State of Arkansas

Arkansas Department of Environmental Quality

Remedial Action Decision Document

Cedar Chemical Company
West Helena, Phillips County, Arkansas

February 2010

9540481

Arkansas Department of Environmental Quality

Notice of Remedial Action Decision Document
Fact Sheet

Facility: Cedar Chemical Corporation
Facility Location: Helena-West Helena, Phillips County, Arkansas
EPA I. D. Number: ARD990660649

The Arkansas Department of Environmental Quality (ADEQ) has issued a Remedial Action Decision Document (RADD) for the Cedar Chemical Corporation (the Facility). This RADD has been developed to allow the public and interested parties to review plans for Facility clean-up before implementation. After a public comment period, ADEQ will then prepare a final RADD to initiate Facility clean-up.

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

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. 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.

The Facility was constructed and initially operated by Helena Chemical in 1970. The Facility was purchased by Jerry Williams who formed Eagle River Chemical to operate the Facility. Ansul states on its website that they acquired Eagle River Chemical in 1971. The Facility was operated for approximately 18 months by Ansul under the name of Eagle River Chemical. During this time period, dinoseb was produced on the site. The Facility from 1971 to 2002 manufactured or processed a variety of agricultural and organic chemicals under various owners and operators. The last owner of record was Cedar Chemical Corporation.

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.

On March 8, 2002, Cedar Chemical Corporation filed for bankruptcy. Manufacturing and plant operations were shut down shortly thereafter. ADEQ assumed control of the Facility on October 12, 2002, and currently acts as the caretaker of the Facility. Currently, the Facility remains abandoned while security guards provide 24 hour maintenance within the fenced area.

As documented in the Comprehensive Assessment Report prepared by ADEQ dated April 2004, the existing 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 March 16, 2010 ,at the UAMS Area Health Education Centers Delta, Helena-West Helena, AR., ADEQ is holding a public meeting at 6:00 pm followed by a public hearing. Any person, who wishes to comment on this decision to issue a remedial action decision, can do so during the public hearing, or submit written comments concerning ADEQ decisions about this matter by hand delivering, mailing, or faxing such written comments along with their name and address, to ADEQ at the address below.

Arkansas Department of Environmental Quality
Clyde E. Rhodes, Jr.
Chief, Hazardous Waste Division
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317
Telephone: (501) 682-0916 Fax: (501) 682-0565

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

Submitting written comments to ADEQ or making oral statements on the record at any formal public hearing on the RADD provides individuals with legal standing to appeal a final Department decision. Only parties with legal standing may appeal a decision.

The RADD is issued under the authority of the Arkansas Hazardous Waste Management Act (Arkansas Code Annotated Section 8-7-201 and following sections), the Arkansas Remedial Action Trust Fund Act (Arkansas Code Annotated Section 8-7-501 and following sections) as amended, and Arkansas Pollution Control and Ecology Commission (APC&EC) Regulation No. 23. This public notice and other actions for this remedial action decision will follow procedures for permitting decisions in APC&EC Regulation No. 8.

Dated this 24rd day of February, 2010

Teresa Marks
Director
Arkansas Dept. of Environmental Quality

State of Arkansas

Arkansas Department of Environmental Quality

Remedial Action Decision Document

Cedar Chemical Company
West Helena, Phillips County, Arkansas

February 2010

Table of Contents

1. Introduction 1
2. Site Background 2
3. Summary of Remedial Approach 5
4. Summary of Site Risks 17
5. Installed On-Site Interim Measures 20
6. Summary of Alternatives Considered In Feasibility Study 20
7. Proposed / Recommended Remedies 22
8. Evaluation of the Proposed Remedy and Alternatives 25
9. Remedial Action Levels 30
10. Selection of Remedy and Justification 34
11. Schedule of Implementation 36
12. Community Participation 36
13. Coordination with Other Divisions/Agencies 38

Tables

Table 1: Solid Waste Management Units (SWMUs) and Areas of Concern (AOCS) Identified by USEPA Region 6 During the RCRA Facility Assessment (RFA) Cedar Chemical Corporation Facility Helena-West Helena, Arkansas 7-16
Table 2A: Constituents of Concern in Soils 17
Table 2B: Constituents of Concern in Groundwater 18
Table 3A: Remedial Alternatives Considered for On-Site Soil 20
Table 3B: Remedial Alternatives Considered for Perched Zone Groundwater.....20
Table 3C: Remedial Alternatives Considered for Alluvial Aquifer Groundwater 21
Table 3D: Remedial Alternatives Considered for Site Structures 21
Table 3E: Remedial Alternatives Considered for Drum Vault.....21
Table 3F: Remedial Alternatives Considered for Wastewater Treatment Ponds 21
Table 4A: Evaluation of Soil Remedy Alternatives 26
Table 4B: Evaluation of Perched Zone Remedy Alternatives.....27
Table 4C: Evaluation of Alluvial Aquifer Remedy Alternatives 28
Table 4D: Removal of Site Structures.....28
Table 4E: Evaluation of Drum Vault Remedy Alternatives.....29
Table 4F: Evaluation of Waste Water Treatment Pond Remedy Alternatives 29
Table 5A: Remedial Action Levels for Chemicals of Concern in Soils 30
Table 5B: Remedial Action Levels for Chemicals of Concern in Soils..... 30-31
Table 5C: Remedial Action Levels for Chemicals of Concern in On-Site Perched Groundwater.32
Table 5D: Remedial Action Levels for Chemicals of Concern in On-Site Alluvial Groundwater33
Table 5E: Remedial Action Levels for Chemicals of Concern in Off-Site Alluvial Groundwater33
Table 6A: Internal Coordination with ADEQ Divisions 38
Table 6B: Internal Coordination with ADEQ Divisions 38

Figures

Figure 1: Site Location Map.....
Figure 2: Facility Structure Locations.....
Figure 3: SWMUs and AOCs Identified by USEPA Region 6 PR/VSI.....
Figure 4: Demolition of On-Site Structures .....
Figure 5: Soil Remedy Alternatives S2b and S2c .....
Figure 6: Soil Remedy Alternatives S4b and S4c .....
Figure 7: Soil Remedy Alternative S1.....

Appendices

Appendix A: Specific Chemicals and Their Manifest
Appendix B: Cost Estimates for ADEQ Remedial Alternatives S2c and S4c

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: Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) Identified by USEPA Region 6 During the RCRA Facility Assessment (RFA) 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 Including demolishing and capping, geotextile membrane; deed notices, ordinances, restrictive covenants
In Situ Physical Treatment	Stabilization thru soil mixing ▪ Area-wide approach→ entire process area ▪ Focused approach→target specific areas
Excavation with Off-Site Disposal as Solid Waste	Soil Removal and waste classification ▪ 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 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 ▪ 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 ▪ 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

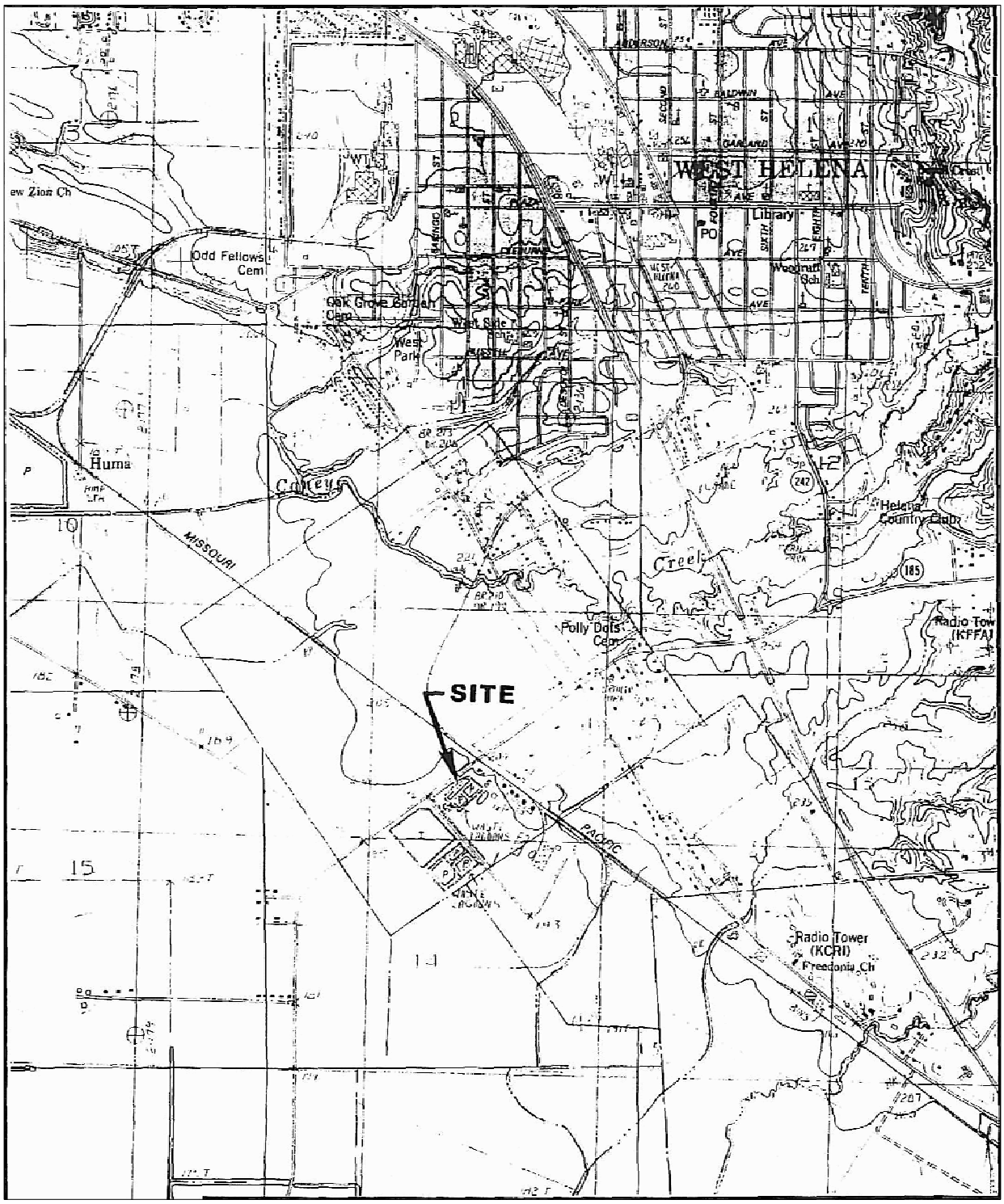
ADEQ Divisions	Consulted or Informed	Sent Notice of Decision
Water	**Yes**	**No**
NPDES	**Yes**	**No**
Air	**No**	**No**
Solid Waste	**No**	**No**
Regulated Storage Tanks	**No**	**No**
Technical Services and Environmental Preservation	**No**	**No**
Mining	**No**	**No**

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

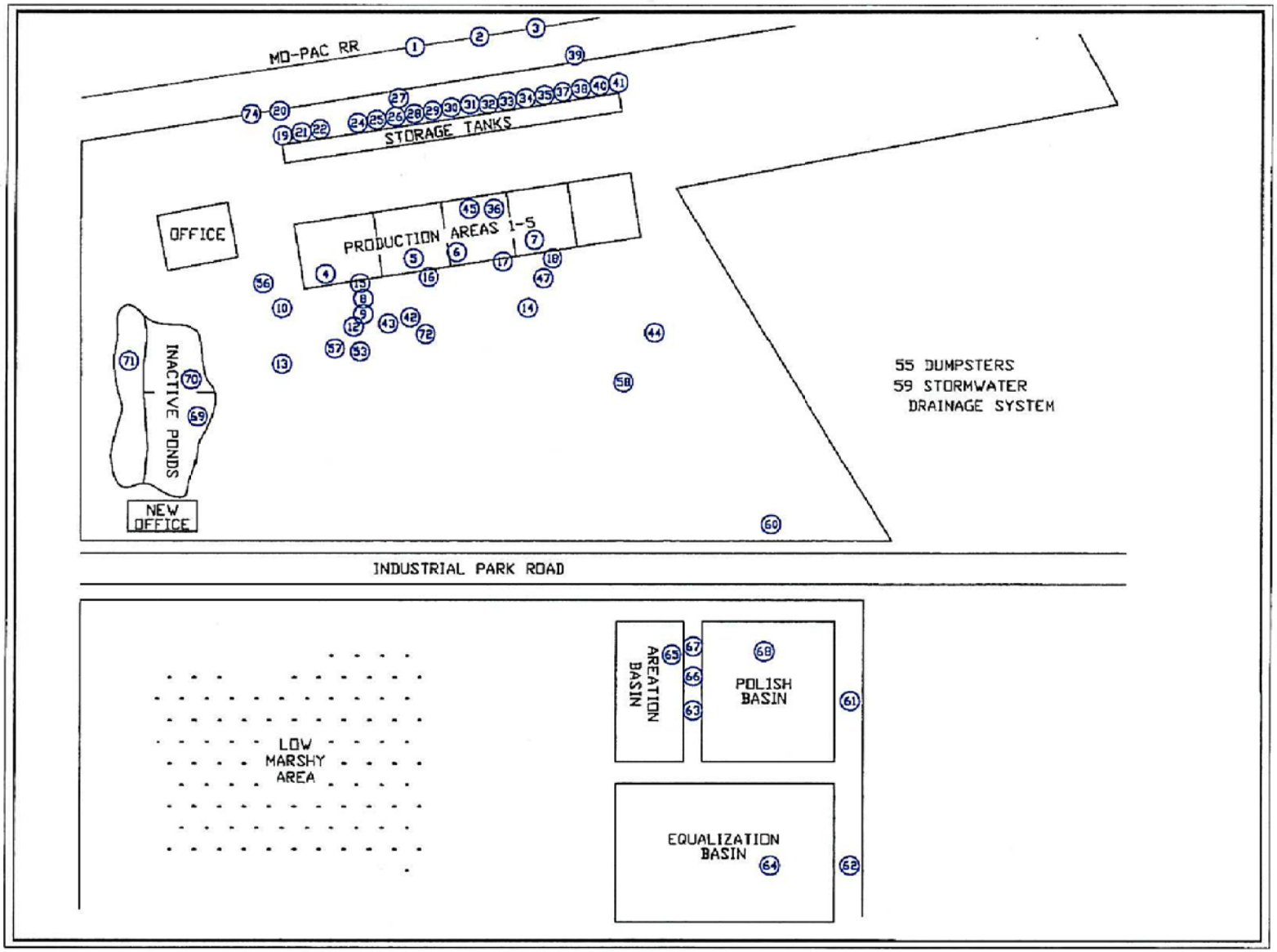
BASEMAP MODIFIED FROM:
Smith & Weiland/Cline-Fraizer Survey, August 2008

0 80
APPROXIMATE SCALE IN FEET

Facility Structure Locations

Cedar Chemical
Helena-West Helena, Arkansas

Figure 2



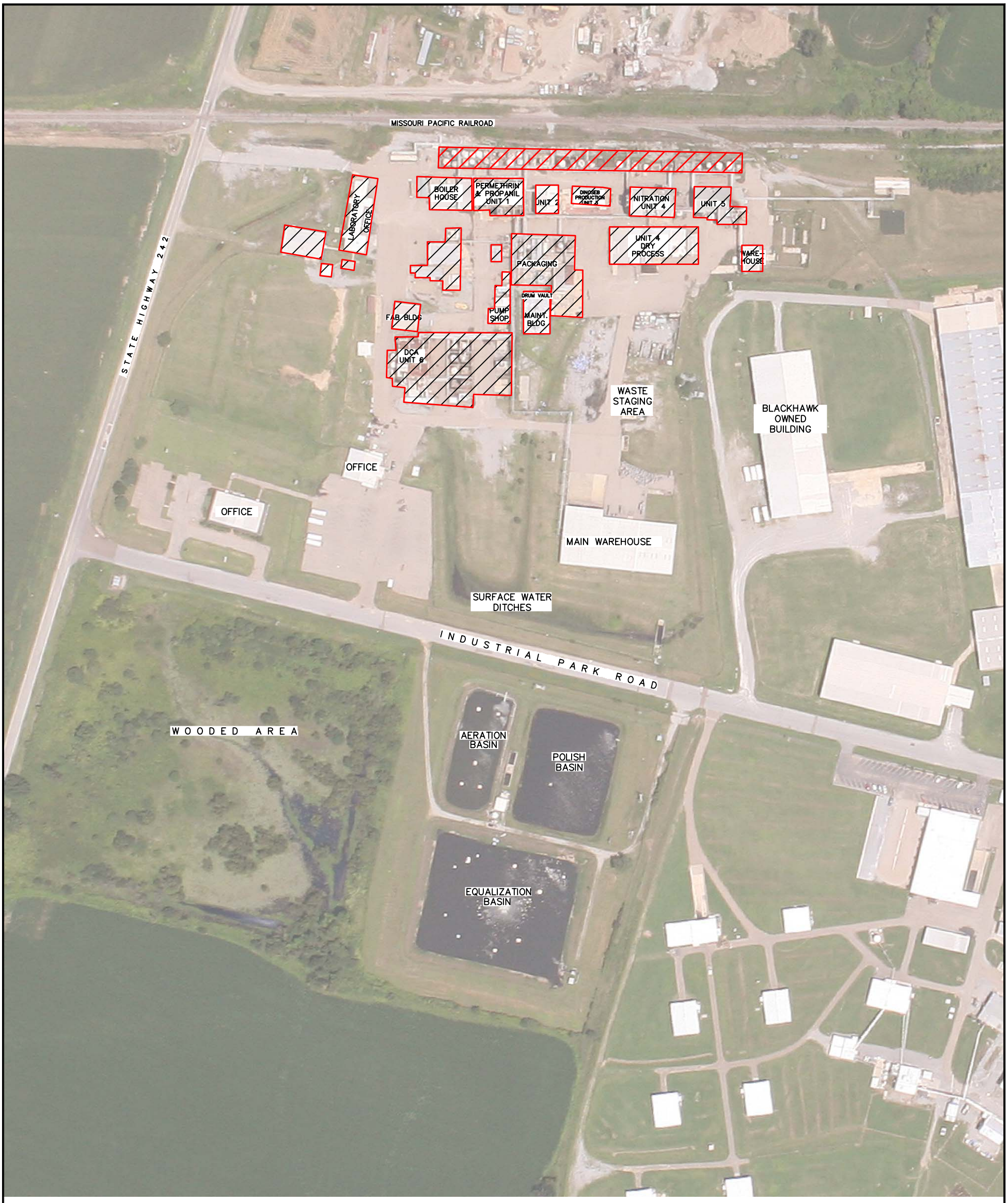
SOURCE: EnSafe 1993 FI Report

SWMUs and AOCs IDENTIFIED IN USEPA REGION 6 PR/VSI

Cedar Chemical
Helena-West Helena, Arkansas

Figure 3

I:\13636 - Arkansas Helena-West Helena\2007 CCR\FINAL FIGURES\ FIG 5 SWMUs and AOCs\FIG 5.dwg



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

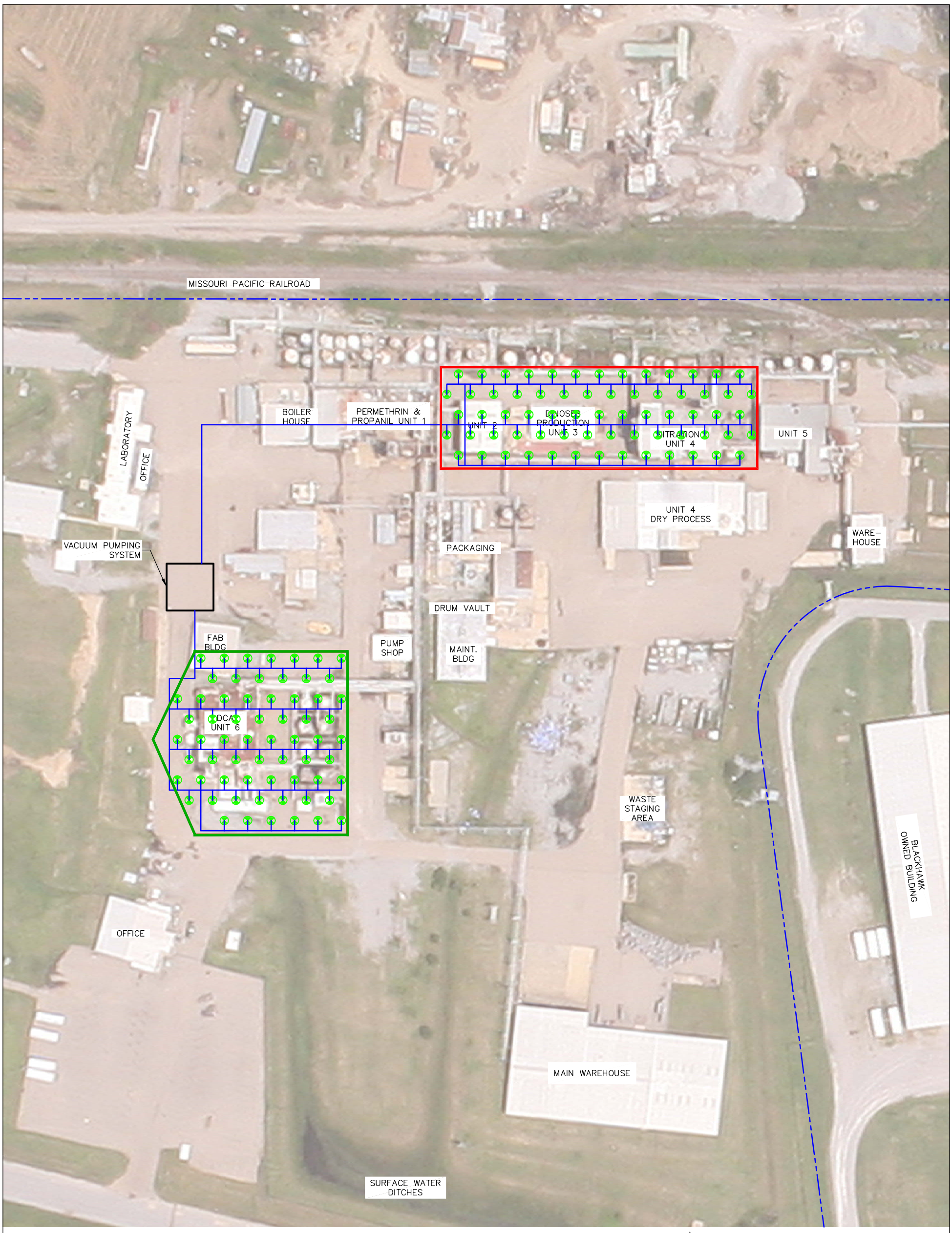
0 50 100
FEET

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

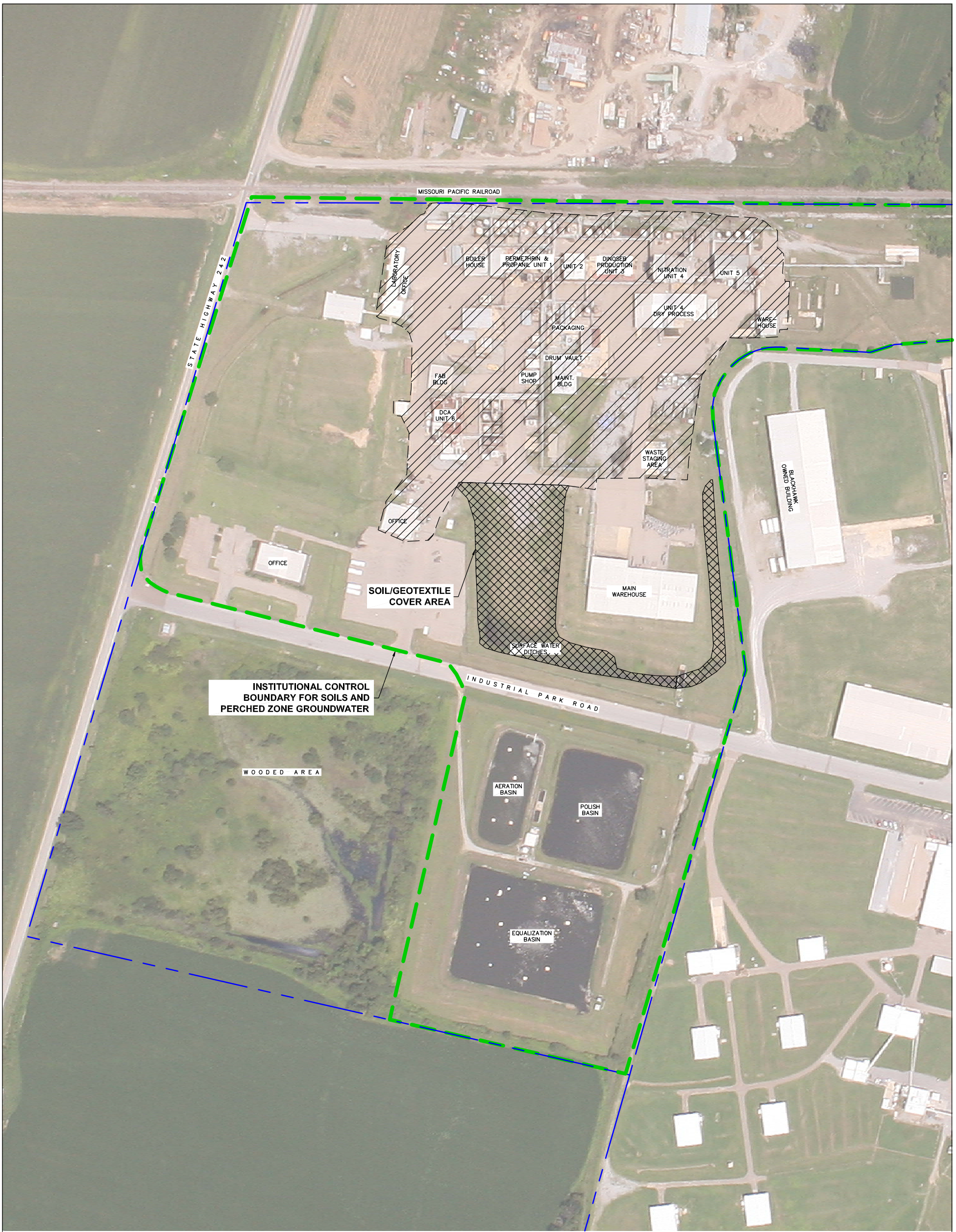
NOTE: Boundaries, well locations, and remedy elements subject to change based on Remedial Design or other factors.

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



EXPLANATION

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

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