls within an area where site structures are present.

Drum Vault Remedy Alternative D1 - Drum Vault Removal:

The removal of the Drum Vault is considered a final remedy with excellent short term and long term effectiveness, and is protective of human health and the environment. This remedial alternative addresses the source of all contamination associated with SWMU-72.

Waste Water Treatment Pond Remedy Alternative WWTP1 - Pond Closure:

Since Exposure Controls will be installed throughout the process area, movement of storm water run-off to temporary holding ponds will no longer be necessary. Therefore, closure of these ponds was selected. This alternative provides excellent short-term and long-term effectiveness and provides protection of human health and the environment. This remedy addresses SWMU's 63, 64, 65, & 68.

## 11. SCHEDULE OF IMPLEMENTATION

To help aide in the procession of remedial activities, the known PRPs are to submit to ADEQ a schedule within sixty (60) days of finalization of the ADEQ RADD regarding this facility. The schedule should give highest priority to implementation of the Drum Vault Removal (Remedial Alternative D1) and alluvial aquifer enhanced biodegradation (Remedial Alternative A3). Each remedy should be scheduled in a way to expedite the implementation of all remedies.

The known PRPs must submit a plan to annually evaluate monitoring data from the SVE and selected groundwater remedies. An evaluation of the overall effectiveness of contaminant removal in soils and groundwater and review of site risks must be conducted at 5-year intervals.

## 12. COMMUNITY PARTICIPATION

Public involvement is an important process for ultimately selecting the final remedies to be employed at the Facility for remediating releases to the environment of hazardous constituents. Since the RADD is an important decision document, the RADD is subject to public notice and comment to allow the public and interested parties to raise all

ascertainable issues concerning the remedies proposed at the facility, including options not potentially addressed.

The Notice of the RADD for Cedar Chemical was published in the *The Daily World* on February 24, 2010. Documents used in preparation of the RADD, along with the RADD, comprise the administrative record. The administrative record is available for review at the following locations:

Arkansas Department of Environmental Quality
Records Management Section
5301 Northshore Drive
North Little Rock, Arkansas, 72118

UAMS Area Health Education Centers Delta
1393 Highway 242 South
Helena-West Helena, AR 72342

Documents comprising the administrative record include:

1. Remedial Action Decision Document (RADD)
2. Public Notice/ Fact Sheet
3. EPA Region 6 Removal Action Report
4. ENSAFE Facility Investigation Report
5. ADEQ Comprehensive Site Assessment Report
6. AMEC-Geomatrix Feasibility Study Report dated December 2009
7. Well Assessment Report
8. ENSAFE Risk Assessment
9. Ansul Focused Feasibility Study Report- Site 3 dated June 2009
10. CAO LIS 07-027

The Department will make a final decision on the RADD after the public comment period. ADEQ will, in response to written requests, hold a public hearing whenever the ADEQ Director determines such a hearing might clarify issues concerning the RADD. Any request for a hearing must include the requestor's name and address and shall state the nature of the issues to be raised at the hearing. ADEQ will issue a public notice of a hearing at least thirty (30) days prior to the scheduled hearing.

Any individuals who wish to comment, request a public hearing or add their names to the mailing list concerning ADEQ decisions relating to the RADD, must do so by hand delivering or mailing written comments, along with their name and mailing address to:

Arkansas Department of Environmental Quality
Hazardous Waste Division
ATTN: Clyde E. Rhodes, Jr., Chief
5301 Northshore Drive
North Little Rock, AR. 72118-5317
Web site: http://www.adeq.state.ar.us

All comments must be received by 4:30 p.m. on March 25, 2010. Only comments regarding the RADD will be considered.

Submitting written comments to ADEQ or making oral statements on the record a public hearing on the RADD decision provides individuals with legal standing to appeal a final Department decision. Comments supporting or opposing the decision will provide legal standing. Only parties with legal standing may appeal the decision.

## 13. COORDINATION WITH OTHER DIVISIONS/AGENCIES

It is important to involve/inform other divisions of ADEQ and other divisions of ADEQ and other agencies in the development of a RADD, as applicable. To keep EPA informed of all corrective action work, EPA Region 6 was provided a copy of the Public Notice and RADD for review and comment. **Tables 6A** and **6B** below provide a list of which divisions and agencies consulted or informed regarding the development of the RADD.

**Table 6A:**
**Internal Coordination with ADEQ Divisions**

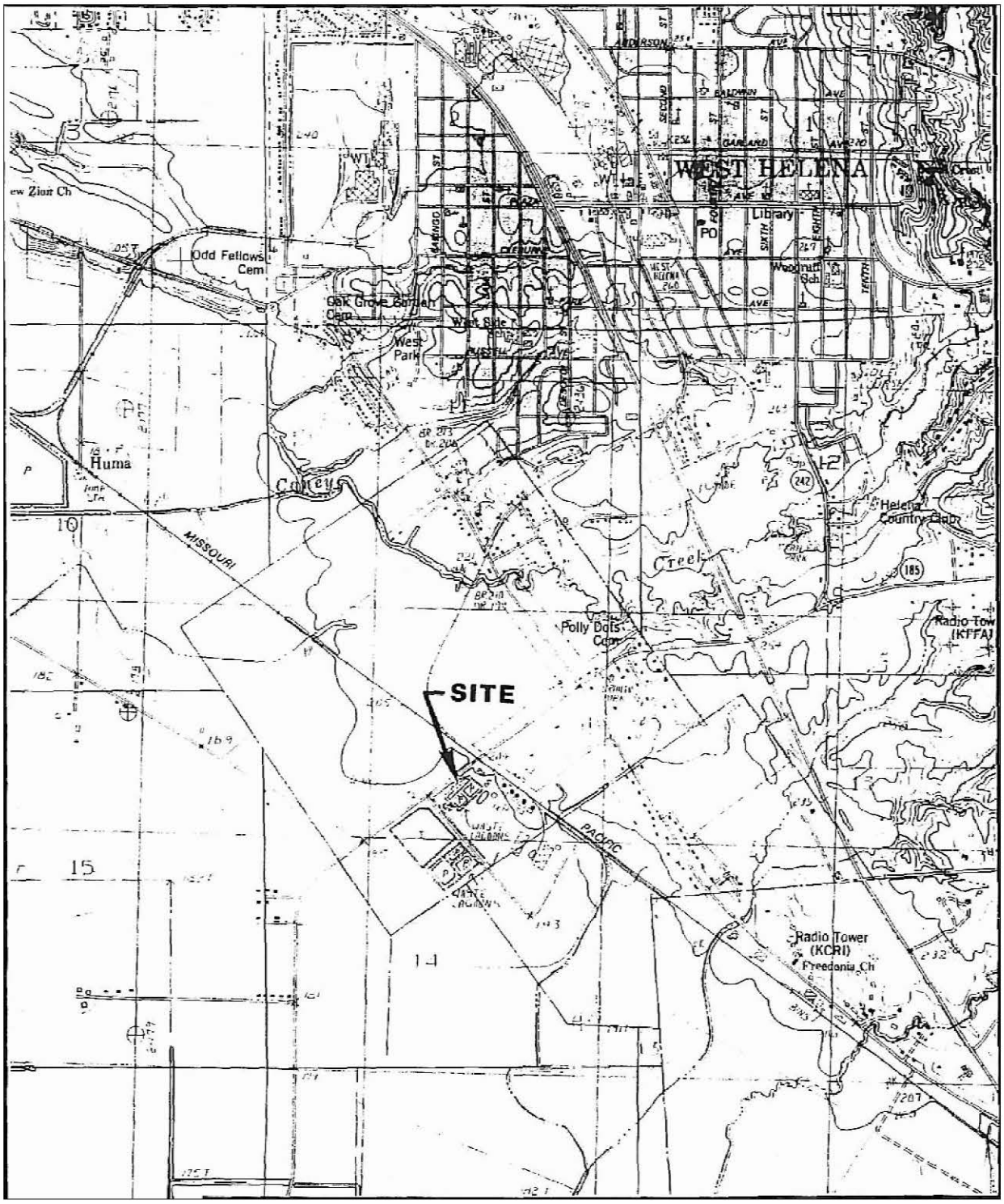
| ADEQ Divisions | Consulted or Informed | Sent Notice of Decision |
|---|---|---|
| Water | **Yes** | **No** |
| NPDES | **Yes** | **No** |
| Air | **No** | **No** |
| Solid Waste | **No** | **No** |
| Regulated Storage Tanks | **No** | **No** |
| Technical Services and Environmental Preservation | **No** | **No** |
| Mining | **No** | **No** |

**Table 6B:**
**External Coordination with Outside Agencies**

| Other State and Federal Organizations | Consulted or Informed | Sent Notice of Decision |
|---|---|---|
| EPA, Region 6 | **Yes** | **Yes** |
| Office of Emergency Services | **No** | **No** |
| AR. Dept. of Health & Human Services | **Yes** | **Yes** |
| AR. State Clearinghouse | **No** | **No** |
| AR. State Historic Preservation | **No** | **No** |
| AR. Natural Heritage Commission | **No** | **No** |
| AR. Game & Fish Commission | **No** | **No** |
| U.S. Army Corps of Engineers | **No** | **Yes** |
| AR. Soil and Water Conservation | **No** | **No** |
| AR. Geological Commission | **No** | **No** |

The RADD was sent to all applicable branches of the Hazardous Waste Division, and to all divisions and agencies listed above.

# Figures




SOURCE: EnSafe, Phase II Investigation Report, 1995

# SITE LOCATION MAP

Cedar Chemical
Helena-West Helena, Arkansas

**Figure 1**

I:\13636 - Arkansas Helena-West Helena\2007 CCR\FINAL FIGURES\ FIG 1 Site Location Map\FIG 1.dwg

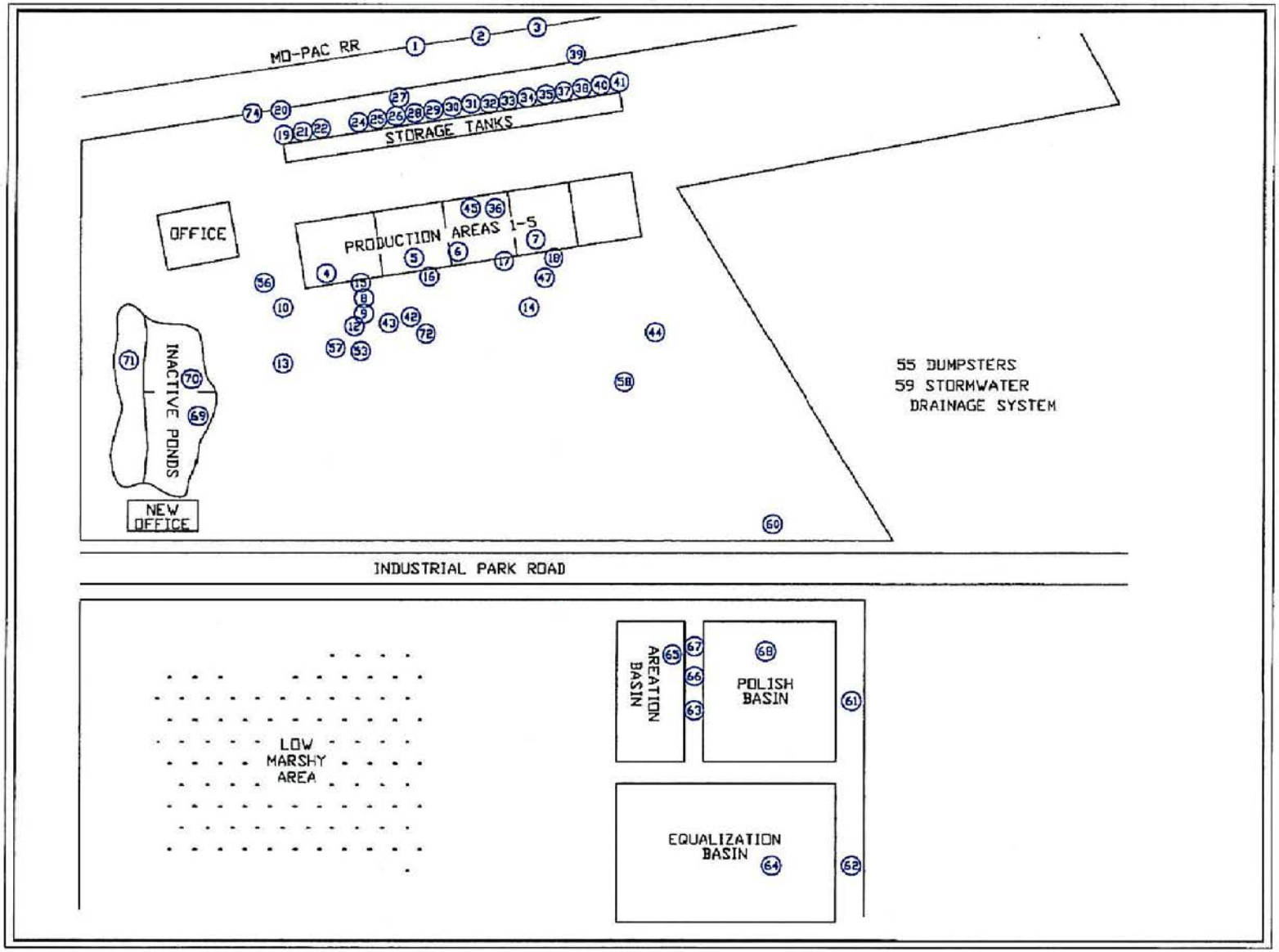
BASEMAP MODIFIED FROM:
Smith & Weiland/Cline-Fraizer Survey, August 2008

0 80
APPROXIMATE SCALE IN FEET

Facility Structure Locations

Cedar Chemical
Helena-West Helena, Arkansas

Figure 2



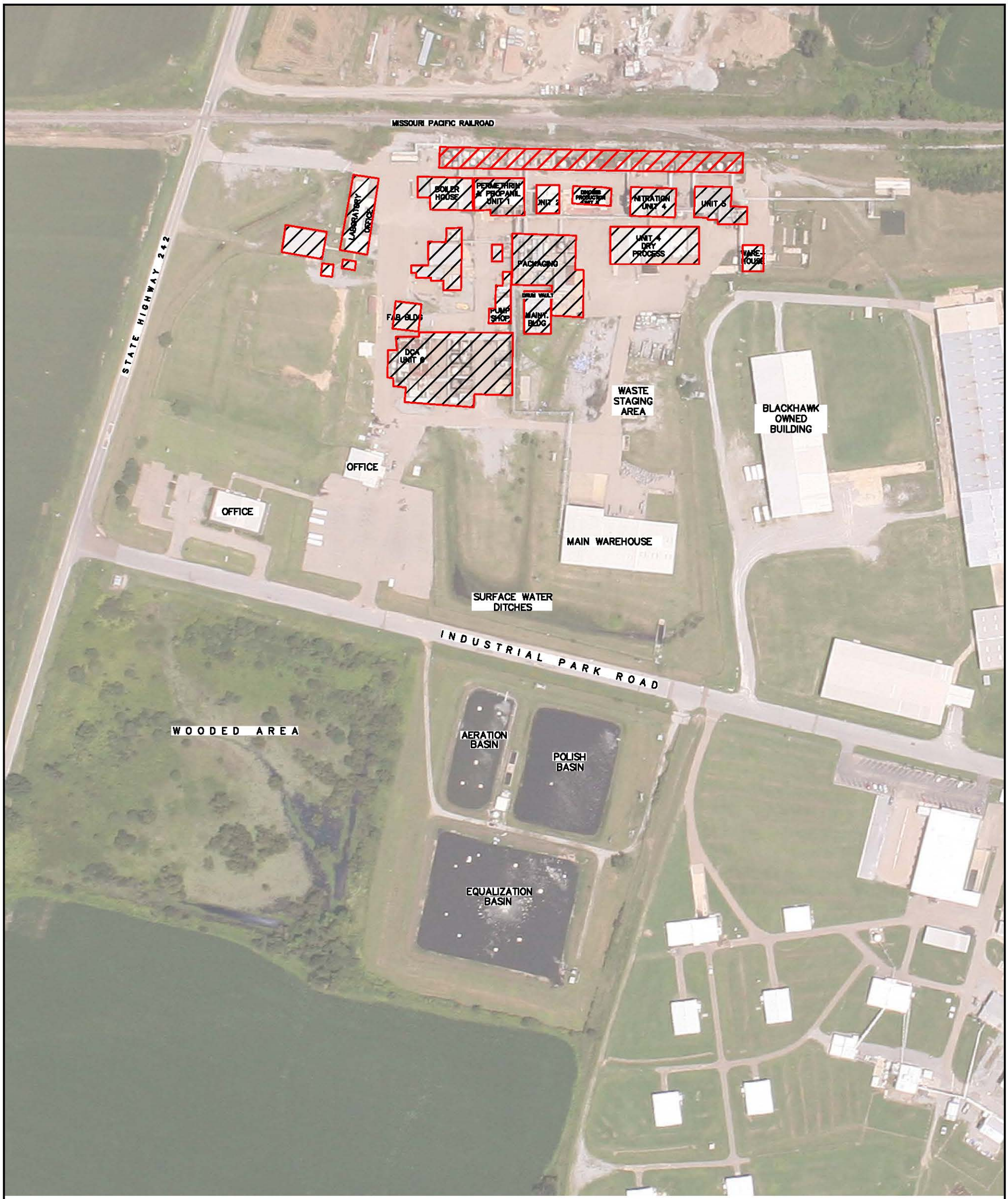

SOURCE: EnSafe 1993 FI Report

# SWMUs and AOCs IDENTIFIED IN USEPA REGION 6 PR/VSI

Cedar Chemical
Helena-West Helena, Arkansas

Geomatrix | Project 13636 | Figure 5

Figure 3




**EXPLANATION**

BUILDINGS AND OTHER STRUCTURES TO BE REMOVED

NOTE: Boundaries, well locations, and remedy elements subject to change based on Remedial Design or other factors.

0 200

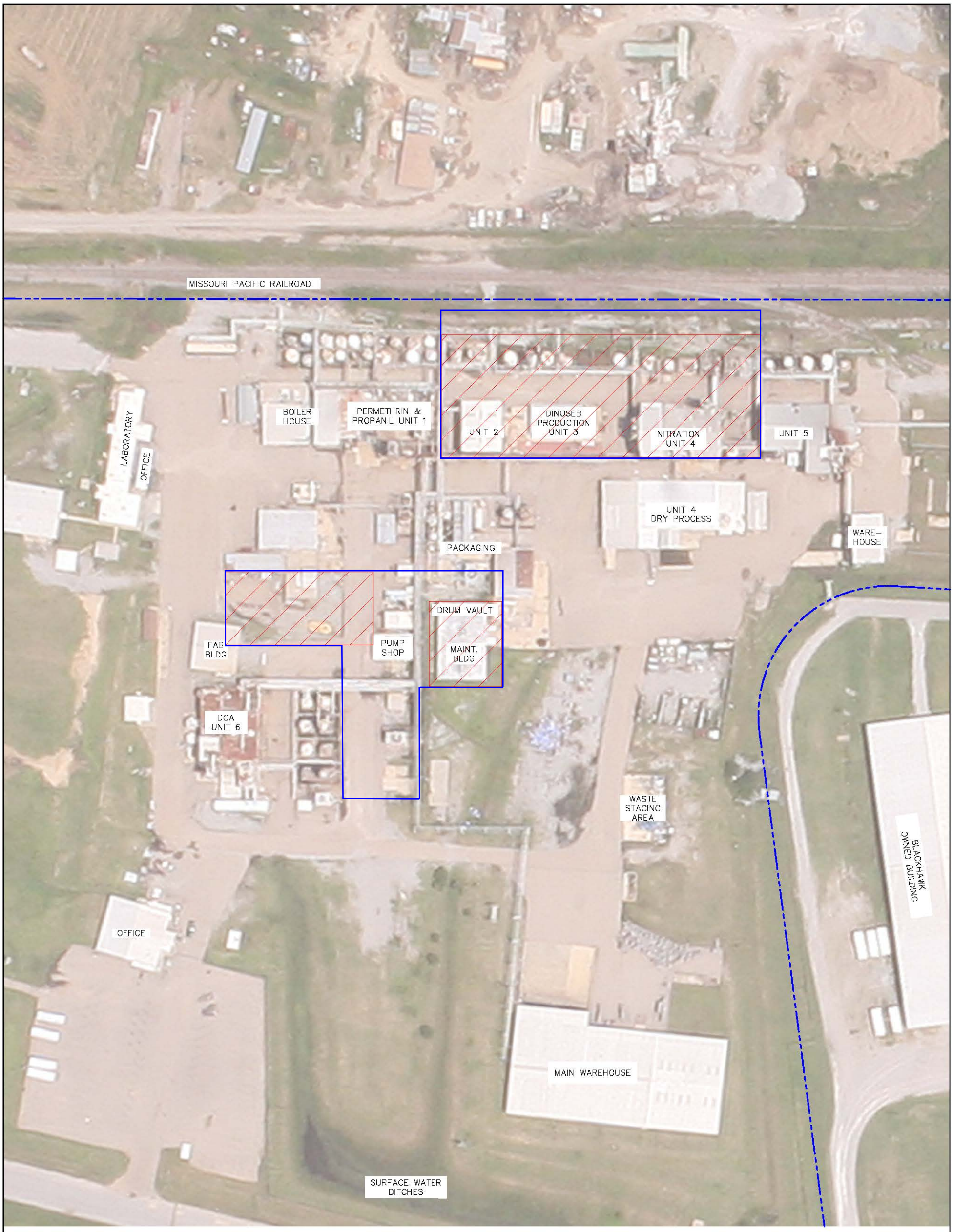
APPROXIMATE SCALE IN FEET

Demolition of On-Site Structures

Cedar Chemical
Helena-West Helena, Arkansas

Figure 4

Plot Date: 12/10/09 - 11:18am, Plotted by: mike.schofield
Drawing Path: I:\13636 - Arkansas Helena-West Helena\FIGURES\, Drawing Name: building_demo.dwg




**EXPLANATION**

Soil Remedy Alternative S2b Soil Stablization Area

Soil Remedy Alternative S2c Soil Stablization Area

Property Boundary

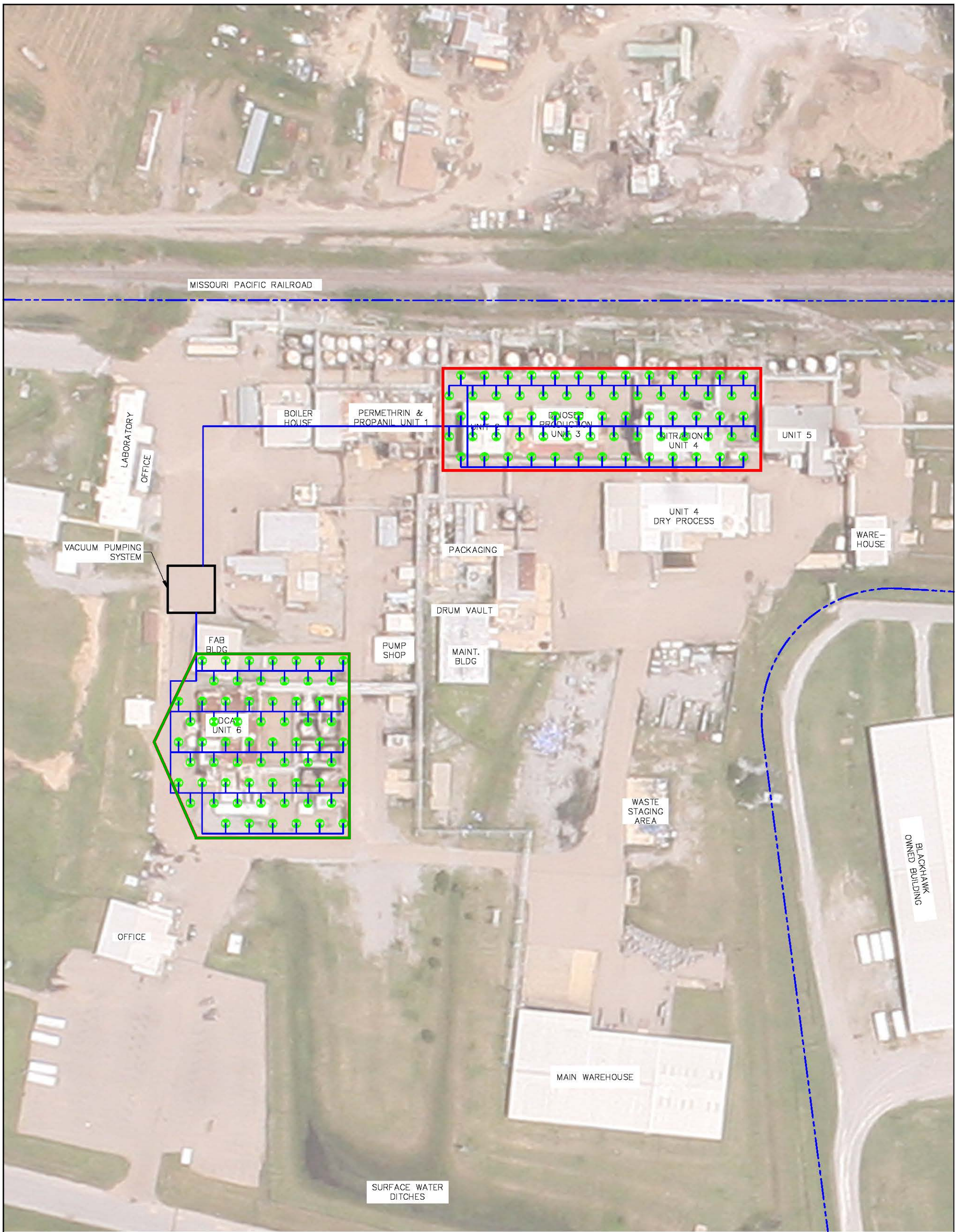
0 50 100
FEET

BASEMAP MODIFIED FROM:
Smith & Weiland/Cline-Fraizer Survey, August 2008

SOIL REMEDY ALTERNATIVES
S2b and S2c
Focused Approach
Cedar Chemical
Helena-West Helena, Arkansas

Figure 5

**NOTE: Boundaries, well locations, and remedy elements subject to change based on Remedial Design or other factors.**




## EXPLANATION

PROPERTY BOUNDARY

PIPING

SOIL VAPOR EXTRACTION WELL

Soil Remedy Alternative S4b - Soil Vapor Extraction Treatment Areas

Soil Remedy Alternative S4c - Soil Vapor Extraction Treatment Area

N

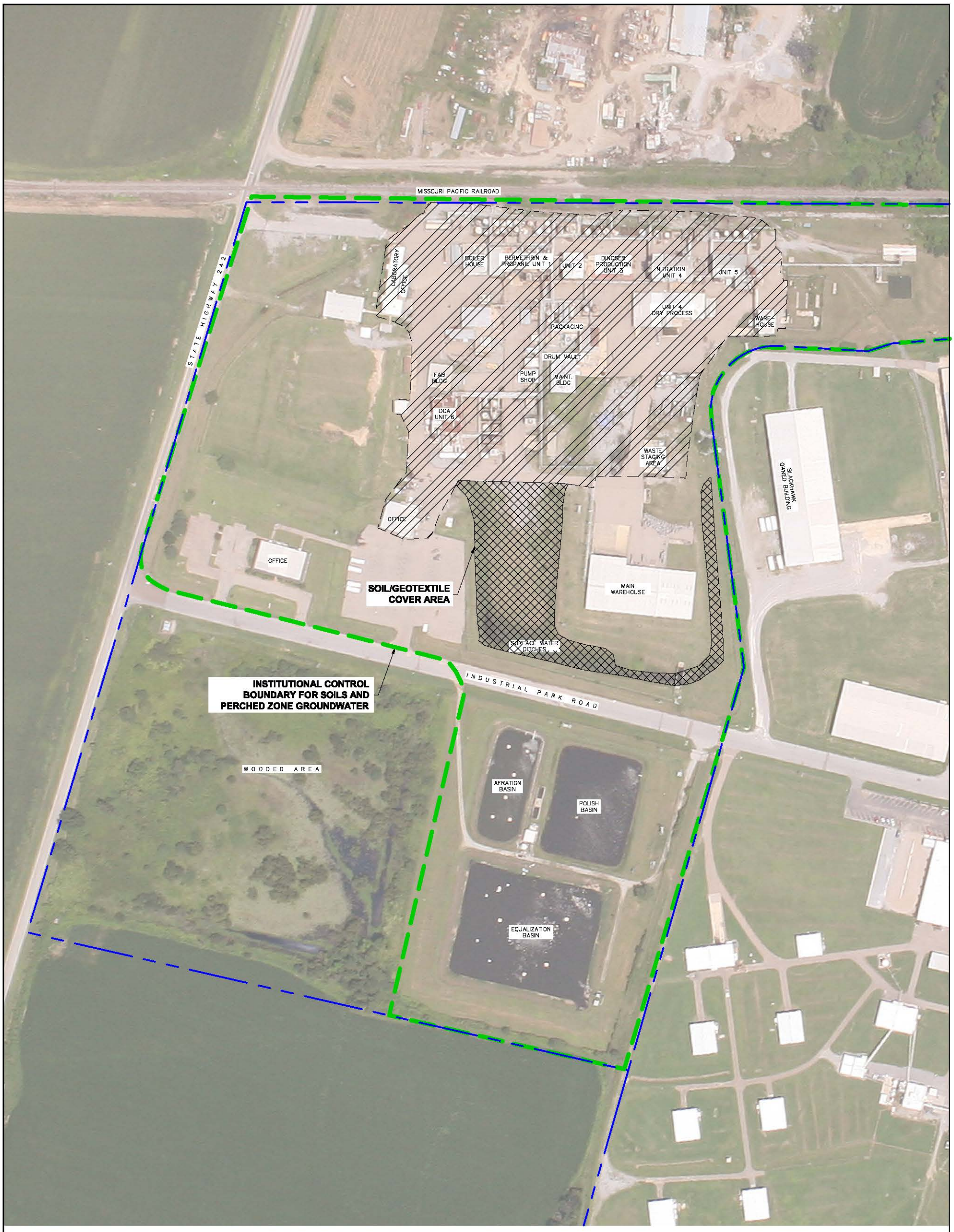
0 50 100
FEET

BASEMAP MODIFIED FROM:
Smith & Weiland/Cline-Fraizer Survey, August 2008

Soil Remedy Alternatives S4b & S4c
Soil Vapor Extraction
Focused Approach
Cedar Chemical
Helena-West Helena, Arkansas

Figure 6

**NOTE: Boundaries, well locations, and remedy elements subject to change based on Remedial Design or other factors.**




## EXPLANATION

- SOIL COVER
- SOIL / GEOTEXTILE COVER AREA
- WASTEWATER TREATMENT POND CLOSURE AREA
- INSTITUTIONAL CONTROL
- PROPERTY BOUNDARY

N

0 50 100
FEET

BASEMAP MODIFIED FROM:
Smith & Weiland/Cline-Fraizer Survey, August 2008

SOIL REMEDY ALTERNATIVE S1
Exposure Control
Cedar Chemical
Helena-West Helena, Arkansas

Figure 7

**NOTE: Boundaries, well locations, and remedy elements subject to change based on Remedial Design or other factors.**

# Appendix A

## Specific Chemicals and Their Manifest

## Appendix A Chemicals/Manifest Summary

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | Toxic solids, organic (potassium chloride, potassium fluoride) | 80 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ waste, flammable liquids, n.o.s. (ethanol, petroleum distillates) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ Waste, corrosive liquids, flammable, n.o.s. (acetic anhydride, hydrochloric acid) | 27 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, corrosive liquid, basic, organic, n.o.s. (sodium hydroxide, tetra butyl ammonium hydroxide) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, toxic liquids, organic, n.o.s. (chloroform, dichloroaniline) | 51 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ waste, toxic liquids, organic, n.o.s. (o-dichlorobenzene, phenol) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (acifluorfen, cyclanilide) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (acifluorfen, diuron) | 110 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ waste, toxic liquids, organic, n.o.s. (2,4-D, phenol)) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (propanil, tromethamine) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic solids, organic, n.o.s. (tromethamine) | 300 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, toxic liquids, organic, n.o.s. (acifluorfen, tromethamine) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | Waste, toxic liquids, organic, n.o.s. (potassium carbonate, urea) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Hydrazine, anhydrous | 2 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, hydrazine aqueous solutions | 5 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, mercury compounds, liquid, n.o.s (mercuric nitrate) | 6 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, cyanides, inorganic, n.o.s (potassium cyanide, sodium cyanide) | 5 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, acetic acid, glacial | 5 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, corrosive liquid, acidic, inorganic, n.o.s. (phosphoric acid, sulfuric acid (fuming)) | 60 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, corrosive liquid, acidic, organic, n.o.s. (carbon tetrachloride, dichloroaniline) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Methanesulfonyl choride | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Ethylene chlorohydrin | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Wastee, Dinmethyl sulfate | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Chloroacetyl chloride | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Trimethylacetyl chloride | 1 lb | IL 10660014 | Clean Harbors Environmental. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| | | | | | Services Inc. |
| 08/14/03 | Laboratories | Acetone cyanohydrin, stabilized | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Chloroacetyl chloride | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Ethylene chlorohydrin | 1 lb | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Trimethylacetyl chloride | 4 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Nitric acid, red fuming | 5 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, Polyamines, flammable, corrosive, n.o.s. | 20 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, corrosive liquids, flammable, n.o.s. | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable, liquid, toxic, corrosive, n.o.s. (diallyamine) | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Carbon disulfide | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Hydrogen peroxide | 2 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, nitric acid | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Sodium dithionite | 2 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, elf-heating solid, inorganic, n.o.s. (raney nickel) | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | Waste, water-reactive solid, self-heating, n.o.s (sodium borohydride, zinc powder) | 3 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, oxidizing liquid, toxic, n.o.s. (silver nitrate, sodium nitrite) | 56 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable solids, organic, n.o.s. (paraformaldehyde, sulfur) | 82 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Acetic anhydride | 10 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (diuron) | 545 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, toxic liquids, organic, n.o.s. (molinate, tillam) | 201 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, toxic liquids, organic, n.o.s. (carbaryl, chloroform) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (alachlor, propanil) | 158 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (acetochlor) | 192 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (glycerin) | 272 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. chloroacetophenone)126 lbs | 126 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (diuron) | 134 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (propanil) | 194 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, toxic liquids, organic, n.o.s. (butylate, tetrachloroethylene) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (chlorothalinil) | 245 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, corrosive, n.o.s. (formaldehyde 37%, isopropylamine) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic solids, organic, n.o.s (4-(2,4-dichlorophenoxy) butyric acid) | 40 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, toxic liquids, organic, n.o.s (2,6-dichlorobenzonitrie) | 184 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, n.o.s. (kerosene, xylene) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, corrosive liquid, basic, organic, n.o.s. (modified amines) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (celite) | 132 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic liquids, organic, n.o.s. (glycerol) | 145 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, n.o.s. (paint, petroleum distillates) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Toxic solids, organic, n.o.s. (sodium chloride) | 60 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, Paraformaldehyde | 40 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, n.o.s. (paint) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, n.o.s. (xylene, toluene) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | RQ, Waste, flammable liquids, n.o.s. (xylene, toluene) | 150 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Corrosive solids, n.o.s. (2,4-dichlorophenoxy butyric acid) | 100 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Potassium fluoride | 250 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Pesticides, liquid, toxic, n.o.s. (dichloroaniline) | 300 lbs | IL 10660014 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable liquids, n.o.s. | 106 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, corrosive liquid, acidic, organic, n.o.s. | 20 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, corrosive liquid, basic, organic, n.o.s. | 10 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable solids, organic, n.o.s. | 60 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable solids, corrosive, organic, n.o.s. | 20 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable liquids, n.o.s. | 80 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste oxidizing liquid, corrosive, n.o.s. | 5 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 08/14/03 | Laboratories | Waste Water-reactive liquid, n.o.s. | 1 lb | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste, flammable solids, organic, n.o.s. | 35 lbs | AR-1033810 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste Compressed gases, flammable, n.o.s. | 3 lbs | S00682444 | Clean Harbors Environmental. Services Inc. |
| 08/14/03 | Laboratories | Waste Ethylene oxide | 12 lbs | S00682444 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Flammable liquids, n.o.s. | 4400 lbs | 3096553 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Hazardous waste, liquid, n.o.s. (trichloroethylene) | 9600 lbs | 3096553 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Non D.O.T. regulated | 400 lbs | 3096553 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Flammable liquids, n.o.s. | 800 lbs | 3096553 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Hazardous waste liquids, n.o.s. | 3200 lbs | 3096553 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Pesticieds, solid, toxic, n.o.s. (propanil, diuron) | 4400 lbs | AR-1390047 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 10/03/03 | Processing unit piping product and warehouse drums | Non D.O.T. regulated material | 100 lbs | AR-1390047 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Dichloroanilines, solid | 2000 lbs | AR-1390047 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Pesticides, solid, toxic, n.o.s. | 4800 lbs | AR-1390047 | Clean Harbors Environmental. Services Inc. |
| 10/03/03 | Processing unit piping product and warehouse drums | Dichloroanilines, solid | 3200 lbs | AR-1390047 | Clean Harbors Environmental. Services Inc. |
| 10/05/03 | Processing unit piping product and warehouse drums | Pesticides, solid, toxic, n.o.s. (Propanil, Diuron) | 180 lbs | AR-1390060 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | RQ, Waste, mercury | 3 lbs | IL10711292 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | Waste, organic peroxide type S, solid | 1 lb | AR-969803 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | Waste, organic peroxide type C, solid, temperature controlled | 1 lb | S00440690 | Clean Harbors Environmental. Services Inc. |

## Appendix A Chemicals/Manifest Summary (Continued)

| DATE | SOURCE | TYPE | QUANTITY | MANIFEST NUMBER | HAUL CONTRACTOR |
|---|---|---|---|---|---|
| 10/06/03 | Processing unit piping product and warehouse drums | Waste, flammable solids, organic, n.o.s. | 1 lb | S00440691 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | Pesticides, solid, toxic, n.o.s. (propanil, diuron) | 180 lbs | S00440691 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | Waste, hazardous waste, liquid, n.o.s. (trichloroethylene) | 1350 lbs | S00440691 | Clean Harbors Environmental. Services Inc. |
| 10/06/03 | Processing unit piping product and warehouse drums | Waste, hazardous waste, liquid, n.o.s. (trichloroethylene) | 900 lbs | S00440691 | Clean Harbors Environmental. Services Inc. |

# Appendix B

## Cost Estimates for ADEQ Remedial Alternatives S2c and S4c

# SOIL REMEDY ALTERNATIVE S2c: IN SITU STABILIZATION

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Total:** | **$3,343,491** |
| treatment area: | 2.19 | acres | | | |
| 1. Mobilization | | | | | $18,019 |
| Assume | 32 | D6 Dozer (4) | $86.63 | per hour | $2,772 |
| Assume | 32 | compactors (4) | $86.63 | per hour | $2,772 |
| Assume | 24 | Water Truck (4) | $86.63 | per hour | $2,079 |
| Assume | 24 | Dump Truck (4) | $86.63 | per hour | $2,079 |
| Assume | 32 | 924 Loader (4) | $86.63 | per hour | $2,772 |
| Assume | 64 | 210 trackhoe (8) | $86.63 | per hour | $5,544 |
| 2. Foundation and Pavement Removal | | | | | $190,793 |
| Assume | 95,396 | sqft | $2.00 | per hour | $190,793 |
| 3. Excavation (50 cubic yards per hour) | | | | | $527,925 |
| Assume | 2,004 | trackhoes | $165.31 | per hour | $331,229 |
| Assume | 502 | contractor supervisor | $66.00 | per hour | $33,115 |
| Assume | 2,004 | dump truck | $81.64 | per hour | $163,581 |
| 4. Stablization | | | | | $1,472,516 |
| Assume | 16,621 | fly ash | $32.24 | per ton deliver | $535,865 |
| Assume | 2,004 | trackhoes | $165.31 | per hour | $331,229 |
| Assume | 1,002 | dozers | $127.89 | per hour | $128,126 |
| Assume | 1,002 | compactors | $87.65 | per hour | $87,812 |
| Assume | 1,002 | loader at stock pile | $101.63 | per hour | $101,817 |
| Assume | 1,002 | water wagon | $81.64 | per hour | $81,790 |
| Assume | 1,002 | dump truck | $102.72 | per hour | $102,909 |
| Assume | 1,254 | compaction tests | $45.00 | per hour | $56,409 |
| Assume | 250 | contractor supervisor | $66.00 | per hour | $16,503 |
| Assume | 1,002 | labor | $30.00 | per hour | $30,055 |
| 5. Confirmation Sampling | | | | | $127,669 |
| Assume | 35 | samples (16 samples per acre) | | | $0 |
| Assume | 35 | SPLP confirmation sample | $845 | per sample | $29,609 |
| Assume | 196 | days rental equpment at | $500 | per day | $98,060 |
| 6. AMEC Excavation Contractor Field Oversight | | | | | $164,208 |
| Assume | 6.5 | months office trailer at | $500 | per month | $3,269 |
| Assume | 144 | days per diem/lodging/truck rental | $260 | per day | $37,393 |
| Assume | 1,437 | hours AMEC field supervisor at | $86 | per hour | $123,545 |
| 7. Project Management & Reporting | | | | | $285,113 |
| Assume | 1 | Report | $35,000 | Lump Sum | $35,000 |
| Assume | 1 | AMEC project management at 10% of all other cost | | | $250,113 |
| 8. Contingency | | | | | $557,248 |
| Assume | 1 | Continegency | 20% | | $557,248 |

# SOIL REMEDY ALTERNATIVE S4c: SOIL VAPOR EXTRACTION (Capitol Costs)

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Total:** | **$806,866** |
| remedy area: | **0.8** | **acres** | | | |
| 1. Power to Site | | | | | $25,000 |
| Assume | 1 | to drop electrical conncection to system, including: | | | |
| | | - Installation by a qualified electrician; | | | |
| | | - Installation of main disconnect; | | | |
| | | - Installation of an electrical meter face; | | | |
| 2. SVE System Equipment | | | | | $112,500 |
| Assume | 1 | Prewired skid mounted 10000 scfm SVE system, including: | | | |
| | | 1 X 500 Hp PD Blowers | | | |
| | | 1 X 500 gallon vapor/liquid separator with transfer pump | | | |
| | | 2,500 gallon holding tank | | | |
| | | 2 X 2500 lb carbon vessels | | | |
| | | Control system w/ telemetry | | | |
| 3. SVE System Installation | | | | | $357,328 |
| Assume | 70 | SVE wells at | $3,366 | per well | $235,171 |
| Assume | 2 | truck loads of IDW | $385 | per load | $821 |
| Assume | 3 | tons of hazardous IDW | $132 | per ton | $352 |
| Assume | 23 | tons of non-hazardous IDW | $38 | per ton | $892 |
| Assume | 13 | IDW profile samples | $758 | per sample | $9,702 |
| Assume | 787 | feet of trenching at | $30 | per linear foot | $23,616 |
| Assume | 787 | feet of piping at | $30 | per linear foot | $23,616 |
| Assume | 787 | feet of resurfacing at | $12 | per linear foot | $9,446 |
| Assume | 70 | wellhead fittings at | $400 | per well | $27,947 |
| Assume | 213 | sqft concrete pad at | $11 | per sqft | $2,347 |
| Assume | 1.0 | fencing to enclose system | $2,244 | | $2,244 |
| Assume | 4 | TO-14 Analysis at Start-up | $275 | per sample | $1,173 |
| Assume | 1 | Air Emissions Permit | $20,000 | lump sum | $20,000 |
| 4. Installation Direction and Oversight | | | | | $76,435 |
| Assume | 349 | Project Scientist I | $113 | per ton delivered | $39,475 |
| Assume | 157 | Senior Technician | $86 | per hour | $13,531 |
| Assume | 41 | hours of travel to/from the site | $105 | per hour | $4,256 |
| Assume | 51 | per diem/lodging/truck/fuel | $260 | per hour | $13,173 |
| Assume | 5 | airfare and parking costs of | $650 | per hour | $3,467 |
| Assume | 10 | field supplies cost of | $250 | per hour | $2,533 |
| 5. Project Management & Reporting | | | | | $101,126 |
| Assume | 1 | Installation Report & Drawings | $40,000 | Lump Sum | $40,000 |
| Assume | 1 | AMEC project management at 10% of all other cost | | | $61,126 |
| 8. Contingency | | | | | $134,478 |
| Assume | 1 | Continegency | | | $134,478 |

SOIL REMEDY ALTERNATIVE S4c: SOIL VAPOR EXTRACTION (Annual Costs)

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Total:** | **$278,013** |
| remedy area: | **0.8** | **acres** | | | |
| 1. Utilities/Carbon | | | | | $137,649 |
| Assume | 400 | Total SVE system horsepower | | | |
| Assume | 4,380 | System run-time (hours/year) | | | |
| Assume | 0 | per kilowatt hour | | Electrical Total | $130,649 |
| Assume | 4 | Carbon changes at | | per change | $7,000 |
| 2. Fluid Profiling/Air Emissions Analytical Costs | | | | | $4,590 |
| Assume | 2 | VOC in water analysis | $125 | per sample | $250 |
| Assume | 2 | SVOC in water analysis | $250 | per sample | $500 |
| Assume | 2 | RCRA metals in water analysis | $100 | per sample | $200 |
| Assume | 2 | TPH in water analysis | $60 | per sample | $120 |
| Assume | 2 | RCI in water analysis | $110 | per sample | $220 |
| Assume | 12 | TO-14 analysis | $275 | per sample | $3,300 |
| 3. System Operation | | | | | $49,657 |
| Assume | 1 | technician | | | |
| Assume | 3 | hours of travel to/from the site from Houston, TX | $86 | per hour | $258 |
| Assume | 16 | hours of system inspection, sampling, and maintenance | $88 | per hour | $1,408 |
| Assume | 3 | per diem/lodging/truck/fuel | $260 | per day | $693 |
| Assume | 1 | airfare and parking costs of | $650 | round trip | $650 |
| Assume | 1 | field supply cost of | $100 | per inspection | $100 |
| Assume | 12 | events at | $5,318 | per event | $37,312 |
| Assume | 1 | 10% of wells to be replaced annually at 50% cost | $12,345 | lump sum | $12,345 |
| 4. Fluid Disposal | | | | | $6,720 |
| Assume | 2,133 | gallons of hazardous water disposal | $2.50 | per gallon | $5,333 |
| Assume | 11 | hours of vacuum truck (includes transport) | $95 | per hour | $1,013 |
| Assume | 1 | Truck washout | $350 | each | $373 |
| 5. Project Management & Reporting | | | | | $33,062 |
| Assume | 4 | System operation report | $3,000 | Lump Sum | $12,000 |
| Assume | 1 | AMEC project management at 10% of all other cost | | | $21,062 |
| 8. Contingency | | | | | $46,336 |
| Assume | 1 | Continegency | | | $46,336 |

SOIL REMEDY ALTERNATIVE S4c: SOIL VAPOR EXTRACTION (Decommissioning Costs)

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Total:** | **$232,444** |
| remedy area: | **0.8** | **acres** | | | |
| 1. System Decommissioning | | | | | $84,331 |
| Assume | 1 | Mob/Demob | $1,000 | each | $1,000 |
| Assume | 16 | Equipment Rental | $350 | days | $5,600 |
| Assume | 16 | Labor (4 man crew, 10 hrs/day) | $1,800 | days | $28,800 |
| Assume | 16 | Total days of contractor per diem (4 man crew) | $130 | man/day | $2,080 |
| Assume | 7 | truck loads of waste | $385 | per load | $2,669 |
| Assume | 11 | tons of hazardous IDW | $132 | per ton | $1,408 |
| Assume | 96 | tons of non-hazardous IDW | $38 | per ton | $3,648 |
| Assume | 70 | Wells plugged and abandoned (est. depth 20 ft) | $560 | each | $39,125 |
| 2. AMEC Oversight | | | | | $13,109 |
| Assume | 11 | per diem/lodging/truck/fuel | $260 | per day | $2,773 |
| Assume | 105 | hours Senior Technician at | $86 | per hour | $9,036 |
| Assume | 2 | airfare | $650 | per trip | $1,300 |
| 3. Confirmation Sampling and Reporting | | | | | $28,654 |
| Assume | 22 | samples (24 samples per acre) | | | |
| Assume | 22 | Confirmation sample | $640 | per sample | $13,995 |
| Assume | 3 | days of Geoprobe | $2,500 | per day | $8,000 |
| Assume | 5 | hours per technician/day for | 6 | days per event | |
| Assume | 3 | hours sample shipping at | 1 | per event | |
| Assume | 6 | hours mob for technician at | 1 | per event | |
| Assume | 42 | hours for technician at | $86 | per hour | $3,578 |
| Assume | 3 | per diem/lodging/truck/fuel | $260 | per event | $832 |
| Assume | 1 | airfare | $650 | per trip | $650 |
| Assume | 3 | days renatl equipment at | $500 | per day | $1,600 |
| 5. Project Management & Reporting | | | | | $67,609 |
| Assume | 1 | Annual Report | $50,000 | per report | $50,000 |
| Assume | 1 | AMEC project management at 10% of all other cost | | | $17,609 |
| 8. Contingency | | | | | $38,741 |
| Assume | 1 | Continegency | | | $38,741 |

| | |
|---|---|
| Capitol $ | $852,920 |
| Annual $ | $324,430 |
| Decommision $ | $232,444 |
| TOTAL $: | $1,409,794 |