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RECORD OF DECISION

VERTAC SUPERFUND SITE
JACKSONVILLE, ARKANSAS

OPERABLE UNIT #2
SOILS, FOUNDATIONS AND UNDERGROUND UTILITIES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1996

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RECORD OF DECISION
CONCURRENCE DOCUMENTATION
FOR THE
VERTAC SUPERFUND SITE
OPERABLE UNIT #2
JACKSONVILLE, ARKANSAS

Philip H. Allen, P.E.
Site Remedial Project Manager

John Dugdale
Senior Attorney, 6SF-DL

Wren Stenger, Chief
Arkansas/Oklahoma Section, 6SF-AO

William K. Honker, Chief
Superfund AR/OK/TX Branch, 6SF-A

Mark Peycke, Chief
Superfund Litigation and Enforcement Branch, 6SF-DL

Myron O. Knudson, P.E., Director
Superfund Division, 6SF

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DECLARATION
VERTAC SUPERFUND SITE
RECORD OF DECISION
OPERABLE UNIT #2
SEPTEMBER 1996

SITE NAME AND LOCATION

Vertac Incorporated
Jacksonville, Arkansas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 2, Soils, Foundations and Underground Utilities, for the Vertac Incorporated site (the site), located in Jacksonville, Arkansas, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the administrative record file for this site.

The State of Arkansas fully supports this remedy, and a concurrence letter from the Arkansas Department of Pollution Control and Ecology (ADPC&E) can be found in Attachment C to this Record of Decision (ROD).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

There are six operable units for the Vertac site. This ROD for Operable Unit 2 (OU2) addresses the remediation of dioxin- and herbicide-contaminated on-site soils and debris, of on-site underground utilities, and of on-site building foundations and curbs. This ROD also addresses the disposal of contiguous soils and debris originally addressed by the Vertac Superfund Site Off-Site Areas Record of Decision (ROD), dated September 27, 1990, in which EPA had selected its preferred remedy for soils, sediments, and sludges excavated or to be excavated from contiguous areas adjacent to the site. That 1990 Off-Site Areas ROD had selected on-site incineration as the remedy for the soils to be excavated from the Rocky Branch Creek floodplain, the sediments removed from sewage collection lines, and the sludges removed from the sewage digester. Subsequent to executing the 1990 Off-Site Areas ROD, EPA deferred addressing the disposition of the 1990 Off-Site Areas ROD media so that its disposal would be consistent with the disposal of similar media addressed in the RODs for OU1 and OU2.

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Finally, in 1990 Hercules, Inc., a party liable for site response actions and costs, in 1990 had performed a removal action in which it excavated and bagged, and then stored on-site, dioxin-contaminated soils excavated from contiguous residential areas. The 1993 ROD for OU1 expressly deferred the disposition of those bagged soils until EPA selected a remedy for OU2. All of the media addressed in this ROD constitute low level threat media, and the remedy selected takes into account the reasonably anticipated future land use for the site, which is commercial/industrial. A brief description of the components of the OU2 remedy follows:

On-Site Soils

The remedy selected for OU2 consists of the excavation and consolidation within an on-site hazardous waste landfill that meets the substantive requirements of Subtitle C of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq., of site soils and debris that contain dioxin contamination levels at or above a 5 part per billion (ppb) cleanup level. Excavated areas will be backfilled with clean fill, graded, and vegetative cover will be established. Upon completion of the site remediation, data indicate that the average dioxin concentrations will be less than 1 ppb. This is due to the fact that a large percentage of the site acreage contains dioxin levels well below 1 ppb.

The northern portion of the site, which is approximately 100 acres, never had been used for industrial operations and the soils are less than 1 ppb dioxin. The northern portion of the site will be unrestricted and will be available for commercial/industrial redevelopment. The southern portion of the site, which consists of about 93 acres, is where active industrial activities had occurred and the highest concentrations of dioxin contamination are found. Some segments of the southern portion of the site will remain fenced and access will be restricted to on-site maintenance workers where existing landfill areas exist, where the on-site hazardous waste landfill will be located, where an active wastewater treatment plant is located, and possibly where ground water extraction and containment wells are likely to be situated as part of implementing the remedy for ground water. EPA plans to execute the ROD for the ground water operable unit (OU3) concurrently with the execution of this ROD.

Such restrictions on the southern portion of the site are necessary to prevent trespass into and the disturbance of the existing waste disposal areas that were created as a result of a 1984 order of the U.S. District Court for the Eastern District of Arkansas, into the wastewater treatment plant, into the hazardous waste landfill, and possibly around any future ground water wells. The 1984 court order imposed the "Vertac Remedy," under which the Vertac plant cooling water pond and the equalization basin were closed and sediments from these units were removed and placed into an excavated area where earlier operators had buried drums of waste. The burial area was capped, a French drain and leachate collection system were installed around the burial areas, and a wastewater treatment plant was constructed to treat water from the French drain and storm water runoff. Ground water monitoring wells were also installed and a ground water monitoring program was initiated.

Notwithstanding the limitations of the 1984 Court-ordered Vertac Remedy, the remedy selected herein provides a feasible means of ensuring that the greatest amount of site acreage be returned to commercial/industrial use upon completion of the remedy by addressing low level threat wastes through consolidating them on-site in a RCRA Subtitle C hazardous waste landfill.

Crystalline Tetrachlorobenzene (TCB) and Soils Contaminated with TCB

In addition to addressing the dioxin contamination within on-site soils and debris at 5 ppb and above, the remedy selected for OU2 will address crystalline tetrachlorobenzene (TCB) and soils having TCB contamination above a 500 parts per million (ppm) action level. This contamination exists in a small area of the central process area of the site where some time during active site operations a TCB spill had occurred from a rail car parked at an on-site siding. Therefore, the remedy calls for the excavation of crystalline TCB material and TCB-contaminated soils where the TCB concentration exceeds 500 ppm. EPA's risk assessment has established that soils containing TCB concentrations below 500 ppm do not pose an unacceptable risk to future site workers or occasional bypassers. Both the excavated crystalline TCB material and the TCB-contaminated soils will be taken off-site for treatment by incineration at a compliant RCRA-regulated facility.

Bagged Residential Soils from a 1990 Removal Action

In 1990, Hercules, Inc., conducted a removal action involving the excavation of dioxin-contaminated soils from contiguous residential areas where the dioxin concentrations were 1 ppb or greater. The 1993 ROD for OU1 deferred the treatment decision for those soils, and the soils have been stored on-site in bags until a decision on the remedy for similar on-site OU2 soils would be made. The total volume of bagged soil is estimated at 2,770 cubic yards, and the remedy selected in this ROD calls for the on-site consolidation within the RCRA Subtitle C landfill.

Vertac Off-Site Areas ROD Soils, Debris, and Sludges

The remedy selected in the 1990 Off-Site Areas ROD specified the removal of sediments from the active sewer interceptor and the installation of pipe liners in the clean sewer, the filling of the abandoned interceptor with grout, the removal of sludge

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from the sludge digester in the old wastewater treatment plant, the capping of the sludge drying beds in the old wastewater treatment plant with one foot of clean soil, the draining of an aeration basin in the old wastewater treatment plant, the demolition of the berm and capping of the basin with one foot of clean soil, and the excavation of Rocky Branch Creek flood plain soils that are contaminated with dioxin at 1 part per billion (ppb) and greater. That ROD also selected on-site incineration of those excavated soils, sediments and sludges, and monitoring the Rocky Branch Creek and Bayou Meto fish for dioxin.

Under the terms of a Unilateral Administrative Order (UAO) issued to Hercules, Inc. pursuant to CERCLA Section 106, 42 U.S.C. § 9606; in July 1993, Hercules, Inc., has completed the performance of the 1990 ROD's off-site remedial actions except for the excavation of the Rocky Branch Creek flood plain soils and the on-site incineration of sediments removed from sewage collection lines, sludge removed from the digester, and the as-yet unexcavated Rocky Branch Creek soils. The removed sediments and sludge are currently stored on-site. Subsequent to issuing the 1990 Off-Site Areas ROD, EPA determined that the off-site soils and debris are similar in their physical characteristics and in the nature and extent of contamination in that they all constitute low level threat media. For that reason, EPA concluded that it was appropriate to defer the disposal of the off-site soils and debris to ensure that such disposal would be consistent with that of the on-site soils.

Both EPA's original Proposed Plan for the Vertac Operable Unit 2, presented to the public on May 25, 1995, and the Supplemental Proposed Plan for OU2, presented to the public on March 5, 1996, stated that EPA intended to address the disposal of the 1990 Off-Site Areas ROD wastes as a component of the OU2 remedy. In addition, both proposals indicated that EPA's preferred remedy for those off-site soils and debris was on-site consolidation within the RCRA Subtitle C landfill due to their similarity to OU2 contaminated media. Therefore, the public had two opportunities to comment on this change to the remedy selected in the 1990 Off-Site Areas ROD. During those two comment periods, EPA received no adverse comments to that aspect of the proposals.

Therefore, in the absence of adverse comment, EPA has amended the 1990 Off-Site Areas ROD and hereby incorporates the change in the disposal method for off-site soils and debris within the Vertac OU2 ROD.

The major components of that amendment, which are selected in this ROD, include the consolidation of soils to be excavated from the Rocky Branch Creek flood plain within the on-site RCRA Subtitle C landfill. Consistent with the 1990 Off-Site Areas ROD, all soils with dioxin concentrations greater than or equal to 1 ppb in the Rocky Branch Creek flood plain will still be excavated. In addition, this ROD calls for the consolidation of removed sediments from the sewage collection lines within the on-site RCRA Subtitle C landfill. Those sediments have been removed and are currently stored on-site. Finally, this ROD calls for the consolidation of removed digester sludges within the on-site RCRA Subtitle C landfill. Those dioxin-contaminated sludges have been removed from the abandoned sewage treatment plant sludge digester and are currently stored on-site.

Underground On-Site Utility Lines, Building Foundations and Curbed Areas

The final component of the remedy selected in this ROD relates to on-site utility lines, building foundations, and curbed areas. Under this remedy, the underground utility lines will be cleaned to remove solids and filled with grout. Solids from the lines will be consolidated within the on-site RCRA Subtitle C landfill. Cutoff barriers will be installed around various underground utility lines to prevent shallow water migration and contaminant transport along the lines.

The remedy selected for the building foundations and curbed areas consists of the cleaning through hydroblasting and scarification, after which they will be left in place. Areas with persistent staining will be sealed with epoxy type sealants. Upon completion of the cleaning and scarification, the foundations and curbed areas will be covered with soil adequate to support a vegetative cover and contoured to prevent erosion and ponding.

While the OU2 feasibility study (FS) identified five underground storage tanks (USTs) suspected of containing petroleum products, and both the original May 1995 Proposed Plan for OU2 and the March 1996 Supplemental Proposed Plan for OU2 discussed those five USTs, Hercules, Inc., has recently taken action to address those tanks by draining their contents and backfilling the tanks with "flowable" grout containing a mixture of cement, fly ash, and sand. Therefore, this ROD need not address the tanks.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. Because this remedy involves on-site consolidation of low level threat media, it need not satisfy treatment as a principal element of the remedy. Instead, the remedy selected is consistent with the NCP's preference for containment remedies when addressing low level threat media. However, because this remedy will result in the consolidation within a RCRA Subtitle C hazardous waste landfill of contaminated soils, debris, and sludges, hazardous substances will remain on a portion of the site above levels that allow for unlimited use and unrestricted exposure. This is due to the fact that the hazardous waste landfill will remain in place for an indefinite period of time, and due to the fact that the above-described 1984 Court-ordered remedy resulted in dioxin wastes remaining in place. Therefore, EPA shall review the remedial action no less than every five years after initiation of the selected remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. That five-year review is required by CERCLA Section 121(c), 42 U.S.C. § 9621(c).

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Jane N. Saginaw
Regional Administrator
U.S. EPA Region 6

SEP 17 1996
Date

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DECISION SUMMARY
FOR THE
VERTAC SUPERFUND SITE
JACKSONVILLE, ARKANSAS
OPERABLE UNIT #2
SEPTEMBER 1996

1.0 SITE LOCATION AND DESCRIPTION

The Vertac Incorporated Superfund Site (the site) is approximately 193 acres in size, and is located on Marshall Road in Jacksonville, Pulaski County, Arkansas, as shown in **Figure 1.** Jacksonville is about 15 miles northwest of the State Capital, Little Rock. Approximately 1,000 residents live within one mile of the site with residential areas bordering the entire east and south sides. The west and northern sides of the site are bounded by an industrial area and the Little Rock Air Force Base, respectively.

The site consists of two parcels of land (Parcel 1 and Parcel 2) that were acquired at different times during plant operations (**Figure 2**). Parcel 1 (the southern acreage), which contains the central process area, is approximately 93 acres and has been in nearly continuous industrial use since 1948. Parcel 2, which is approximately 100 additional acres to the north, was purchased by Vertac Chemical Corporation (Vertac) in 1978 but was never used in the herbicides formulations operation. In 1979, the 2,4,5-T storage shed was built adjacent to the Regina paint building, which today is believed to contain empty Vertac 2,4,5-T waste drums. Parcel 2 does not contain production facilities and is currently used by the United States Environmental Protection Agency (EPA) for drum storage in newly-constructed warehouse buildings. An incinerator constructed under the contract to the Arkansas Department of Pollution Control and Ecology (ADPC&E) to burn drummed waste is also located in the northern part of Parcel 1.

Topographically, the land has moderate relief, sloping from about 310 feet above mean sea level (MSL) in the north to approximately 260 feet near the southwestern corner. The central process area is located on a south plunging topographic nose bounded by Rocky Branch Creek on the west and Marshall Road on the east. Land on the western side of Rocky Branch Creek has not been used for manufacturing or disposal and is topographically separated from the central process plant area by the creek. Land on the eastern side of Marshall Road has not been used for manufacturing and is geographically separated from the central process plant area by Marshall Road. Land on the northern part of the site has not been used for herbicide manufacture and is generally up slope from the central process plant area.

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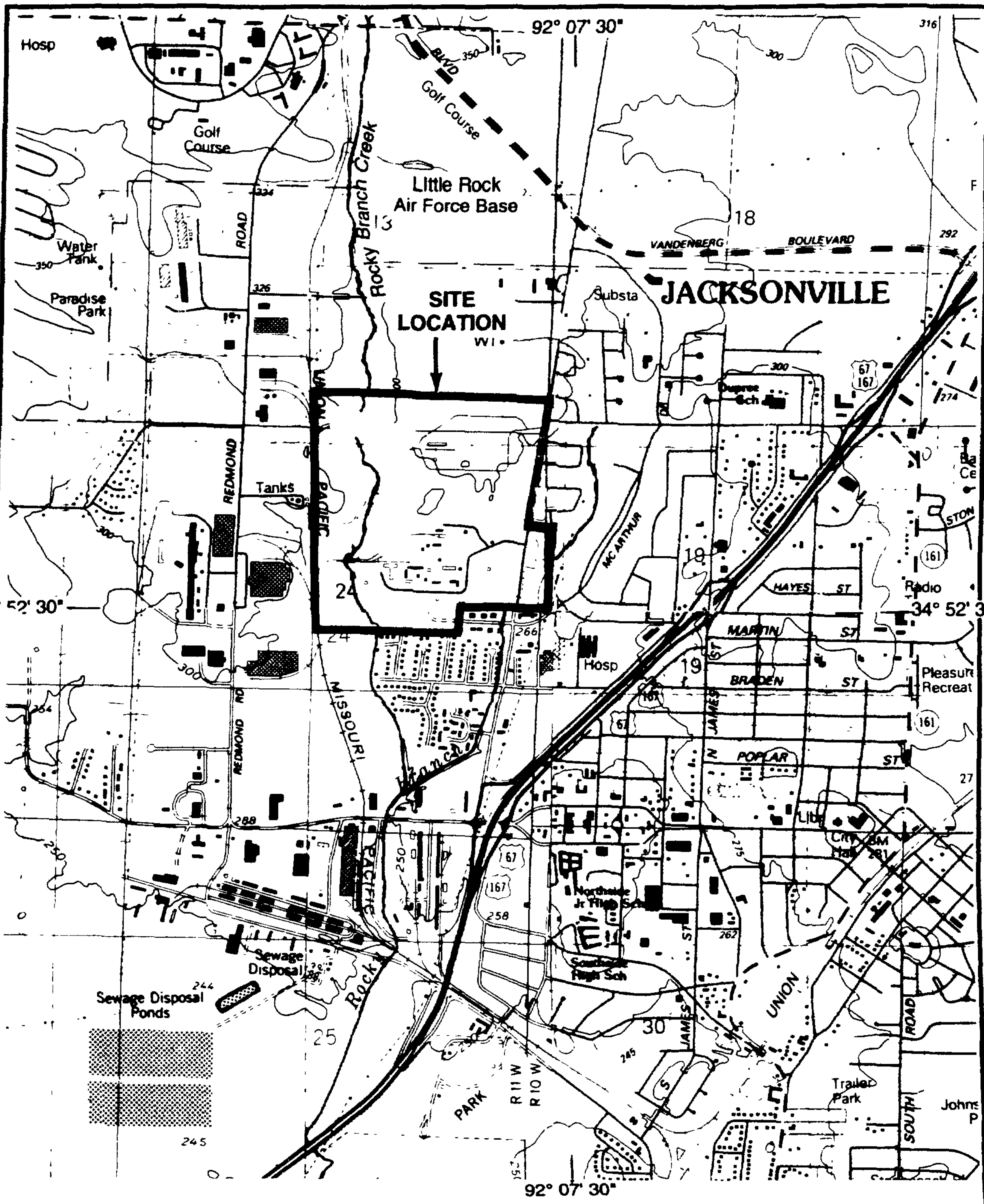
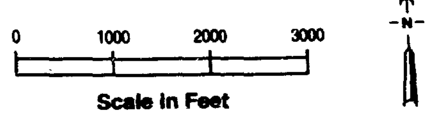


Source: U.S. Geological Survey
7.5 Minute Series
Olmstead, AR (1987)
Cabot, AR (1987)
Jacksonville, AR (1987)
McAlmont, AR (1986)

1248-331 11/16/92

QUADRANGLE LOCATION



Scale in Feet

SITE LOCATION MAP, VERTAC SITE
JACKSONVILLE, ARKANSAS

FIGURE 1

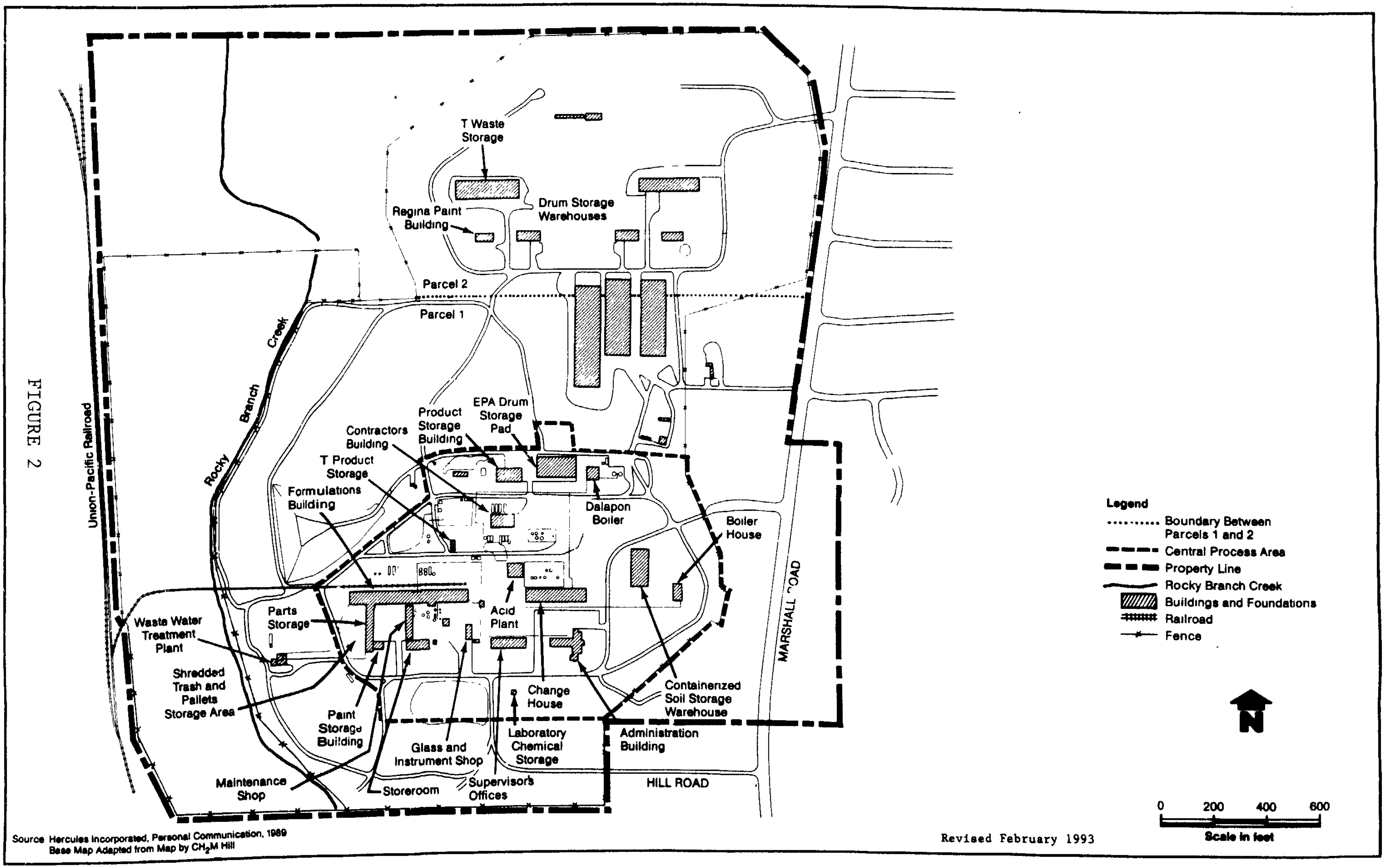


FIGURE 2

SITE MAP, VERTAC SITE
JACKSONVILLE, ARKANSAS

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2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SITE OPERATIONS HISTORY

The first facilities on the site were constructed by the U.S. Government in the 1930's and 1940's. These facilities were part of a munitions complex that extended beyond the present site boundaries. Little is known about the operations that occurred during that time period. In 1948, the Reasor-Hill Company purchased the property and converted the operations to manufacture insecticides such as DDT, aldrin, dieldrin, and toxaphene. During the 1950's, Reasor-Hill manufactured herbicides such as 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5,-T), and 2,4,5-trichlorophenoxypropionic acid (2,4,5,-TP), which is also called Silvex. Drums of organic material were stacked in an open field immediately southwest of the production area, and untreated process water was discharged from the western end of the plant to Rocky Branch Creek.

Hercules Powder Company, now known as Hercules, Inc. (Hercules), purchased the Reasor-Hill property and plant in 1961 and continued to manufacture and formulate herbicides. The drums that were in the open area southwest of the central process area were buried in what is now referred to as the Reasor-Hill Landfill. From 1964 to 1968, Hercules produced the herbicide Agent Orange, a mixture of equal parts of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4-dichlorophenoxyacetic acid (2,4-D). Hercules discontinued operations at the site in 1971.

From 1971 to 1976, Hercules leased the plant site to Transvaal, Inc. (Transvaal), a predecessor company of Vertac. Transvaal resumed production of 2,4-D and intermittently produced 2,4,5-T. Organic wastes from these manufacturing processes were stored and then buried by Hercules on the site in what is now referred to as the North Landfill area. Transvaal purchased the property and plant from Hercules in 1976. In 1978, Transvaal underwent a Chapter XI bankruptcy reorganization and ownership of the site was transferred to the new company, Vertac Chemical Corporation, which is the present owner.

In 1979, ADPC&E issued an order that required Vertac to improve its hazardous waste practices, and in 1980 EPA and ADPC&E jointly filed suit in federal district court against Vertac and Hercules. A Consent Decree entered into by EPA, ADPC&E, Vertac, and Hercules in January 1982 required that an independent consultant assess the conditions of onsite wastes and develop a proposed disposal method for the wastes. The proposal, called the "Vertac Remedy", was deemed by EPA to be unsatisfactory. The court decided in favor of the proposed remedy, which was implemented in the summer of 1984 and completed in July 1986. As

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part of the remedy, the Vertac plant cooling water pond was closed, and sediment from this unit was removed and placed in an above-ground vault. The Reasor-Hill and Hercules/Transvaal Landfills were capped, and a French drain and leachate collection system were installed around the burial (landfill) areas. Ground water monitoring wells were also installed, and a ground water monitoring program was initiated.

Vertac operated the plant until 1986. On January 31, 1987, Vertac abandoned the site and declared bankruptcy, leaving approximately 29,000 drums of 2,4-D and 2,4,5-T wastes. Many of these drums were corroded and leaking. At that time EPA initiated an emergency removal action to stabilize and secure the site.

In 1988, ADPC&E contracted for the incineration of the drummed waste, using a $10.7 million combined trust fund and letter of credit obtained from Vertac during bankruptcy litigation. A contract for the incineration of the drummed waste was signed in 1989 between ADPC&E and Vertac Site Contractors (VSC). VSC is a joint venture of MRK Incineration and Morrison-Knudsen Environmental Services. In January 1992, ADPC&E approved the VSC trial burn and production incineration began. Because of the difficulty in handling the Vertac drummed waste material, incineration operations took longer than originally anticipated. In May 1993, the trust fund money had been expended with approximately 50 percent of the waste destroyed under the State's contract. In June 1993, EPA took over the incineration operation and completed the incineration of the D-waste drums in September 1994. EPA contracted for the off-site incineration of the remaining 3,100 drums of T-waste. Shipments of T-waste to the APTUS commercial hazardous waste incineration facility, located in Coffeyville, Kansas, concluded on March 29, 1996.

On July 16, 1996, the Regional Administrator for EPA Region 6 executed a Non-Time Critical Removal Action Memorandum that concluded the on-site incinerator support activities associated with the on-site D-waste incineration, which had concluded on January 2, 1994. That Action Memorandum authorized the off-site disposal of 33,000 drums of salts (and the associated pallets) that were generated during the on-site incineration of D-wastes, and it authorized the on-site disposal within the RCRA Subtitle C hazardous waste landfill of both 10,000 shredded pallets used to store drummed waste materials and of 6,300 drums of incinerator ash (and their associated pallets). In that Action Memorandum, the Regional Administrator also granted a variance from the RCRA Land Disposal Restriction (LDR) treatment standard applicable to dioxin-containing wastes found at 40 CFR § 268.31. Specifically, the Regional Administrator approved a treatability variance for the disposal of dioxin-contaminated wastes within the on-site RCRA Subtitle C landfill of 5 ppb from the LDR standard of 1 ppb pursuant to the procedures set out at 40 CFR § 268.44. Therefore, should the LDR dioxin treatment standard be applicable to the on-site disposal within the on-site RCRA Subtitle C hazardous waste landfill if placement within the unit occurs, the treatment standard is 5 ppb. See July 18, 1996, Non-Time Critical Action Memorandum in Administrative Record for more details. 002982

Currently, there are no manufacturing operations at the site. At the time operations were shut down, Vertac "mothballed" the plant. Mothballing involved flushing process lines and draining several of the process vessels. Continuing activities at the site include operation of an on-site wastewater treatment plant by Hercules, Inc. The treatment plant processes ground water collected in French drains constructed downgradient (south and west) of the old waste burial areas, and surface water runoff collected in a series of drainage ditches and sumps that surround the central process area. This treated water was originally piped to the West Wastewater Treatment Plant owned and operated by the city of Jacksonville and was discharged into Bayou Meto. As part of ongoing remedial activities at the site, Hercules has recently completed the cleaning and regrouting of certain sections of the sewer lines that run through the site to the West Wastewater Treatment Plant, and as such, water that was discharged to the sewer interceptor on the site is now treated and discharged directly into Rocky Branch Creek (after meeting discharge limits established by ADPC&E).

The Vertac site was added to the National Priorities List (NPL) of hazardous waste sites in 1982. Once the site was placed on the NPL, money available from the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly called Superfund, 42 U.S.C. § 9601 et seq., could be used to investigate and study the problems at the Vertac site and find ways to correct them to protect the public health and the environment.

2.2 ENFORCEMENT ACTIVITIES

A Potentially Responsible Party (PRP) search was not conducted since the Agency knew the identities of former owners, operators, and some generators of waste at the Vertac site, and since litigation was already ongoing prior to CERCLA activities. However, CERCLA Section 104(e) information request letters were mailed in March 1990, and later to several companies which had "tolling agreements" with the Vertac Chemical Corporation and/or Hercules.

The following is a chronology of enforcement activity at the Vertac site:

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1. Litigation was filed in 1980 under Section 7003 of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6973, and other statutes by the United States and the State of Arkansas against Vertac Chemical Corporation and Hercules Inc. (the Parties). In January 1982 EPA and the State of Arkansas entered into a Consent Decree with Vertac Chemical Corp. and Hercules, Inc., in the litigation for developing a remedial plan for certain on-site and off-site areas. After EPA invoked dispute resolution and had a hearing on the remedy, the Court ordered the implementation of the "Vertac Remedy" in July 1984 (see Site History for a discussion of the action taken).

2. In July 1986, pursuant to an agreement between the parties and entry by the court, Vertac established an Environmental Trust Fund as part of a bankruptcy agreement. Vertac placed $6,700,000 in this fund to be used to remediate portions of the plant. A $4,000,000 letter of credit was later added to this Trust Fund also for the purpose of future site remediation. Both EPA and the State of Arkansas had access to this fund which was later used to incinerate the 29,000 drums of waste left at the site by Vertac.

3. In August 1986 EPA issued a Unilateral Administrative Order (UAO) pursuant to Sections 104 and 106 of CERCLA, 42 U.S.C. §§ 9604 and 9606, to all PRP's to require posting of warning signs and the fencing of portions of the West Wastewater Treatment Plant and certain areas of Rocky Branch Creek. This work was performed by Hercules.

4. In January 1987 EPA issued a notice letter to Vertac Chemical Corp. that required Vertac Chemical Corp. to continue operation and maintenance of the leachate collection and treatment system which was established around old on-site waste burial areas.

5. In June 1988 EPA signed an Administrative Order on Consent (AOC) pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, with Hercules to allow Hercules to implement the fine grid sampling investigation for specific off-site areas.

6. In September 1988 EPA signed an AOC pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, with Hercules that required Hercules to remove approximately 3,000 cubic yards of dioxin-contaminated soil from residential yards near the facility.

7. In July 1989 EPA signed an AOC pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, with Hercules that required Hercules to conduct the on-site Remedial Investigation/Feasibility Study (RI/FS).

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8. In March 1990 EPA sent CERCLA Section 104(e) information request letters to several companies which had been involved in business deals with the Vertac Chemical Corp. and Hercules Inc., including "tolling agreements".

9. In July 1990 EPA sent General Notice letters to the PRP's regarding the proposed off-site remedial plan and other site actions.

10. In February 1991 the U.S. District Court for the Eastern District of Arkansas entered a Consent Decree between the United States and "Phoenix Parties", which are companies related to the Vertac Chemical Corp., and which carried on the remaining business of Vertac under their names after Vertac abandoned the site. Hercules appealed the entry of the Consent Decree to the Eighth Circuit Court of Appeals, which upheld the entry of the Consent Decree in April 1992. Under the terms of the Consent Decree, the Phoenix Parties have contributed $1,840,000 to a RCRA Closure Trust Fund, and will contribute a percentage of pre-tax profits for 12 years, in return for release of liability.

11. Hercules, Inc., had opposed the United States' efforts to select various CERCLA remedies at Vertac. This opposition included a motion filed in September 1992 to enforce the 1982 RCRA Consent Decree. The parties were ultimately unable to resolve their differences regarding this motion. In June 1992 the District Court entered an order denying Hercules' motion to enforce the Consent Decree and allowed EPA to utilize CERCLA procedures to select remedies for the Vertac site.

12. The United States added CERCLA Section 107, 42 U.S.C. § 9607, cost recovery claims against Hercules, Dow Chemical Company, and Uniroyal Chemical Limited of Canada, in a complaint filed in March, 1992. By order of the trial court in June 1992, this complaint was administratively closed, and the claims asserted against Hercules, Dow, and Uniroyal were consolidated with the existing litigation. Other parties, including BASF AG, Standard Chlorine, and Velsicol, have been added to the litigation as third-party defendants.

13. Special notice letters for Remedial Design/Remedial Action (RD/RA) for the off-site areas were sent to the PRP's in August 1992. No "good faith" offers were received in response to the letter. A subsequent special notice letter was sent in December 1992 to the PRP's after EPA revised the scope of the remedial work at the off-site areas. Negotiations regarding this work did not result in an RD/RA Consent Decree.

14. In June 1993 EPA issued a Unilateral Administrative Order (UAO) pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, to Hercules requiring it to implement the Remedial Design and Remedial Action for the Off-site ROD, which was signed in September of 1990.

15. In March 1994 EPA issued another UAO pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, to Hercules requiring it to implement the Remedial Design and Remedial Action for the Operable Unit 1 ROD, which was signed in June of 1993.

16. The liability phase of the on-going litigation was completed in October 1994, when the United States was granted a motion for summary judgement against Hercules, Inc., holding it jointly and severally liable to the United States for past and future response costs incurred at the site. The claims made by the United States were against Hercules, Inc., Dow Chemical Company, and Uniroyal under CERCLA Section 107, 42 U.S.C. § 9607, for recovery of costs related to the Vertac site, including EPA removal costs. The claims against Dow and Uniroyal were based on tolling agreements that those companies had with Vertac, where they sent raw materials to Vertac for processing into finished product that was shipped back to them. These tolling agreements constituted arrangements for disposal pursuant to CERCLA Section 107(a)(3), 42 U.S.C. § 9607(a)(3). Prior to a liability phase trial, the United States settled its claims against Dow through a Consent Decree for $3.5 million. Settlements were also reached with Velsicol and the United States on behalf of the Department of Defense.

The only United States claims remaining unresolved after these settlements were those against Uniroyal. The liability phase of the trial against Uniroyal was concluded in November 1993. A jury, sitting both as an advisory jury and a fact-finding jury, returned a verdict finding Uniroyal also liable at the site for CERCLA Section 107 costs, but that its involvement was divisible. To date, the Court has not entered its order addressing the findings of the jury, and the cost phase of the trial has not been initiated.

17. Although not specifically enforcement related, several separate citizens suits were filed seeking to halt incineration of the 29,000 drums of dioxin contaminated still bottom wastes which were stored at the site. They are as follows:

After the incineration contract was finalized, but before the first trial burn, came National Toxics Campaign (NTC), et.al. v. Arkansas Department of Pollution Control and Ecology (ADPC&E), et. al., seeking to enjoin the impending trial burn. After six days of testimony, the trial court denied a preliminary injunction based on the merits. NTC subsequently dismissed its lawsuit in federal court.

Incineration opponents sued again, in State chancery court, on the morning of the same trial burn approved in federal court during the NTC litigation. This suit, Ruby Brown and Sharon Golgan v. ADPC&E, was filed in Pulaski County Chancery Court. The chancellor denied the temporary restraining order on the merits after a hearing that day.

After thousands of D-waste drums had been burned, ADPC&E's director announced that T-waste would be burned after a limited burn of T-waste so that ambient air and incinerator stack data could be evaluated for risk considerations. This announcement brought the lawsuit by the Arkansas Peace Center (APC) et al., in October 1992. During this litigation, control of the incineration passed from State to EPA control, after State funds were exhausted.

The APC litigation resulted in a preliminary injunction (the March 17, 1993, order mentioned above), a subsequent stay of that injunction by the Eighth Circuit based on both jurisdiction and the merits, and eventual dismissal due to lack of jurisdiction.

After denial of a petition for certiorari to the U.S. Supreme Court, plaintiffs filed suit again in chancery court in April 1994. That case was removed to federal court and eventually dismissed. In the dismissal order, the district court found that the lawsuit was barred by CERCLA 113(h), 42 U.S.C. § 9613(h), since the lawsuit was clearly designed to stop incineration. The District Court also found that dismissal was appropriate based on res judicata, i.e., that the same case had already been tried.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

A community relations plan for the Vertac site was put in place in 1983. This plan listed contacts and interested parties within the federal, state, and local governments, various organized affiliations, and local citizens. It also established communication pathways to ensure timely dissemination of pertinent information about site activities. Extensive community outreach has been performed in Jacksonville over the years through the release of information fact sheets, by conducting frequent open houses and work shops, and through numerous meetings with local civic groups and media representatives (newspapers, radio and TV). Reports updating activities at the site are also distributed to the Mayor, interested civic groups, and the local media on a weekly basis. A satellite community relations office was established in Jacksonville in July 1990 to provide easy access to documents and information, and to provide a local contact for questions and concerns.

A Technical Assistance Grant (TAG) was awarded by EPA in 1989 to a citizens group called Jacksonville People With Pride Clean Up Coalition (JPWPCUC). This award was challenged by citizen groups that had competed for the grant and who alleged that JPWPCUC was funded by the Potentially Responsible Parties (PRP's) for Vertac. Upon investigation by EPA, the grant was annulled after it was determined that the JPWPCUC TAG application listed their source of matching funds as a bank account shared with their larger "parent" group, the Jacksonville People With Pride. This parent group had indeed accepted monetary contributions from Vertac PRP's, and since these funds were not distinct from those of JPWPCUC, EPA determined that a possible conflict of interest could exist, resulting in annulment of the TAG in December 1991.

TAG availability was again advertised in January 1992, and the grant was awarded to the Concerned Citizens Coalition (CCC) in April 1993 after considerable effort by EPA to facilitate consolidation of four competing citizen groups. CCC then solicited several technical groups in order to select a technical advisor for the TAG. The Environmental Compliance Organization (ECO) was selected as the technical advisor and actively reviewed site documents for the community.

In February 1995 EPA released the draft feasibility study (FS) for Operable Unit 2, and several meetings were held in Jacksonville with local citizens groups and the press to discuss the various options being considered. The Operable Unit 2 FS was finalized in April 1995, and was made available to the public at five local repositories (Jacksonville City Hall, Public Library, Police Courts Building, Air Force Base Library, and ADPC&E). The official Administrative Record for this Operable Unit is maintained at EPA in Dallas, the Jacksonville City Hall, and the Arkansas Department of Pollution Control and Ecology in Little Rock.

In the feasibility study, EPA assumed that the future land use for the site, based on past land use and existing zoning ordinances, would be commercial/industrial. This reasonably anticipated future use for this site is consistent with EPA's directive "Land Use in the CERCLA Remedy Selection Process," OSWER Directive No. 9355.7-04, May 25, 1995.

On May 25, 1995, EPA held an informal open house in Jacksonville to discuss EPA's proposed plan of action for contaminated soils at the Vertac site. The meeting was well attended by Jacksonville citizens, members of the city government, State Health Department representatives, numerous local civic groups, and the technical advisor for the TAG grant.

At that time, the proposed plan was released to the public for review and comment. Several weeks prior to the informal open house, the EPA project manager met with the local press to discuss the major elements of EPA's proposed plan which received coverage in both local papers and the State paper. At this open house, EPA discussed with the community the anticipated future land use scenario for the site, which formed the basis for EPA's risk assumption. That risk assumption presupposed that the future usage of the site would remain consistent with both past land use and current zoning for the site area, which is commercial/industrial. Therefore, the EPA derived the site's cleanup level of 5 parts per billion (ppb) toxicity equivalents (TEQ) for dioxin due to the fact that a commercial/industrial human exposure scenario assumes that a worker would be exposed to post-cleanup dioxin levels over a 40-hour-per-week period. This worker exposure scenario additionally is protective of a trespasser or a passerby, both of whose exposure period would be less than that of a site worker.

On June 15, 1995, EPA held a formal public meeting in Jacksonville at the community civic center to discuss EPA's proposed cleanup scenario for dioxin-contaminated soils at the Vertac site. At that meeting EPA attempted to address all comments or questions raised concerning the proposed cleanup and formally accepted all public comments. Over 100 citizens attended the meeting, including members from the Jacksonville Chamber of Commerce, Jacksonville City Council, the Mayor, representatives from ADPC&E, and the State Health Department. The comment period for the proposal ran from May 26 through August 11, 1995, after EPA granted two extensions of time. All comments received by EPA prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary section of this Record of Decision. Thus, the requirements of CERCLA Sections 113(k)(2)(B)(i-v) and 117, 42 U.S.C. §§ 9613(k)(2)(B)(i-v) and 9617, were met during the remedy selection process. During both the May open house and the June public meeting, the community indicated its approval and acceptance of EPA's reasonably anticipated land use for the site and the risk assumptions based on that anticipated future land use.

EPA's original proposal for remediation of soils, foundations and underground utilities at Vertac was presented to the community at an informal open house held in Jacksonville on May 25, 1995. At that time EPA's preferred alternative called for the off-site incineration of dioxin-contaminated hot spots and on-site landfilling of dioxin contaminated soils that exceeded a site-specific commercial/industrial exposure level. Under this scenario approximately two-thirds of the site would have potentially been available for future commercial reuse.

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Following the release of the original Proposed Plan for OU2 in May 1995 and the subsequent community meetings, EPA Administrator Carol M. Browner issued a series of administrative reforms for the Superfund Program on October 3, 1995. One purpose of the reforms was to control remedy costs and to promote cost effectiveness, and the reforms directed EPA to base site cleanup decisions on practical future land usage and reasonable contaminant exposure scenarios.

As a result of those reform measures, and due to the ongoing deadlock over the Federal budget occurring at the time, Region 6 revised the proposed plan of action for OU2. The Supplemental Proposed Plan was issued on February 26, 1996, and presented to the public at an Open House on March 5, 1996. The Supplemental Proposed Plan for OU2 eliminated the off-site incineration component of the original proposed plan, included capping in-place soils having dioxin contamination between 5 to 50 ppb, and proposed on-site landfilling of soil contaminated with dioxin in excess of 50 ppb. The community objected strongly to the Supplemental Proposed Plan.

After the March 5, 1996, Open House, EPA representatives conducted numerous meetings with several community groups to listen to the concerns of the local residents. Following the March 5, 1996, release of EPA's Supplemental Proposed Plan for OU2, EPA held another comment period to accept formal public comment on the supplemental plan. The response to these comments is contained separately from the original responsiveness summary in the "Supplemental Responsiveness Summary," which is included as Attachment B to this document. Subsequently, EPA conducted another open house on July 30, 1996, to present to the public the remedial elements it had reconsidered and currently held under consideration at the time. In general, EPA has responded to community concerns and has reevaluated the OU2 FS and the two proposed plans, and the elements discussed during the July 30, 1996, Open House are now contained in this ROD.

4.0 SCOPE AND ROLE OF OPERABLE UNIT

The problems at the Vertac Superfund site are complex, and the EPA has determined that site remediation can be accomplished most efficiently in six phases. This ROD addresses one of the six cleanup phases, i.e., Operable Unit 2, which consists of on-site soils, off-site soils and sediments, underground utility lines, building and equipment foundations, curbs, and pads.

The studies undertaken at the Vertac Superfund site for Operable Unit 2 media have identified the soils at the site to be a low-level threat in light of all the media being remediated at the site. EPA has made that determination with respect to the site soils and associated debris, which includes contaminated media having similar dioxin contamination levels. Those media

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include treatment residues from the on-site incineration of D-waste, dioxin-contaminated drums, containers, pallets, personal protective clothing and equipment, process equipment and structures, and sludges and sediments associated with historical treatment of wastewaters. EPA has defined these media as constituting low-level threats in contrast to principal threats.

Generally, EPA associates principal threats with liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials that generally cannot be reliably contained. See NCP Section 300.430(a)(iii)(A), 40 CFR § 300.430(a)(iii)(A). Low-level threat wastes are those source materials that can be reliably contained and that would pose only a low risk in the event of a release. Wastes that generally are considered to constitute a low-level threat include surface soils containing contaminants of concern that are relatively immobile in air or ground water, i.e., non-liquid, low volatility, and low leachability. See "A Guide to Principal Threat and Low Level Threat Wastes," November 1991, OSWER Directive No. 9380.3-06FS. That guidance document states where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} (1 in 1,000 excess cancer deaths) or greater, treatment alternatives generally should be evaluated. In addition, NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B), in characterizing EPA's remedial program expectations, states:

> EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable.

Therefore, on-site consolidation within a RCRA Subtitle C hazardous waste landfill is appropriate for these low level threat dioxin-contaminated media because EPA's threat guidance would only direct EPA to consider other treatment alternatives where those media would constitute a principal threat. Such a determination would only arise when the overall dioxin concentration would exceed 5,000 ppb (three orders of magnitude above the 5 ppb dioxin cleanup level identified in its site-specific risk assessment as protective for commercial/industrial exposures).

The concentrations of dioxin present in Vertac soils are generally an order of magnitude lower than the concentrations found in the dioxin-containing liquids (both drummed still bottom wastes and process tank sludges), and as such, are identified as a low-level threat based on relative concentration to other site media. The dioxin in the Vertac soils also fit the definition of a low-level threat due to the fact that they are relatively immobile except through sediment transport, i.e., soil migration from rainwater runoff. Dioxins are characterized as having a very low solubility in water and a very low vapor pressure (they do not readily leach to ground water or vaporize to the air). In addition, numerous studies have also shown that dioxin binds tightly to fine-grained and organic-rich soils, further reducing its mobility.

Dioxin, however, is considered to be a highly toxic compound, and if left unremediated would continue to present a serious threat to the public health and the environment due to the potential for cancer and noncancer effects, and would also continue to present potential long term threats to the environment from the migration of contaminants off-site through various sediment transport mechanisms.

Remedial action objectives have been developed to address the compounds of concern at this site, namely, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD or dioxin) and other dioxin and furan congeners, chlorobenzene, chlorophenoxyherbicides, chlorophenols, and toluene. The remedial action objectives are formulated in such a way that residual contaminant concentrations in the media of concern are reduced or controlled to a level where exposure of an environmental receptor to the contaminants does not result in an unacceptable carcinogenic risk or an adverse toxic response when considering the reasonably anticipated land use intended for the site. EPA's risk assumption for OU2 presupposed that the future usage of the site would remain consistent with past land use and the current zoning for the site area, which is commercial/industrial. Therefore, the EPA derived the site's cleanup level of 5 parts per billion (ppb) toxicity equivalents (TEQ) for dioxin due to the fact that a commercial/industrial human exposure scenario assumes that a worker would be exposed to post-cleanup dioxin levels over a 40-hour-per-week period. This worker exposure scenario additionally is protective of a trespasser or a passerby, both of whose exposure period would be less than that of a site worker.

The remedial action objectives, developed to address the low-level threats present at the site, which are applicable to the OU2 media are as follows:

- Prevent exposure of future site workers to concentrations of site contaminants in surface soils that remain following remedial activities which would result in an excess lifetime cancer risk greater than 1 in 10,000 to 1 in a 1,000,000.

- Complete the soils remedial action activities to result in average dioxin concentrations no greater than 1 ppb.

- Prevent exposure of future site workers to concentrations of site contaminants that would result in an adverse toxic response.

- Prevent off-site environmental receptors from exposure to site contaminants that would result in an adverse toxic response.
- Prevent/control dust generation during remedial activities and/or removal activities to the maximum extent practicable.
- In concert with OU3 (ground water) remedial activities, prevent potential contamination of the on-site and off-site ground water by releases from below-ground portions of the plant, and
- Destroy and/or contain hazardous substances generated by the remediation.

Following is a description of the six cleanup phases or operable units that are currently in progress, or have been completed at the Vertac site. Collectively, the completion of all six phases is intended to address all environmental risks posed by the site.

Phase 1 The "VERTAC REMEDY"

ADPC&E issued an order in 1979 that required Vertac, Inc., to improve its hazardous waste practices, and in 1980 EPA and ADPC&E jointly filed suit in federal district court against Vertac, Inc., and Hercules, Inc. A Consent Decree entered into by EPA, ADPC&E, Vertac, and Hercules in January 1982 required an independent consultant to assess the conditions of on-site wastes and to develop a proposed disposal method for the wastes. The proposal, called the "Vertac Remedy", was deemed by EPA to be unsatisfactory and EPA returned to court in early 1984 for a resolution. The court decided in favor of the proposed remedy, which was implemented in the summer of 1984 and completed in July 1986.

As part of the remedy, the Vertac plant cooling water pond and the equalization basin were closed and sediments from these units were removed and placed into an excavated area where earlier operators had buried drums of waste. The burial area was capped and a French drain and leachate collection system were installed around the burial areas. Ground water monitoring wells were also installed and a ground water monitoring program was initiated.

Phase 2 DRUMMED WASTE INCINERATION

In 1989, ADPC&E signed a contract to have approximately 29,000 barrels of 2,4-D and 2,4,5-T herbicide still bottom wastes incinerated on-site. Wastes from the production of 2,4,5-T at this site have been found to contain up to 50 ppm of dioxin, while wastes from the production of 2,4-D generally contain dioxin in the low parts per billion range. All drummed wastes are treated as F-listed (dioxin containing) wastes pursuant to the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 <u>et seq.</u>

To accomplish this incineration, the State used funds from the trust fund that was established when Vertac went bankrupt. Incineration of these wastes began in fall 1990. In June 1993, funding for the project was depleted and EPA assumed immediate responsibility for incinerating the remaining drums as a time-critical removal action undertaken pursuant to CERCLA Section 104, 42 U.S.C. § 9604. In late September 1994, the incineration of 25,179 drums of dioxin-contaminated 2,4-D waste was completed at the Vertac site. In July 1995 EPA announced that it would pursue the off-site incineration of approximately 3,200 drums of dioxin containing 2,4,5-T waste located at the Vertac site. On November 9, 1994, a contract was signed between the APTUS commercial incineration facility in Coffeyville, Kansas, and EPA's prime contractor URS Consultants, to accept the Vertac drummed T-waste material. The first shipment of T-waste went to APTUS in November 1994, and the last shipment was sent off-site on March 29, 1996.

Phase 3 VERTAC OFF-SITE AREAS

A Record of Decision (ROD) was signed in September 1990 to address the cleanup of contiguous off-site areas that were contaminated as a result of untreated and partially treated surface and underground discharges of plant wastewater and other releases. Elements of this operable unit include an active sewer interceptor and an abandoned sewer interceptor, portions of an old abandoned trickling filter wastewater treatment plant, an active West Wastewater Treatment Plant, and the Rocky Branch Creek flood plain. The selected remedy called for removing sediments from the active sewer interceptor, installing pipe liners in the clean sewer, filling the abandoned interceptor with grout, and removing sludge from the sludge digester in the old wastewater treatment plant. Sludge drying beds in the old wastewater treatment plant were capped with one foot of clean soil and the aeration basin in the old wastewater treatment plant was drained and demolished. Flood plain soils along Rocky Branch Creek that are contaminated with dioxin in excess of one part per billion (ppb) will be excavated for treatment at Vertac. Monitoring of fish in Rocky Branch Creek and Bayou Meto for dioxin will continue.

As EPA proceeded with overall site remediation, it concluded that it was appropriate to defer the disposal of the contaminated soil and debris addressed in the 1990 Off-Site Areas ROD to make the disposal of excavated off-site soils and debris consistent with the disposal of on-site soils and debris. All other elements of the off-site remedial action, except for the above-mentioned off-site soils and debris disposal and the excavation of flood plain soils were completed in November 1995.

Hercules has completed the remedial design and has started the remedial action under the terms of a Unilateral Administrative Order issued in July 1993. The Order requires Hercules to conduct the remedial design and remedial action to implement the selected remedy, except the on-site incineration of soils excavated from the Rocky Branch Creek flood plain and contaminated sludges and debris from sewage treatment plant and sediments from the interceptor lines was deferred to make the disposal of excavated off-site soils consistent with the disposal of on-site soils. All off-site remedial actions (except for the excavation of flood plain soils) were completed in November 1995. The excavation of the flood plain soils is expected to be completed in early 1997.

Phase 4   ON-SITE ABOVE GROUND MEDIA (Operable Unit #1)

A ROD for the above ground media was signed in June 1993. The above ground media include buildings, process equipment, leftover chemicals in the process vessels, spent activated carbon, shredded trash and pallets, and miscellaneous drummed wastes at the site. The selected remedy consisted of: (1) On-site incineration of F-listed process vessel contents, spent carbon, shredded trash and pallets, and miscellaneous drummed wastes; (2) off-site incineration of PCB transformer oils and non- F-listed process vessel contents; (3) recycle/reuse of decontaminated process equipment to the maximum extent practicable; (4) on-site consolidation of debris resulting from demolition of buildings and equipment that cannot be recycled/reused in a RCRA subtitle C landfill; (5) the deferral of a decision on the treatment of approximately 2,770 cubic yards of TCDD-contaminated residential soils Hercules, Inc., had excavated as a removal action in 1990 from contiguous residential areas south of the site; (6) disposal of treatment residues consistent with disposal of ash and salt that was generated by the incineration of drummed wastes at the site; and, (7) the construction of a RCRA Subtitle C landfill on-site.

A Unilateral Administrative Order (UAO) was issued to Hercules, Inc., in March 1994 requiring it to perform the remedial design and remedial action under the ROD for OU1. Hercules' remedial design work plan has been approved. Part of the work plan expressed interest in pursuing off-site incineration as the means to perform the actions under the ROD. Therefore, Hercules has signed a contract with APTUS, an off-site commercial hazardous waste incineration facility. An Explanation of Significant Difference (ESD) was issued in May 1995 by EPA to allow such off-site incineration. Hercules has completed off-site incineration of F-listed and non- F-listed liquids and solids that were present in the process vessels. The remedial design is expected to be complete by the end of 1996. Hercules has commenced construction of the on-site RCRA Subtitle C landfill, with completion expected in November 1996. Also, Hercules has commenced the off-site shipment of activated carbon that was used for the treatment of leachate and storm water, which should be completed by the end of 1996. All remedial actions for this Operable Unit are expected to be completed by the end of 1997.

Phase 5 SOILS AND UNDERGROUND UTILITIES (Operable Unit 2)

Operable Unit 2 (OU2) media are the subject of this ROD, which addresses surface and subsurface soils, underground utilities, foundations, curbs and pads. In addition, in conjunction with an amendment to the 1990 Off-Site Areas ROD, the ROD for OU2 addresses media originally intended to be addressed by the 1990 Off-Site Areas ROD, which consist of contiguous soils from the Rocky Branch Creek flood plain, sludge from the Old Sewage Treatment Plant sludge digester, and the sediment from the associated interceptor lines (which are considered to be contiguous to the site due to the continuous connection to the site via the sewer interceptor). Finally, the ROD for OU2 also addresses bagged soils Hercules had excavated from contiguous residential yards in 1990 as part of a removal action, the treatment of which EPA deferred in the OU1 ROD.

Because of the similarity of OU2 media to the media from the 1990 Off-Site Areas ROD and contiguous off-site residential soils Hercules had excavated during a 1990 removal action, EPA has chosen to address them in the OU2 ROD so that similar waste materials associated with the Vertac site would be treated in a consistent manner.

The 1990 Off-site Areas ROD called for the excavation and incineration of soils in the flood plain area along Rocky Branch Creek that had a 2,3,7,8-TCDD concentration greater than 1 ppb. The estimated volume of flood plain soils is approximately 4,100 cubic yards. The 1990 Off-site Areas ROD also called for the incineration of sludges removed from the digester and sediments from the interceptor that connected the Old Sewage Treatment Plant to the Vertac facility. The approximate volume of sludges from the digester is 800 cubic yards, and the approximate volume of sediments from the interceptor line is 2 cubic yards. The ROD for OU1 deferred the treatment decision for the bagged soils removed from residential yards as a part of a removal action in 1990. The total volume of bagged soil is estimated at 2,770 cubic yards. The final disposition of these materials will be discussed in detail in Sections 7 and 9.

Phase 6 GROUND WATER (Operable Unit #3)

Hercules completed the Remedial Investigation/Feasibility Study (RI/FS) for this phase of the site cleanup in September 1995. Remedy selection is expected to occur in September 1996.

Ground water remediation at the Vertac site will pose certain technical challenges due to the combination of complex subsurface geology (tilted, fractured bedrock), and the presence of dense nonaqueous phase liquids (DNAPL's). Ground water is generally contaminated with chlorophenols, chlorophenoxyherbicides, and dioxin. More detailed information on groundwater will be provided in the ROD for the Groundwater Operable Unit (OU3).

5.0 <u>SUMMARY OF SITE CHARACTERISTICS</u>

5.1 DEMOGRAPHY AND LAND USE IN THE AREA OF THE SITE

The Vertac site covers approximately 192 acres on Marshall Road within the city limits of Jacksonville, Arkansas, population 29,000. Approximately 1,000 residents live within one mile of the site with residential areas bordering the entire east and south sides. The west and northern sides of the site are bounded by an industrial area and the Little Rock Air Force Base.

The Vertac site is currently zoned for industrial use and has been used for commercial/industrial operations for approximately 50 years. Land use zoning near the Vertac plant is shown in **Figure 3**. The area just south of the Vertac site, between Marshall Road and the Missouri-Pacific railroad tracks, south to West Main Street, is a residential area made up of both single family homes and apartments. The area immediately west of the railroad tracks and north of West Main Street has recently been developed and supports several light industries. The area between West Main Street and South Redmond Road is commercial and light industrial. Just south of South Redmond Road is undeveloped land that includes the Jacksonville Sewage Treatment Plant, DuPree Park, and Lake DuPree. On to the south, the rest of the area consists predominantly of irrigated rice fields and woodlands.

As discussed in Section 4.0 above, EPA has evaluated the past land use for the site, the current land use scheme for the area surrounding the site determined by zoning ordinances, and has held discussions with City of Jacksonville officials and residents regarding land use. Based on this evaluation, EPA has concluded that the reasonably anticipated future land use for the site is commercial/industrial. Thus, EPA derived its site-specific risk assessment based on that reasonably anticipated future land use.

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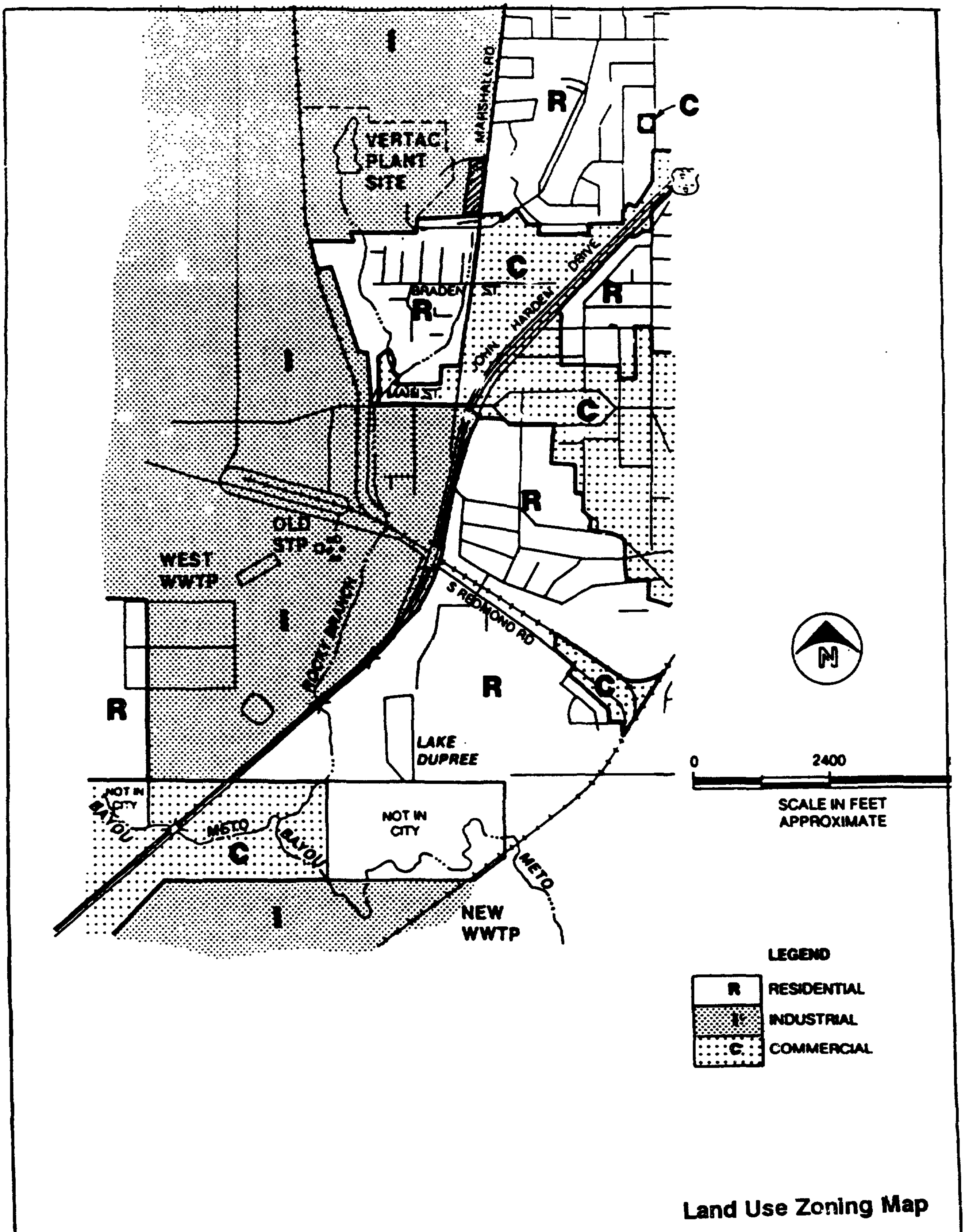

FIGURE 3

5.2 SOILS AND GEOLOGY

5.2.1 Soils

Soils in the area of the plant are classified as the Leadvale-Urban land complex with a 1 to 3 percent slope. The Leadvale series soils are composed of moderately well-drained soils in valleys, formed mainly of loamy sediment and washed from uplands consisting of weathered shale, siltstone and sandstone, such as those that underlie the site. Leadvale soils are generally described as having moderately low permeability and a seasonally perched water table. The Leadvale-Urban land complex consists of areas of Leadvale soils that have been modified by urban development. Because of the extensive development and earth-moving activities at the site, natural soil characteristics have been obscured.

5.2.2 Geology

The site lies in the transition zone between the Coastal Plain and the Interior Highlands Physiographic Province. The surficial geology of the Coastal Plain Province in the region surrounding the site is dominated by westward thinning wedge of unconsolidated sediment consisting of the Tertiary Age Clairborne Group, Wilcox Group, and Midway Formation.

The Clairborne Group and the Wilcox Group are undifferentiated along the fall line that occurs in the site area. The wedge onlaps the Rocks of Pennsylvanian Age lower Atoka Formation, which dominate the geology of the Interior Highlands Province in the region surrounding the site. Quaternary alluvium and terrace deposits occur locally along drainages in both provinces and are more common in the Coastal Plain Province. A generalized summary of the geologic formations surrounding the site is presented in **Table 1**. A map of the site geology is presented in **Figure 4**.

The contact between the Tertiary Age sediments and the Pennsylvanian Age rocks occurs along a regional trend northeast to southwest and is present in the area of the site. On a local scale, the trend of the contact depends on the current erosional surface and the paleotopographic surface of the Atoka Formation. The strike of the Wilcox Group Sediments and the Midway Formation tends toward the northeast-southwest. The dip of the sediments is low and oriented toward the southeast. The Midway Formation was deposited onto the irregular and weathered surface of the Atoka Formation, which was folded and fractured during the late stages of the Alleghenian orogeny. The Atoka Formation was later uplifted and weathered. In the area of the site, the strike of the beds in the Atoka Formation trends N70°W and dips about 35°NE. The Atoka Formation outcrops along Rocky Branch Creek on the western side of the property.

TABLE I

ERA	SYSTEM	SERIES	SUBDIVISION	THICKNESS (FEET)	LITHOLOGY	WATER SUPPLY
CENOZOIC	QUARTERNARY	HOLOCENE	ALLUVIUM	0-50	RED TO GRAY CLAY; OCCASIONALLY SILTY TO SANDY	GENERALLY NON-WATER BEARING; DOMESTIC SUPPLIES AVAILABLE FROM BASAL UNITS
		PLEISTOCENE	ALLUVIUM AND TERRACE DEPOSITS	0-156	BASAL SAND AND GRAVEL OVERLAIN BY FINE SAND, SILT AND CLAY	BASAL SANDS AND GRAVELS YIELD UP TO 2000 GPM; MOST IMPORTANT AQUIFER IN AREA
	TERTIARY	EOCENE	CLAIBORNE GROUP	0-700	WHITE TO LIGHT GRAY, FINE TO MEDIUM SAND; GRAY TO TAN CLAY AND SANDY CLAY	NOT WELL DEVELOPED
			WILCOX GROUP	0-800	SPECKLED LIGHT GRAY AND BLACK TO BROWN CLAY; LIGNITIC CLAY AND LIGNITIC FINE SAND	NOT WELL DEVELOPED
			TERTIARY UNDIFFERENTIATED NEAR FALL LINE	0-219	YELLOWISH TO REDDISH-BROWN MOTTLED/CLAYEY SAND AND SANDY CLAY; MOTTLED GRAY UNDER REDUCING CONDITIONS	CLEAN SAND BEDS YIELD DOMESTIC SUPPLIES
		PALEOCENE	MIDWAY FORMATION	0-500	DARK BLUE-GRAY TO BLACK NONCALCAREOUS TO VERY CALCAREOUS CLAY; OCCASIONAL THIN BEDS OF WHITE CLAY AND DENSE, FINE GRAINED SANDSTONE	GENERALLY NON-WATER BEARING
MESOZOIC	CRETACEOUS	UPPER CRETACEOUS	UNDIFFERENTIATED	0-500	LIGHT GRAY TO WHITE, CALCAREOUS, FOSSILIFEROUS, GLAUCONITIC SANDSTONE; OVERLAIN AND UNDERLAIN BY SANDY CLAY SHALE AND MARL	DEEPLY BURIED; SALINE WATER
PALEOZOIC	PENNSYLVANIAN	ATOKA	ATOKA FORMATION	500-1500	INTERBEDDED SHALE AND SANDSTONE; SANDSTONE TIGHTLY CEMENTED	WATER BEARING IN OUTCROP ONLY; DOMESTIC SUPPLIES UP TO 10 GPM

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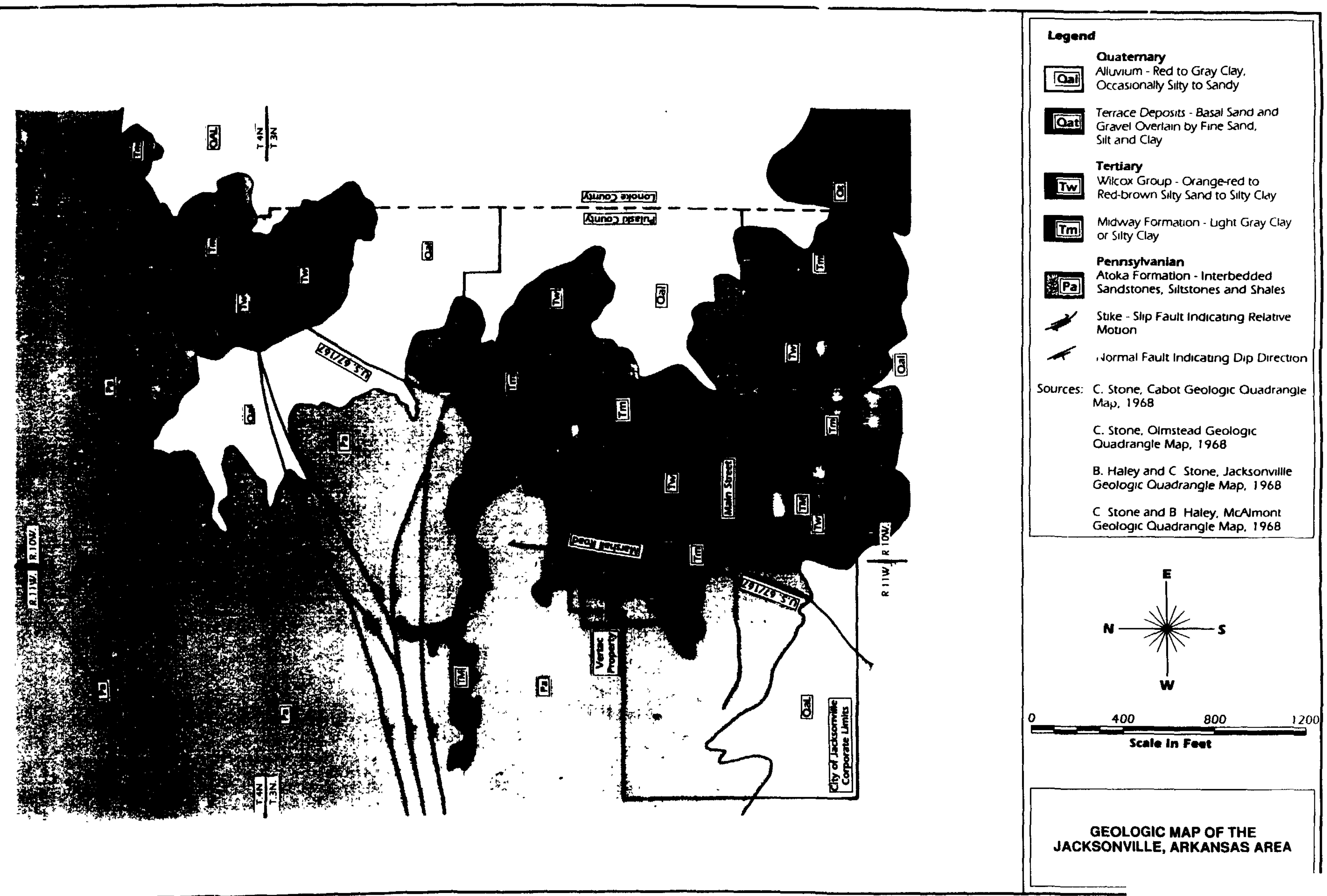
SUMMARY OF SELECTED GEOLOGIC FORMATIONS AND WATER - YIELDING CHARACTERISTICS FOR REGION SURROUNDING VERTAC SITE

From Peer Consultants, 1990
Modified after Counts (1957)
Plebuch (1960)

FIGURE 4



Legend
Quaternary
Qal
Alluvium - Red to Gray Clay, Occasionally Silty to Sandy
Qat
Terrace Deposits - Basal Sand and Gravel Overlain by Fine Sand, Silt and Clay
Tertiary
Tw
Wilcox Group - Orange-red to Red-brown Silty Sand to Silty Clay
Tm
Midway Formation - Light Gray Clay or Silty Clay
Pennsylvanian
Pa
Atoka Formation - Interbedded Sandstones, Siltstones and Shales
Strike - Slip Fault Indicating Relative Motion
Normal Fault Indicating Dip Direction
Sources: C. Stone, Cabot Geologic Quadrangle Map, 1968
C. Stone, Olmstead Geologic Quadrangle Map, 1968
B. Haley and C. Stone, Jacksonville Geologic Quadrangle Map, 1968
C. Stone and B. Haley, McAlmont Geologic Quadrangle Map, 1968
E
N
S
W
0
400
800
1200
Scale in Feet
GEOLOGIC MAP OF THE JACKSONVILLE, ARKANSAS AREA
Lonoke County
Pulaski County
T4N
T3N
R.11W.
R.10W.
U.S. 67/167
Main Street
Marshall Road
Vertac Property
City of Jacksonville Corporate Limits
M324-4097

5.3 HYDROLOGY

5.3.1 Surface Water

Because of the potential for surface runoff to transport potentially contaminated soils off of the site, previous remedial actions included the installation of sumps to collect the first flush of surface water runoff from the central process area for treatment. After treatment, this water is discharged to Rocky Branch Creek. Runoff that exceeds the capacity of the sumps currently flows to the Rocky Branch Creek. This ROD will in part address potentially contaminated sediments that bypass the sumps after they are inundated by heavy rains. See Section 7.2, Storm Water Runoff Control.

There are two major drainageways in the area, Rocky Branch Creek, and Bayou Meto, which is a tributary to the Arkansas River. Rocky Branch Creek flows through the part of the site west of the central process area. Approximately 2 miles downstream, Rocky Branch Creek flows into Bayou Meto.

Surface drainage ditches on the western part of the site direct local runoff westward toward Rocky Branch Creek. An earthen dam was constructed across the creek in the early 1950's to form a cooling water pond that was used to supply non-contact cooling water to the plant.

At its maximum extent, the pond extended to a distance of about 1,000 feet north of the dam. The pond was adjacent to the north burial area. The dam was removed and the cooling water pond was closed in July 1985. Rocky Branch Creek was diverted around the location of the former cooling water pond as a part of the pond closure. The diversion is maintained today by an earthen dike along the eastern side of the creek.

Surface water runoff from the eastern part of the central process area, including the central ditch that transects the central process area, is contained in drainage ditches that divert the initial runoff to sumps. The sumps are connected to the wastewater treatment plant, which uses activated granular carbon to treat the water.

Surface drainage ditches in the northeastern part of the site direct runoff eastward toward a primary ditch that lies along the western side of Marshall Road. This ditch directs water toward Rocky Branch Creek south of the site.

5.3.2 Ground Water

This ROD does not address the ground water issue. The Operable Unit 3 ROD, scheduled for September 1996, will address ground water contamination.

Ground water in the region surrounding the site occurs in both the overburden and the underlying bedrock. The overburden and bedrock are generally not considered as major sources of ground water near the site. Ground water supplies in the region are obtained from the unconsolidated sands and gravels in the Tertiary and younger Quaternary sediments. Most ground water is produced from wells completed in the sands within the Wilcox Group and basal sands and gravels within the Pleistocene alluvium and terrace deposits. Yields from these deposits can range up to 2,000 gallons per minute (gpm). Ground water in the unconsolidated sediments is present in the primary intergranular pore space. Some domestic ground water supplies are obtained from the Atoka Formation. Yields can range up to 10 gpm. Ground water in the bedrock is present in fractures and partings within the rock.

The hydrology in the area of the site is influenced by the location of Rocky Branch Creek, the French drain, the central ditch, and the hydraulic characteristics of the overburden, weathered rock, and bedrock.

5.4 REMEDIAL INVESTIGATION FINDINGS

5.4.1 Background

Site investigations and remedial actions have been performed at the site since 1978. **Figure 5** shows an overview of the remedial action performed at the site to date, mostly involving the closing of a cooling water pond, capping old landfills and burial areas, and the installation of a french drain leachate collection system around the landfills and an on-site wastewater treatment plant. Hercules, Inc., completed the RI for OU2 Phase 1 in December 1992 which addressed surface and subsurface soils, shallow ground water, and underground structures such as underground utilities, foundations, curbs, pads and fuel storage tanks. The USTs have since been addressed. Hercules, Inc., emptied these underground storage tanks (USTs) and filled them with grout. The OU2 Phase 2 RI, completed in September 1995, principally addressed deep ground water contamination and some additional soil investigation in the northern part of the site. Ground water has since been split off into a separate operable unit (OU3) for the purpose of expediting the completion of the soils and underground structures remediation effort and is not a part of this ROD.

The RI for OU2 has shown that the nature and levels of contaminants found in the soils at the site tend to parallel particular process areas of the plant. The central process area of the site has been divided into 10 subareas based on operational activities (see **Figure 6**). They include the following:

FIGURE 5

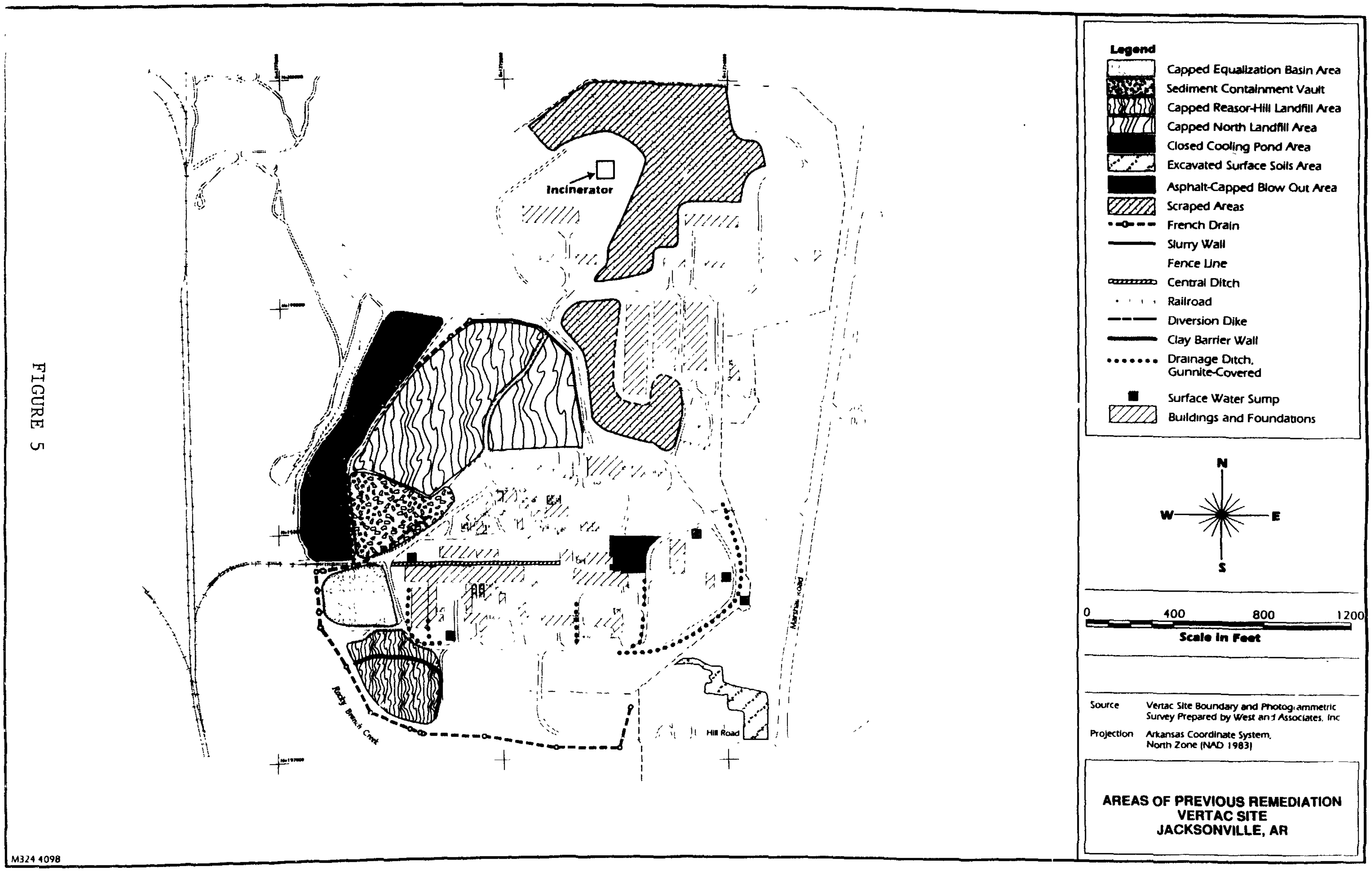
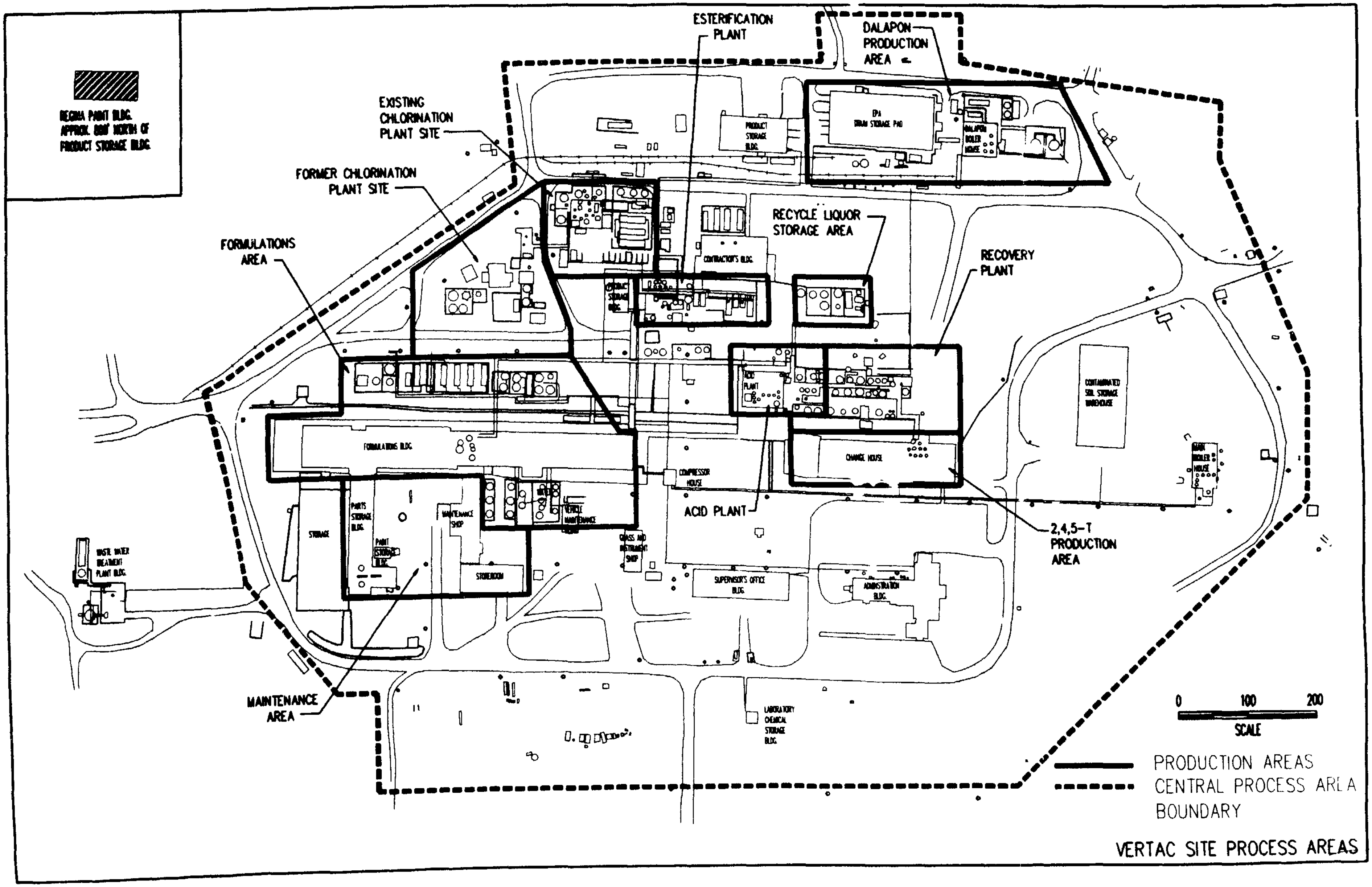

Legend
Capped Equalization Basin Area
Sediment Containment Vault
Capped Reasor-Hill Landfill Area
Capped North Landfill Area
Closed Cooling Pond Area
Excavated Surface Soils Area
Asphalt-Capped Blow Out Area
Scraped Areas
French Drain
Slurry Wall
Fence Line
Central Ditch
Railroad
Diversion Dike
Clay Barrier Wall
Drainage Ditch, Gunnite-Covered
Surface Water Sump
Buildings and Foundations
Incinerator
Rocky Branch Creek
Hill Road
N
W
E
S
0
400
800
1200
Scale in Feet
Source Vertac Site Boundary and Photogrammetric Survey Prepared by West and Associates, Inc
Projection Arkansas Coordinate System, North Zone (NAD 1983)
AREAS OF PREVIOUS REMEDIATION
VERTAC SITE
JACKSONVILLE, AR
M324 4098

FIGURE 6



REGINA PAINT BLDG. APPROX. 800' NORTH OF PRODUCT STORAGE BLDG.
ESTERIFICATION PLANT
DALAPON PRODUCTION AREA
EXISTING CHLORINATION PLANT SITE
FORMER CHLORINATION PLANT SITE
FORMULATIONS AREA
RECYCLE LIQUOR STORAGE AREA
RECOVERY PLANT
PRODUCT STORAGE BLDG.
EPA DRUM STORAGE PAD
CONTRACTOR'S BLDG.
FORMULATIONS BLDG.
COMPRESSOR HOUSE
CHANGE HOUSE
CONTAMINATED SOIL STORAGE WAREHOUSE
MAIN BOILER HOUSE
ACID PLANT
2,4,5-T PRODUCTION AREA
STORAGE
STOREROOM
SUPERVISOR'S OFFICE BLDG.
ADMINISTRATION BLDG.
MAINTENANCE AREA
0
100
200
SCALE
PRODUCTION AREAS
CENTRAL PROCESS AREA BOUNDARY
VERTAC SITE PROCESS AREAS

- Maintenance Area - used for equipment repairs and storage of equipment, parts, and some raw materials.

- Formulations Area - used for the storage of raw and finished products (large warehouse and some process vessels).

- Former Chlorination Plant Area - used in manufacturing 2,4-D herbicide.

- Existing Chlorination Plant Area - built in early 1980's and replaced old chlorination plant.

- Esterification Plant - used to add alcohols to increase solubility of the herbicide to water.

- Dalapon Production Area - used in manufacturing dalapon (1,1,1-trichloropropionic acid).

- Recycle Liquor Storage Area - used for the storage of manufacturing materials such as recycle liquor, caustic soda, and spent solvents. Currently used to store drums generated by ongoing site activities.

- Recovery Plant - used in the treatment of process wastes. 2,4-D waste were recovered, and drums containing 2,4-D were washed.

- 2,4,5-T Production Area - used in manufacturing of 2,4,5-T herbicide.

- Acid Plant - chlorophenols were reacted with acetic acid and monochloroacetic acid to form phenoxyacetic acid herbicides.

The area around the Regina Paint Building, located in Parcel 1 (north area of the site) is included in OU2 because the building was used to store empty drums that had been used to handle or store wastes from the manufacture of 2,4,5-T.

The media addressed in the OU2 RI include:

- Surface soils
- Subsurface soils
- Tetrachlorobenzene (TCB) spill area
- Underground utilities
- Building Foundations and Curbed Areas
- Underground Storage Tanks (USTs)

The USTs have since been addressed. Hercules, Inc., emptied these USTs and filled them with grout. Therefore, they will not be addressed in this ROD.

Other media that will also be addressed in this ROD include;

- Off-site soils from Rocky Branch Creek flood plain (1990 ROD).

- Sludge from the Old Sewage Treatment Plant sludge digester, and sediments from the interceptor line. (1990 ROD).

- Bagged soils excavated from residential yards (1993 ROD).

Remediation of the off-site soils, sludges from the off-site sewage digester and sediments from the interceptor line, and bagged soils from a residential removal action were originally addressed by EPA as response elements in previous ROD's and removals. However, because of the similarities of these media, and the wish to treat similar media in a consistent manner, EPA now will address these media with the on-site soil media.

The ROD for the off-site area, dated September 1990, called for the excavation and incineration of soils in the flood plain area along Rocky Branch Creek that had a 2,3,7,8-TCDD concentration greater than 1 ppb. The estimated volume of flood plain soils is approximately 4,100 cubic yards. The off-site ROD also called for the incineration of sludges removed from the digester at the Old Sewage Treatment Plant and sediments from the interceptor line. The approximate volume of sludges from the digester is 800 cubic yards and the sediments from the interceptor line is about 2 cubic yards. The ROD for OU1 deferred the treatment decision for the bagged soils removed from residential yards as a part of a removal action in 1990. The total volume of bagged soil is estimated at 2,770 cubic yards.

5.4.2 Sampling Results for Surface Soils

During the period between 1989 and 1992 approximately 461 grids were established for the purpose of determining the level of contaminants present across the site. EPA, IT Corporation, Hercules, Vertac Site Contractors, and Weston (contractor for Hercules) were principally responsible for the collection of this information (see **Figures 7, 8, and 9**; early grid sampling, surface grid locations in the central process plant area, and surface soils sampling outside the central process plant area, respectively).

Over 180 grids were sampled under the OU2 Phase 1 RI. The majority of the grids were located in the central process area and were approximately 5,000 square feet. These grids were sampled for 2-chlorophenol, 4-chlorophenol, 2,4-dichlorophenol, 2,6-dichlorophenol, 2,3,6-trichlorophenol, 2,4,5-trichlorophenol, 2,4-D, Silvex, 2,4,5-T, and 2,3,7,8-TCDD. Grids outside the

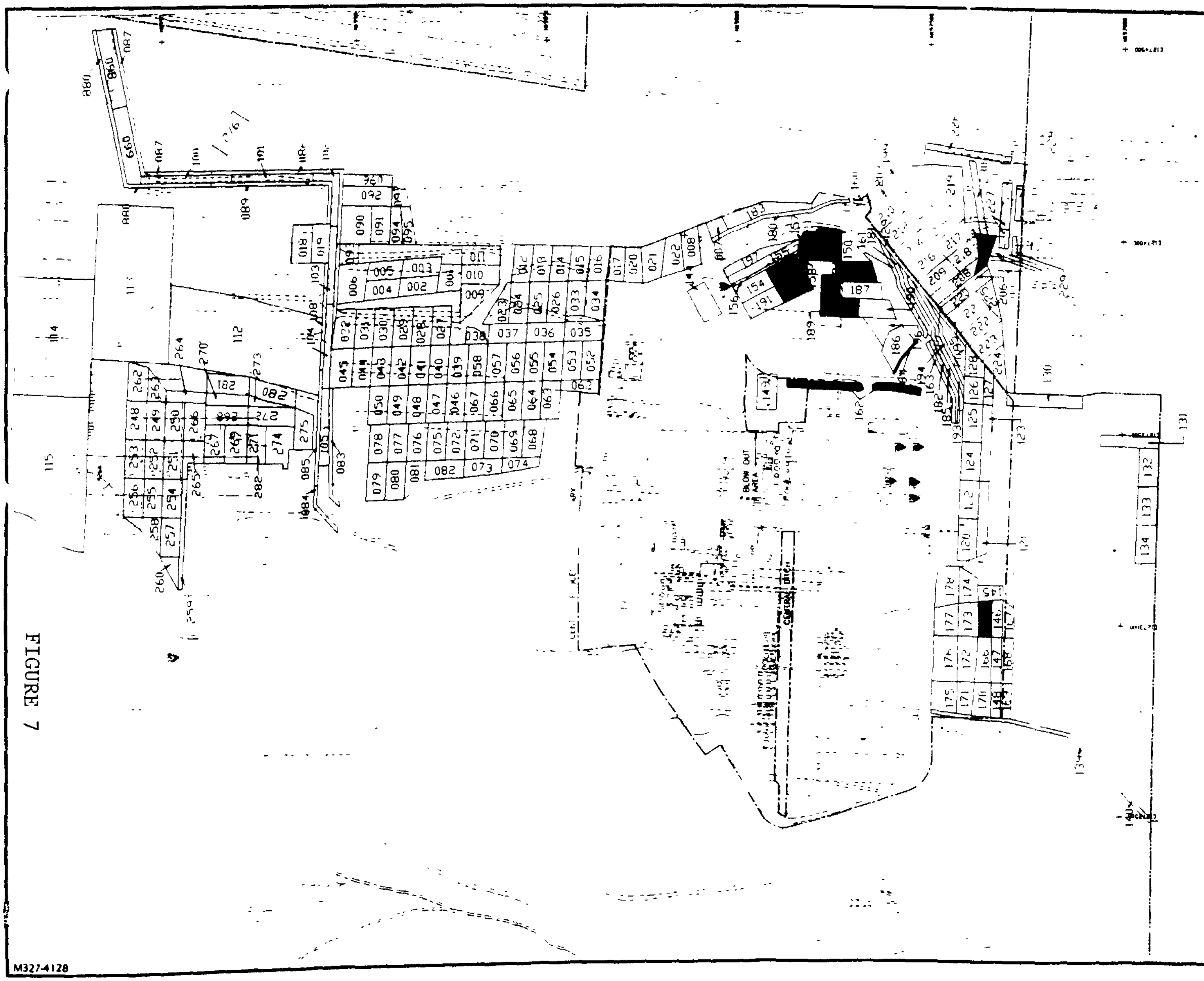


FIGURE 7

M327-4128

Legend

- 001 — U S Environmental Protection Agency Surface Soil Sampling Grid and Number. Numbers for EPA Grids and Grab Samples Range from 001 Through 282
- 159 — U S Environmental Protection Agency Surface Grab Sampling Location and Number
- 800 — International Technology Surface Soil Sampling Grid and Number. Numbers for International Technology Grids Range from 800 Through 820
- 900 — Vertac Site Contractors Surface Soil Sampling Grid and Number. Symbol Represents Grab Sampling Location and Number. Numbers for Vertac Site Contractors Grids Range from 900 Through 949
- X 926A — Vertac Site Contractors Surface Soil Grab Sampling Location and Number
- Grids Where Elevated Concentrations (>20 ppb) of 2,3,7,8-TCDD Were Found
- Central Process Area Boundary
- Property Boundary

N S E W

0 250 500 750

Scale In Feet

Source: Vertac Site Boundary and Photogrammetric Survey Prepared by West and Associates, Inc.

GRIDS FROM PREVIOUS SURFACE SOIL SAMPLING SURROUNDING THE CENTRAL PROCESS AREA
VERTAC SITE
JACKSONVILLE, AR

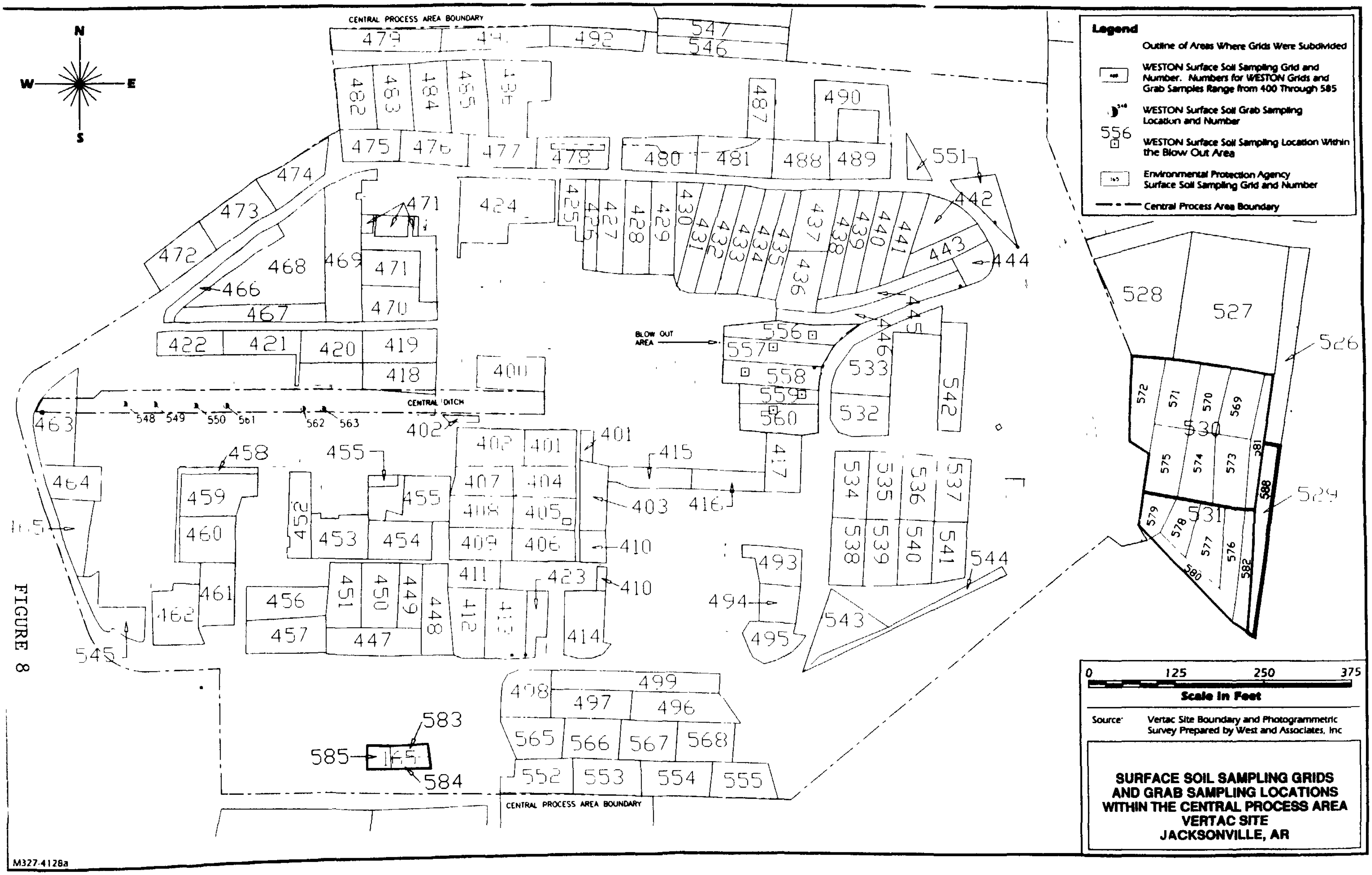

CENTRAL PROCESS AREA BOUNDARY
BLOW OUT AREA
CENTRAL DITCH
Legend
Outline of Areas Where Grids Were Subdivided
WESTON Surface Soil Sampling Grid and Number. Numbers for WESTON Grids and Grab Samples Range from 400 Through 585
WESTON Surface Soil Grab Sampling Location and Number
WESTON Surface Soil Sampling Location Within the Blow Out Area
Environmental Protection Agency Surface Soil Sampling Grid and Number
Central Process Area Boundary
0 125 250 375
Scale in Feet
Source: Vertac Site Boundary and Photogrammetric Survey Prepared by West and Associates, Inc
SURFACE SOIL SAMPLING GRIDS AND GRAB SAMPLING LOCATIONS WITHIN THE CENTRAL PROCESS AREA
VERTAC SITE
JACKSONVILLE, AR
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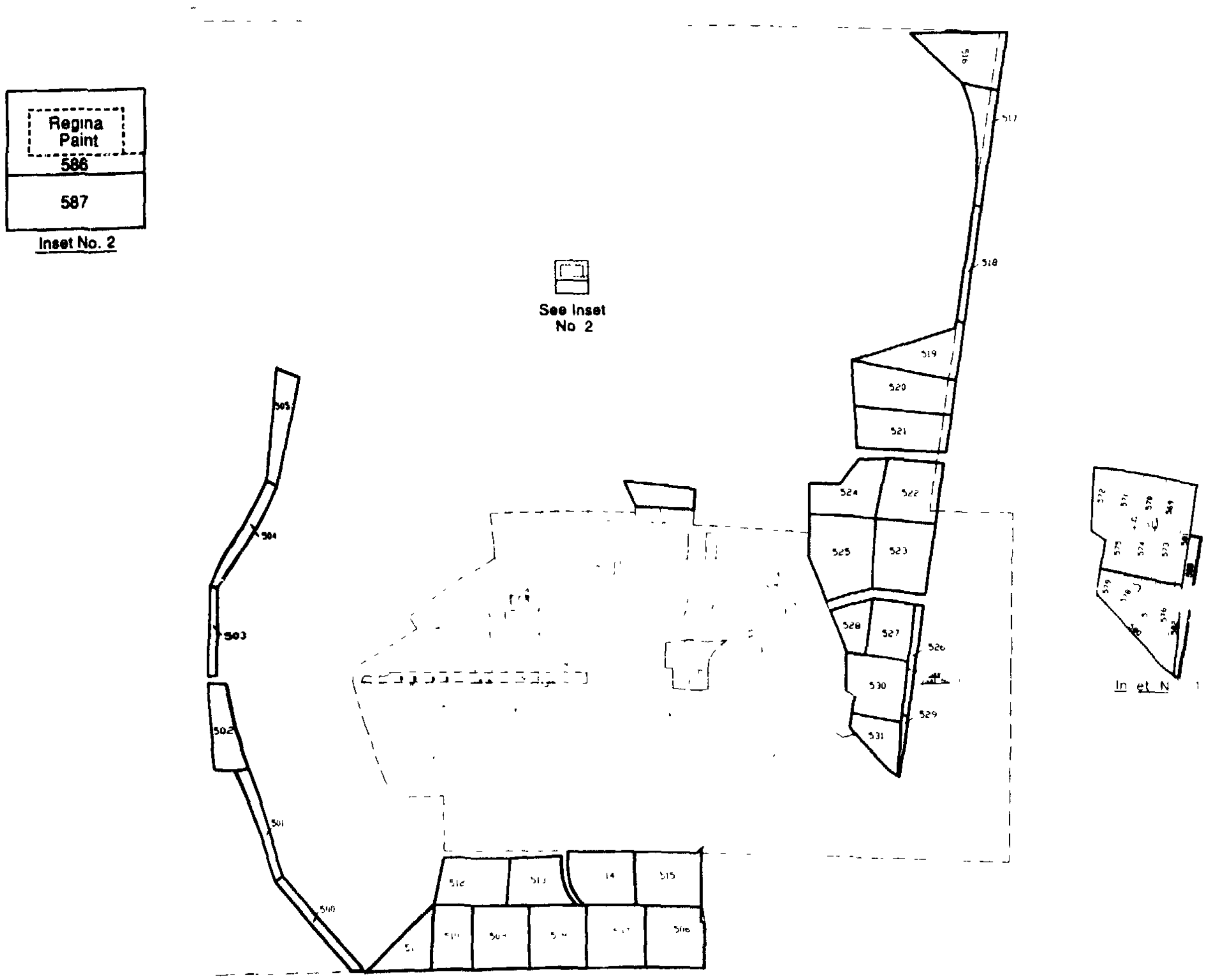
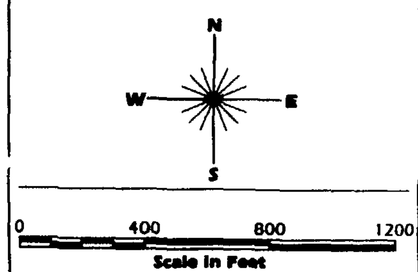
FIGURE 8

FIGURE 9



Legend

- Outline of Grids Outside the Central Process Area
- WESTON Surface Soil Sampling Grid and Number, Numbers for WESTON Grids and Grab Samples Range from 400 Through 585
- WESTON Surface Soil Grab Sampling Location and Number
- WESTON Surface Soil Sampling Location Within the Blow Out Area
- Central Process Area Boundary
- Property Boundary



Source: Vertac Site Boundary and Photogrammetric Survey Prepared by West and Associates, Inc

SURFACE SOIL SAMPLING GRIDS OUTSIDE THE CENTRAL PROCESS AREA VERTAC SITE JACKSONVILLE, AR

M361-4128a

central process area are approximately 40,000 square feet and were screened for 2,3,7,8-TCDD only, because these areas were outside of known production operations. Eleven samples were collected from a series of 11 uniform nodes within each grid.

From those 11 samples three composites were made and analyzed for 2,3,7,8-TCDD. Essentially all areas exhibiting elevated TCDD concentrations are located in the central process area, and relative concentrations of chlorophenoxyherbicides and chlorophenols measured in the surface soils paralleled dioxin concentrations.

Most of the unsampled areas of the site were generally in a downstream direction from sampled areas exhibiting TCDD concentrations of 2 ppb or less. **Table 2** depicts the maximum and average concentrations for the contaminants of concern (COC's) at the site.

Table 2.

CHLOROPHENOLS	**MAXIMUM CONC.**	**AVERAGE CONC.**
2-chlorophenol	3 ppm	1.9 ppm
4-chlorophenol	0.12 ppm	not computed
2,4-dichlorophenol	360 ppm	6.9 ppm
2,6-dichlorophenol	15 ppm	0.54 ppm
2,3,6-trichlorophenol	0.73 ppm	0.54 ppm
2,4,5-trichlorophenol	270 ppm	2.0 ppm
2,4,6-trichlorophenol	79 ppm	3.5 ppm
CHLOROBENZENES		
Trichlorobenzene	17,000 ppm	not computed
CHLOROPHENOXYACIDS		
2,4-D	5,500 ppm	191 ppm
Silvex	290 ppm	12.4 ppm
2,4,5-T	710 ppm	23.1 ppm

TCDD concentrations at the site ranged between non-detect to 2,800 ppb. The highest concentrations of TCDD found in surface soils at the site were in the following areas (note: TCDD concentrations are reported as the 95 percent upper confidence limit for each grid sampled in an area):

- Blow Out Area - For the seven grids sampled in this area TCDD concentrations ranged between 0.25 ppb for the least contaminated grid to 660 ppb for the most contaminated grid.

  The dioxin in this area is associated with occasional releases or "blow outs" during facility operations from the reactor vessel when the control of the chemical reactions was not maintained. After such a release, the solidified 2,4-D and 2,4,5-T was scraped from the ground and replaced with a thin layer of clean fill material.

- East Drum Storage Field Area - TCDD concentrations for this area ranged between 7.3 ppb and 120 ppb.

  The east drum storage field can be subdivided into two distinct areas. The first area includes the drainage grids along the northern side of the site entrance road Dioxin in this area was most likely transported there from the blow out area. The second area is located in the western part of the drum field. Soil contaminants are most likely related to spillage from the drum storage operations.

- Main Boiler House Area - TCDD concentrations in this area ranged between 0.39 ppb and 1,270 ppb.

  This area acted as a sediment retention basin, and since it is located downslope from the blow out area, TCDD is likely present from sediment migration from the blow out area.

- Area East of the Main Boiler House - TCDD concentrations in this area ranged between non-detect and 98 ppb.

  This area is down slope from the main boiler house. Therefore, the TCDD may have originated at the blow out area and migrated with sediments from the main boiler house area.

- Area of the Existing and Former Chlorination Plants - TCDD concentrations in this area ranged between 22 ppb and 2,800 ppb.

  Portions of this area were used to dry 2,4,5-T, and TCDD is suspected to be present as the result of these drying practices.

- Maintenance Area - TCDD concentrations in this area ranged between 4.8 ppb and 57 ppb.

  Previous overpacking of leaking drums in this area may have contributed to the TCDD found in this area.

5.4.3 Subsurface Soils

During the RI, numerous subsurface soil samples were taken from soil borings throughout the site. The purpose was to determine whether significant sources of contamination existed below the surface soils which could potentially migrate and degrade water quality. Analyses were performed on these samples to quantify the concentrations of chlorophenols, chlorophenoxyherbicides, and TCDD in these soils.

Of more than 90 samples taken and analyzed for TCDD, only 5 were greater than 20 ppb. The range of the 5 samples were between 20 ppb and 310 ppb. These elevated levels were all obtained in different borings and at different depths.

The vertical extent of TCDD at depths greater than 36 inches appears to be related to areas where burial occurred such as the chlorination area, or where sediments may have accumulated such as the main boiler house area. The vertical extent of TCDD between 12 and 36 inches is limited to areas where the land surface may have been built up during subsequent site activities, such as the blow out area, and south of the chlorination area. The data suggest that TCDD contamination between 12 and 36 inches of soil depth is not the result of downward migration of TCDD from the surface.

5.4.4 Tetrachlorobenzene Spill Area

The tetrachlorobenzene (TCB) spill area resulted from an accidental release of TCB from a railroad car. Molten TCB filled the low area between the railroad tracks and penetrated into the soils pore spaces under the tracks before crystallizing. The spill area is about 830 square yards, based on where TCB was observed. The western limit was not found because access for excavation was impeded due to physical obstructions at the site, e.g., building foundations, etc. The vertical extent was also not determined at the time of the RI for similar reasons. The horizontal and vertical extent of the TCB contamination will be determined during the remediation process. TCB was found at concentrations ranging between 200 ppm and 1,700 ppm in pit samples at depths of 32 to 34 inches below ground surface.

5.4.5 Underground Utilities

Because TCDD tends to adsorb to clay-rich and organic-rich soils and due to the potential for the compound to migrate with these sediments if they are transported by water flow, samples were taken from several underground utility lines including the industrial and sanitary sewer lines as well as surface water sumps. Pressurized piping (natural gas lines and public water lines) were not sampled since there was no accessible point of

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entry to these lines at the site due to the fact that they were under constant pressure.

Five samples were collected for each structure.

- Industrial Sewer - sediment samples showed the highest TCDD concentrations of any underground utilities, with the concentrations ranging between 7.3 ppb and 79 ppb.

- Surface Water Sumps - sediment samples for TCDD from the surface water sumps ranged between 8.4 ppb and 18 ppb, and are generally consistent with the soil concentrations within the central process area.

- Sanitary Sewer - the lowest concentrations of TCDD were found in the sanitary sewer system and ranged between non-detect to 4.1 ppb. Measurable concentrations of TCDD were found in the on-site sewer lines extending southeastward from the central process area. No TCDD was found in the currently active portions of the sanitary sewer which extends southward of the site.

- Porous Bedding Material around Underground Utilities - there is no field information or design drawings available that indicate whether or not granular material was used for bedding of these lines. Therefore, the potential for preferential flow of ground water in bedding material around the outside of utility piping may exist at the site.

5.4.6 Underground Storage Tanks (USTs)

A survey of the USTs for the site indicated the presence of 5 tanks, with capacities ranging between 250 gallons and 1,000 gallons. All 5 tanks have previously been used to store gasoline or diesel fuel. The approximate volume of residual fuel in the tanks is as follows:

- UST1 - 42 gallons
- UST2 - 57 gallons
- UST3 - 17 gallons
- UST4 - 35 gallons
- UST5 - 208 gallons

Since the preparation of the RI and FS, all 5 tanks have been pumped dry and backfilled with grout containing a mixture of sand, cement, and flyash by Hercules, Inc. Subsurface soil samples around the UST's for petroleum hydrocarbons, lead, benzene, toluene, and xylenes do not indicate the presence of any significant leaks from these USTs.

5.4.7 Off-site Rocky Branch Creek and Bayou Meto Flood Plain Soils

One element of the 1990 Off-site ROD called for the excavation of flood plain areas that are currently zoned residential where the TCDD concentrations are greater than 1 ppb. Approximately 4,100 cubic yards of soils are estimated to contain dioxin above the cleanup goal. The highest TCDD concentration found in this area was 9.6 ppb. The remedy in the 1990 ROD also called for these soils to be brought back to the Vertac site for on-site incineration. EPA subsequently deferred the treatment requirement for these soils such that all site soils could be handled in a consistent manner. The remediation of these soils has now been incorporated into this ROD. For more information see the Vertac Superfund Site Record of Decision for Off-site Areas, September 1990. The final disposition of the flood plain soils is discussed in Section 9.0 of this document.

5.4.8 Residential Bagged Soils

In 1988, EPA signed an Administrative Order on Consent (AOC) with Hercules, Inc., requiring it to remove soils from residential yards south of the Vertac plant where TCDD was found above 1 ppb, and a drainage ditch on-site in the area of the residences. Approximately 2,770 cubic yards of soils were bagged and placed in a storage facility at the site. Chlorinated phenols, chlorinated benzenes, and chlorinated phenoxyherbicides were present at non-detect to low concentrations. TCDD was detected in all samples at levels ranging from 13 ppb to 55 ppb. The 1993 ROD for Vertac On-site Operable Unit 1 (above ground media) deferred the treatment requirement for these soils so that all site soils could be handled in a consistent manner. The remediation of these soils has now been incorporated into this ROD. For more information see the Record of Decision, Vertac Superfund site - Operable Unit 1, June 1993. The final disposition of the residential soils Hercules, Inc., excavated as part of a removal action is discussed in Section 9.0 of this document.

5.4.9 Sludges and Sediments from the Old Sewage Treatment Plant Digester

One element of the Record of Decision for the Vertac Off-Site Areas, dated September 1990, called for cleanup and demolition of the old Sewage Treatment Plant. As a part of that ROD, approximately 890 cubic yards of sludge from the sludge digester was removed in 1994 using a vacuum pumping system. The sludge was then transported back to the Vertac site for on-site incineration. The maximum concentration of TCDD found in the sludge digester sediments was 12.5 ppb. Another element of that ROD called for the removal of sediments from a sewer interceptor line, which physically connected the Old Sewage Treatment Plant to the Vertac facility. Approximately 2 cubic yards of sediments were removed from the interceptor line in 1994 and transported back to the Vertac site for on-site incineration.

EPA subsequently deferred the treatment requirement for these sludges/sediments so that all such site materials could be handled in a consistent manner. As discussed at Section 4.0 above, those media are considered to constitute low level threats due to the fact that the average level of dioxin contamination in those media is well below 5,000 ppb, which is three orders of magnitude above the site's 5 ppb cleanup level identified in the risk assessment. See EPA's guidance on low level and principal threats cited at Section 4.0, OSWER Directive No. 9380.3-06FS. Therefore, the remediation of these sludges/sediments has now been incorporated into this ROD. For more information see the Vertac Superfund Site Record of Decision, Off-Site Areas, dated September 1990. More discussion on the final disposition of these sludges and sediments is included in Section 9.0 of this ROD.

6.0 SUMMARY OF SITE RISKS

6.1 RISK ASSESSMENT DESCRIPTION

An evaluation of the potential risks to human health and the environment from site contaminants associated with Operable Unit 2 media was presented in a separate document called the OU2 Baseline Risk Assessment. The baseline risk assessment was completed in concert with the development of the RI/FS. The purpose of the baseline risk assessment is to evaluate the potential risk to human health and the environment from site contaminants prior to remediation. The results from the baseline risk assessment are used to establish cleanup goals for the contaminants at the site that pose the greatest risk. The OU2 baseline risk assessment is divided into two main sections, the Human Health Risk Assessment and the Ecological Risk Assessment.

In general, a risk assessment is a procedure which uses a combination of facts and assumptions to estimate the potential for adverse effects on human health and the environment from exposure to contaminants found at a site. The environmental or ecological risk assessment is conducted to determine if there are any current or potential impacts on ecological receptors attributable to the unremediated site. Human health risks are determined by evaluating known chemical exposure limits and actual concentrations at the site as identified during the RI sampling activities. In the risk assessment, carcinogenic risks (from chemicals that are known or believed to cause cancer) and non-carcinogenic health risks (from chemicals that are not known to cause cancer, but can cause a range of other illnesses) are calculated.

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6.2 IDENTIFICATION OF CHEMICALS OF CONCERN

This section summarizes the site data that were used to evaluate potential health risks to human and nonhuman receptors. The substances that were considered for each exposure medium include the following:

- **Surface Soil**
  - Chlorophenols
  - Chlorophenoxyherbicides
  - 2,3,7,8-TCDD
- **Ground Water**
  - Acetone
  - Chloroform
  - Chlorophenols
  - Chlorophenoxyherbicides
  - Methylene Chloride
  - Nitroaromatic explosives
  - Priority pollutant metals
  - 2,3,7,8-TCDD
  - Tetrachlorobenzene
  - Toluene
- **Surface Water**
  - Chlorophenols
  - Chlorophenoxyherbicides
  - 2,3,7,8-TCDD
  - Toluene

An effort was made to focus the risk assessment on those chemicals that are of greatest concern for a given medium. Chemicals that were infrequently detected in a medium that was sampled systematically, unless there was evidence for a "hot spot", were eliminated (see U.S. EPA guidance, 1989 (b)).

Tables 3, 4, and 5 present the data summary for substances of potential concern for each medium and their frequency of detection. Please note that the terminology used in Tables 3 through 5 is consistent with the terminology set out in the EPA guidance document "Supplemental Guidance to Risk Assessment Guidance for Superfund (RAGS): Calculating the Concentration Term," OSWER Publication 9285.7-081, 1992. Therefore, the term "Upper 95% Confidence Limit of the Geometric Mean" used in Tables 3 through 5 actually means the upper 95% confidence limit of the arithmetic mean. However, when evaluating the combined risk posed by all the COC's at the site, dioxin contributed over 99 percent of the total risk.

TABLE 3

Substances of Potential Concern in Soil
Data Summary — All Samples

Substance	Frequency of Detection[a]	Range of Sample Quantitation Limits (mg/kg)[b]	Range of Detected Concentrations (mg/kg)[b,c]	Adjusted Geometric Mean Concentration (mg/kg)[b]	Upper 95% Confidence Limit of the Geometric Mean Concentration (mg/kg)[b]
2-Chlorophenol	19/138	0.33-18	0.047-3.0	0.34	0.39
2,4-D	122/127	0.023-4.2	0.0053-5,500	580	3,100
2,4-Dichlorophenol	77/138	0.042-18	0.034-360	3.0	5.0
2,6-Dichlorophenol	33/138	0.33-18	0.066-15	0.54	0.66
Silvex	105/124	0.012-670	0.0012-290	28	110
2,4,5-T	125/129	0.012-670	0.0016-710	63	250
2,3,7,8-TCDD	443/1,146	0.01-4.5 (ng/g)	0.04-2,200 (ng/g)	5.3 (ng/g)	9.2 (ng/g)
Tetrachlorobenzene[d]	1/1	NI	670,000	NA	NA
2,4,5-Trichlorophenol	53/137	0.33-3.8	0.033-270	1.9	3.0
2,4,6-Trichlorophenol	53/136	1.7-91	0.047-79	2.6	3.4

NA = Not applicable
NI = Information was not available

[a]Ratio of the number of sampling locations at which the substance was detected to the total number of sampling locations, with the exception of 2,3,7,8-TCDD. The frequency of detection for 2,3,7,8-TCDD is the ratio of the number of composite samples in which 2,3,7,8-TCDD was detected to the total number of composite samples.
[b]With the exception of 2,3,7,8-TCDD, which is expressed in units of ng/g.
[c]Includes "J" values, which are estimated below the minimum sample quantitation limit.
[d]These data are evaluated in the hot spot analysis (Subsection 3.5).

TABLE 4

Substances of Potential Concern in Groundwater
Data Summary — Atoka Formation

Substance	Frequency of Detection[a]	(Range of) Sample Quantitation Limit(s) (mg/L)[b]	Range of Detected Concentrations (mg/L)[b,c]	Adjusted Geometric Mean Concentration (mg/L)[b]	Upper 95% Confidence Limit of the Geometric Mean Concentration (mg/L)[b]
Organics					
Acetone	5/15	0.0021-0.11	0.009-0.030	0.0095	0.016
Chloroform	3/15	0.005-0.05	0.002-0.030	0.0049	0.0071
2-Chlorophenol	34/76	0.005-0.055	0.002-66.7	3.0	16
4-Chlorophenol	38/80	0.005-0.014	0.001-61.4	13	100[d]
2,4-D	52/85	0.0001-0.027	0.00015-1,640	4,200[d]	160,000[d]
2,6-D	35/47	0.005	0.006-1,100	10,000[d]	2,000,000[d]
2,4-Dichlorophenol	43/81	0.005-0.06	0.0012-597	55	580
2,6-Dichlorophenol	35/81	0.005-0.82	0.001-90.1	4.4	25
Methylene chloride	2/15	0.005-0.063	0.022-0.10	0.0077	0.013
Phenol	20/47	0.005	0.001-10	1.0	7.6
Silvex	41/85	0.0005-0.54	0.00036-110	23	230[d]
2,4,5-T	45/85	0.00013-0.007	0.0001-380	430[d]	11,000[d]
2,4,6-T	31/47	0.005	0.004-210	230[d]	8,700[d]
2,3,7,8-TCDD	9/39	0.01-1.8 (ng/L)	0.85-2,080 (ng/L)	13 (ng/L)	97 (ng/L)
Tetrachlorobenzene	12/30	0.01-0.40	0.008-2.9	0.041	0.10
Toluene	41/85	0.001-0.82	0.002-440	1,100[d]	29,000[d]
2,3,6-Trichlorophenol	19/80	0.005-0.82	0.002-8.92	0.048	0.095
2,4,5-Trichlorophenol	44/81	0.005-4.1	0.002-411	19	130

TABLE 4 (cont)

Substances of Potential Concern in Groundwater
Data Summary — Atoka Formation
(continued)

Substance	Frequency of Detection[a]	(Range of) Sample Quantitation Limit(s) (mg/L)[b]	Range of Detected Concentrations (mg/L)[b,c]	Adjusted Geometric Mean Concentration (mg/L)[b]	Upper 95% Confidence Limit of the Geometric Mean Concentration (mg/L)[b]
Organics (continued)					
2,4,6-Trichlorophenol	38/80	0.005-0.82	0.001-94	2.1	9.9
Inorganics					
Antimony	3/26	0.060	0.022-0.029	0.029	0.030[d]
Arsenic	2/26	0.010	0.0036-0.013	0.0053	0.0056
Chromium	5/26	0.010	0.0020-0.012	0.0050	0.0055
Copper	3/26	0.025	0.0066-0.025	0.013	0.014
Lead	2/26	0.003	0.0036-0.011	0.0018	0.0021
Mercury	9/26	0.0002-0.00025	0.00022-0.00076	0.00023	0.00031
Nickel	10/18	0.040	0.011-0.109	0.032	0.049
Silver	11/26	0.010	0.0034-0.0094	0.0056	0.0060
Thallium	4/26	0.010-0.10	0.010-0.100	0.031	0.060
Zinc	22/22	0.020[e]	0.011-0.270	0.043	0.063

[a]Ratio of the number of wells in which the substance was detected during one or more sampling rounds to the total number of wells sampled.
[b]With the exception of 2,3,7,8-TCDD, which is expressed in units of ng/L.
[c]Includes "J" values, which are estimated concentrations, usually below the minimum sample quantitation limit.
[d]Exceeds the maximum reported concentration (Subsection 2.1).
[e]Sample quantitation limits were not available. The contract-required detection limit/instrument detection limit (CRQL/IDL) is indicated.

TABLE 5

Substances of Potential Concern in Surface Water
Data Summary — All Sample Locations

Substance	Frequency of Detection[a]	Range of Sample Quantitation Limits (μg/L)[b]	Range of Detected Concentrations (μg/L)[b,c]	Adjusted Geometric Mean Concentration (μg/L)[b]	Upper 95% Confidence Limit of the Geometric Mean Concentration (μg/L)[b]
2-Chlorophenol	6/6	0.8-5	0.85-460	18	420
4-Chlorophenol	6/6	1.1-5	1.2-8,800	230	480,000[d]
2,4-D	6/6	2-5	2.9-17,000	1,100	2,700,000[d]
2,6-D	6/6	2-5	2.0-5,400	500	45,000[d]
2,4-Dichlorophenol	6/6	1-5	1.8-6,800	200	290,000[d]
2,6-Dichlorophenol	6/6	0.5-50	1.0-1,100	13	350
Phenol	6/6	0.6-5	0.60-620	24	4,600[d]
Silvex	6/6	1-2	1.0-1,100	84	18,000[d]
2,4,5-T	6/6	1-2	1.7-3,300	200	44,000[d]
2,4,6-T	6/6	1-2	1.1-11,000	240	33,000[d]
2,3,7,8-TCDD	3/6	2-10 (ng/L)	2.0-12 (ng/L)	1.6 (ng/L)	1.9 (ng/L)
Toluene	6/6	5-21	0.022-3,900	52	9,900[d]

TABLE 5 (cont)

Substances of Potential Concern in Surface Water
Data Summary — All Sample Locations
(continued)

Substance	Frequency of Detection[a]	Range of Sample Quantitation Limits (μg/L)[b]	Range of Detected Concentrations (μg/L)[b,c]	Adjusted Geometric Mean Concentration (μg/L)[b]	Upper 95% Confidence Limit of the Geometric Mean Concentration (μg/L)[b]
2,3,6-Trichlorophenol	5/6	1.2-50	2.0-69	4.1	12
2,4,5-Trichlorophenol	6/6	1.5-5	1.6-5,000	130	350,000[d]
2,4,6-Trichlorophenol	6/6	1.1-5	1.7-1,500	29	2,500[d]

[a]Ratio of the number of sampling locations at which the substance was detected to the total number of sampling locations.
[b]With the exception of 2,3,7,8-TCDD, which is expressed in units of ng/L.
[c]Includes "J" values, which are estimated below the minimum sample quantitation limit.
[d]Exceeds the maximum reported concentration (Subsection 2.1).

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6.3 HUMAN HEALTH RISK ASSESSMENT

6.3.1 Summary

A baseline risk assessment was conducted for the Vertac site where risks were evaluated using current site conditions for three potential receptor scenarios: teenage trespasser, current unprotected worker, and future unprotected worker. Exposure routes assessed for the trespasser scenario included dermal contact with soil, incidental ingestion of soil, contact with surface water, and inhalation of particulates or vapors. Exposure routes accessed for the current unprotected worker scenario included incidental ingestion of soil, dermal contact with soil, dermal contact with surface water and water from the production outfalls at the site, and the inhalation of airborne particulates and vapors. A future unprotected worker was assumed to be exposed to the same substances of concern as the current unprotected worker with the addition of the ingestion of site ground water. It should be noted, however, that the cleanup goal proposed by EPA for the site does not consider that a future worker will be consuming ground water. Public water supplies are readily available and the future use of site ground water as a drinking water source will be prohibited through institutional controls.

6.3.2 Exposure Assessment

The potentially exposed populations and the pathways through which they could be exposed for current and future site conditions are discussed below.

Current and Future Land Use

As discussed in Section 4.0 above, EPA has evaluated the past land use for the site, the current land use scheme for the area surrounding the site determined by zoning ordinances, and had discussions with City of Jacksonville officials and residents. EPA has concluded that the reasonably anticipated future land use for the site is commercial/industrial, which is consistent with past land use and the current zoning for the site area. EPA's risk assumption for OU2 presupposed that future land use would be commercial/industrial, and so EPA derived the site's cleanup level of 5 parts per billion (ppb) toxicity equivalents (TEQ) for dioxin due to the fact that a commercial/industrial human exposure scenario assumes that a worker would be exposed to post-cleanup dioxin levels over a 40 hour per week period. This worker exposure scenario additionally is protective of a trespasser or a passerby, both of whose exposure period would be less than that of a site worker. In deriving the 5 ppb dioxin cleanup level, EPA assumed that the pathways of exposure to site contaminants likely for future site workers would be soil ingestion, dermal absorption from soil, soil inhalation, vapor

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inhalation or dermal absorption from volatilization of surface water. In addition, EPA assumed a soil ingestion and dermal absorption pathway from soil for a trespasser or an occasional passersby.

Thus, EPA derived its site-specific risk assessment based on that reasonably anticipated future land use. The land occupied by the Vertac facility is zoned commercial/industrial. While there are no manufacturing operations at the site, it is reasonably anticipated that future use could include commercial development. Continuing activities include general maintenance of the plant, maintenance of previous remedies, and operation of a wastewater treatment plant by PRP site maintenance workers. Deed restrictions are in place that will prevent future residential development of the site. Additional deed restrictions will be sought to limit future commercial development of portions of the site that will contain waste disposal areas and are otherwise encumbered by long term remediation and perpetual operation and maintenance activities.

The land located west and north of the plant is also used for commercial/industrial purposes. Residential areas are located directly east and south of the plant.

To assess the current and reasonably anticipated future land use, four receptors were evaluated: A trespasser, a passerby, a current unprotected worker, and a future unprotected worker. Trespassers and workers are the most likely future receptors at the site and represent those individuals with the highest potential for exposure to site related substances of concern.

A trespasser could enter the site unnoticed by either climbing or crawling under one of the fences either currently or in the future. A teenager between 12 and 18 years of age was evaluated for this scenario.

A passerby could walk by the east side of the site along Marshall Road in the future. A teenager between 12 and 18 years of age was evaluated for future exposure using this scenario. Although any exposure is considered remote using this future scenario, it was evaluated since the strip of property along the west side of Marshall Road may eventually be unrestricted and without a fence, allowing for future commercial/industrial development.

Current and future worker scenarios were also evaluated. Because this site is zoned commercial/industrial, a maintenance worker is the individual who has the greatest potential to contact on-site media on a regular basis, both currently and in the future.

Potential Exposure Pathways

Trespasser

It is possible for a trespasser to be exposed to substances of concern on the site through contact with soil, surface water, and air. Potential soil exposure routes include dermal contact and incidental ingestion of soil.

Of the on-site surface waters, a trespasser is most likely to come into contact with Rocky Branch Creek, which is located within the western margin of the site. Due to the shallow nature of the creek, with a depth of approximately 1 foot, only dermal contact was evaluated. The potential for a trespasser to come into contact with outfalls that flow to Rocky Branch Creek was considered to be unlikely, due to the fact that they flow only during periods of high rainfall.

The trespasser could also be exposed to chemicals of concern through the inhalation of airborne substances originating from surface soil and surface water (particulate and/or vapor).

The potential for a trespasser to become exposed to site ground water was considered to be remote. Even if ground water were to be used on the site in the future, it is likely that the ground water would be used only after treatment. Thus, this exposure pathway was not evaluated.

Casual Passerby

A casual passerby was considered for possible exposure to site related contaminants along the east side of the site adjacent to Marshall Road, since the existing fence located at the property boundary will be moved to the west after remedial action is complete so as to minimize the areas of the site that will be restricted in that fashion. EPA will not be certain of precise fence locations until the remedial design phase of the OU2 remediation. However, a casual passerby will have no actual exposure after remediation since there is no complete pathway. If the remote possibility is considered for contact of the passerby through dermal contact and incidental ingestion similar to a trespasser, this would be a conservative assumption.

After remedial action there will be a greenbelt in this area to camouflage the site from view of the motorists along Marshall Road. This greenbelt will be enhanced with vegetation consisting of grass and fast-growing native trees which will nearly eliminate any contaminants from becoming airborne for contact with the passerby. When the site is remediated to 5 ppb the average concentration of dioxin in the area along Marshall Road will be less than 1 ppb. This is due to the fact that after grids where dioxin concentrations exceeding 5 ppb are excavated

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and replaced with clean backfill material, data indicate that average dioxin concentrations along Marshall Road will be at or below 1 ppb because some portions of that area currently have dioxin concentrations less than 1 ppb. The process of averaging resulting dioxin concentrations results in a less than 1 ppb average.

Extremely conservative assumptions were made to calculate the risk for a casual passerby. Using the most conservative assumptions possible, the risk posed by the site after remediation was within EPA's acceptable risk range. Therefore, the site cleanup to 5 ppb provides for a fully protective remedy. See memorandum from Ghassan Khoury to Philip Allen in the Administrative Record.

Current Unprotected Worker

The current unprotected worker was assumed to be exposed to substances of potential concern through the same exposure routes as the trespasser: Incidental ingestion of soil, dermal absorption of soil, dermal absorption from surface water, and inhalation of airborne soil and vapors. The on-site worker could also potentially come into contact with all on-site surface waters, including outfalls, on a regular basis. Contact could occur during performance of general maintenance activities. However, because ground water has no current on-site uses, the current worker has limited potential for contact with ground water. Thus, the ground water pathway was not evaluated.

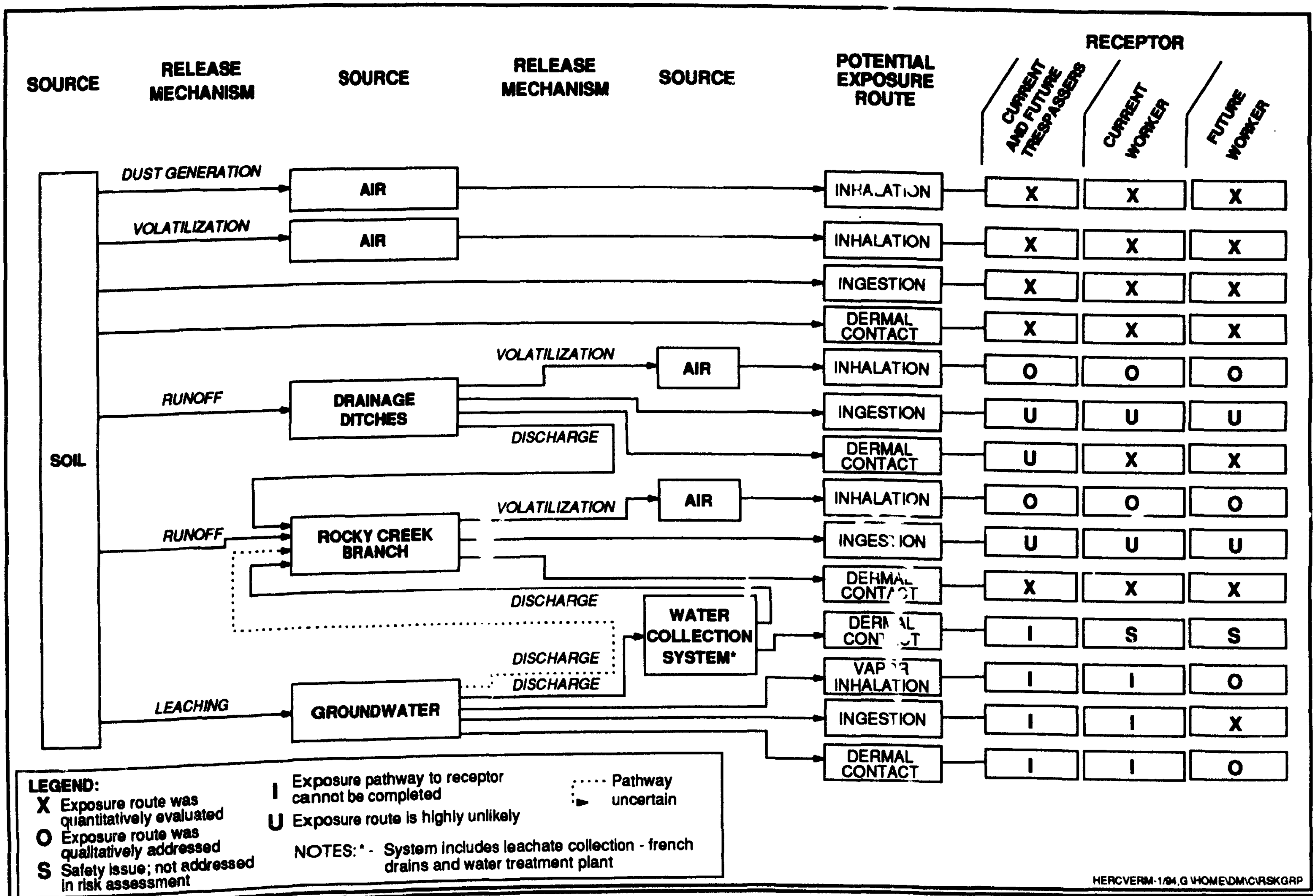
Future Unprotected Worker

The future unprotected worker was assumed to be exposed to the substances of potential concern through the same exposure routes as the current unprotected worker, with the addition of the ingestion of site ground water. Ground water is currently not used as a drinking water source on the site, and it is unlikely that it will be used as such in the future because of the availability of public water. Conservatively, this pathway was evaluated, but EPA did not include this exposure route in developing remediation goals for the site.

A summary of the exposure pathways used for quantitative evaluation is shown in **Figure 10**. Models used to calculate intakes, i.e., doses of the substances of concern for each receptor through the various exposure routes are shown in **Tables 6, 7, 8, 9, 10, and 11**.

6.3.3 Toxicity Assessment

The toxic effects of a chemical generally depend upon the level of exposure (dose), the route of exposure (oral, inhalation, dermal), and the duration of exposure (acute,



CONCEPTUAL MODEL OF POTENTIAL EXPOSURE ROUTES

Model for Calculating Doses through the Incidental Ingestion of Soil

$$\text{Soil Ingestion Dose (mg/kg-day)} = \frac{CS * SIR * EF * ED}{BW * AT}$$

Where:

CS = Chemical concentration in surface soil (mg/kg)

SIR = Soil ingestion rate (kg/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

Exposure Assumptions

All Scenarios:

CS = Surface soil exposure concentrations

Trespasser:

SIR = 5.0E-05 kg/day (U.S. EPA, 1994a)

EF = 1 day/week, 26 weeks/year

ED = 5 years

BW = 56 kg, average weight of a 12-to 18-year old (U.S. EPA, 1989a)

AT = 365 days/year x 5 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

Worker (Current and Future):

SIR = 5.0E-05 kg/day (U.S. EPA, 1991)

EF = 250 days/year (U.S. EPA, 1991)

ED = 25 years (U.S. EPA, 1991)

BW = 70 kg (U.S. EPA, 1991)

AT = 365 days/year x 25 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

TABLE 6

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Model for Calculating Doses through Dermal Absorption from Soil

$$\text{Soil Dermal Absorption Dose (mg/kg-day)} = \frac{CS * SA * AF * ABS \text{ (or RABS)} * EF * ED}{BW * AT}$$

Where:

CS	=	Chemical concentration in surface soil (mg/kg)
SA	=	Skin surface area available for contact (cm^2/day)
AF	=	Soil-to-skin adherence factor (kg/cm^2)
ABS	=	Absorption factor (unitless)
RABS	=	Relative dermal absorption factor (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Exposure Assumptions

All Scenarios:

CS	=	Surface soil exposure concentrations
AF	=	1.00E-06 kg/cm^2, reasonable upper limit of soil adherence factor (U.S. EPA, 1992a)
ABS	=	0.03 for dioxin (U.S. EPA, 1992a)
RABS	=	0.50 for all chemicals except dioxin, based on guidance in U.S. EPA, 1989c

Trespasser:

SA	=	1,950 cm^2/day, based on the average arm and hand surface area of a 12- to 18-year old (U.S. EPA, 1989a)
EF	=	1 day/week, 26 weeks/year
ED	=	5 years
BW	=	56 kg, average weight of a 12- to 18-year old (EPA, 1989a)
AT	=	365 days/year x 5 years (for evaluating noncancer risk)
	=	365 days/year x 70 years (for evaluating cancer risk)

TABLE 7

Model for Calculating Doses through
Dermal Absorption from Soil
(continued)

Worker (Current and Future):

SA = 2,000 cm^2/day, based on the average arm and hand surface area of adult males (U.S. EPA, 1989a)

EF = 250 days/year (U.S. EPA, 1991)

ED = 25 years (U.S. EPA, 1991)

BW = 70 kg (U.S. EPA, 1991)

AT = 365 days/year x 25 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

Model for Calculating Doses through the Inhalation of Airborne Soil

$$\text{Soil Inhalation Dose (mg/kg-day)} = \frac{CS * RD * IV * EF * ED}{BW * AT}$$

Where:

CS = Chemical concentration in surface soil (mg/kg)

RD = Respirable-size soil particle concentration in air (i.e., PM_{10}) (kg/m^3)

IV = Inhalation volume (m^3/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

Exposure Assumptions

All Scenarios:

CS = Surface soil exposure concentrations

RD = 3.1E-08 kg/m^3 (URS, 1990)

Trespasser:

IV = 2.5 m^3/day, based on 1 hour of moderate activity on the site (U.S. EPA, 1989a)

EF = 1 day/week, 26 weeks/year

ED = 5 years

BW = 56 kg, average weight of a 12- to 18-year old (U.S. EPA, 1989a)

AT = 365 days/year x 5 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

TABLE 8

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Model for Calculating Doses through the Inhalation of Airborne Soil (continued)

Worker (Current and Future):

IV = 20 m^3/day (U.S. EPA, 1991)

EF = 250 days/year (U.S. EPA, 1991)

ED = 25 years (U.S. EPA, 1991)

BW = 70 kg (U.S. EPA, 1991)

AT = 365 days/year x 25 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

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Model for Calculating Doses through the Inhalation of Vapors

$$\text{Vapor Inhalation Dose (mg/kg-day)} = \frac{CA * IV * EF * ED}{BW * AT}$$

Where:

CA = Chemical vapor concentration in air (mg/m^3)

IV = Inhalation volume (m^3/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

Exposure Assumptions

All Scenarios:

CA = Vapor concentrations

Trespasser:

IV = 2.5 m^3/day, based on 1 hour of moderate activity on the site (U.S. EPA, 1989a)

EF = 1 day/week, 26 weeks/year

ED = 5 years

BW = 56 kg, average weight of a 12- to 18-year old (U.S. EPA, 1989a)

AT = 365 days/year x 5 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

Worker (Current and Future):

IV = 20 m^3/day (U.S. EPA, 1991)

EF = 250 days/year (U.S. EPA, 1991)

ED = 25 years (U.S. EPA, 1991)

BW = 70 kg (U.S. EPA, 1991)

AT = 365 days/year x 25 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

TABLE 9

Model for Calculating Doses through
Dermal Absorption from Surface Water

Surface Water
Dermal Absorption Dose (mg/kg-day) = $\frac{CSW * CF\text{-}1 * SA * PC * ET * CF\text{-}2 * EF * ED}{BW * AT}$

Where:

CSW = Chemical concentration in surface water (mg/L)

CF-1 = Conversion factor (mg/μg)

SA = Skin surface area available for contact (cm^2)

PC = Dermal permeability coefficient (cm/hour)

ET = Exposure time (hours/day)

CF-2 = Conversion factor (L/cm^3)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

Exposure Assumptions

All Scenarios:

CF-1 = 1 mg/1,000 μg

PC = Permeability coefficient.

CF-2 = 1 L/1,000 cm^3

Trespasser:

CSW = Surface water exposure concentrations for Rocky Branch Creek, presented in Table 3-2

SA = 1,970 cm^2, average hand and foot surface area of a 12- to 18-year old (U.S. EPA, 1989a)

ET = 1 hour/day

EF = 1 day/week, 13 weeks/year

ED = 5 years

BW = 56 kg, average weight of a 12- to 18-year old (U.S. EPA, 1989a)

AT = 365 days/year x 5 years (for evaluating noncancer risk)
= 365 days/year x 70 years (for evaluating cancer risk)

TABLE 10

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Model for Calculating Doses through Dermal Absorption from Surface Water (continued)

Worker (Current and Future):		
CSW	=	Surface water exposure concentrations based on all surface waters, presented in Table 3-2
SA	=	840 cm^2, average hand surface area of an adult (U.S. EPA, 1989a)
ET	=	1 hour/day
EF	=	1 day/week, 50 weeks/year (U.S. EPA, 1991)
ED	=	25 years (U.S. EPA, 1991)
BW	=	70 kg (U.S. EPA, 1991)
AT	=	365 days/year x 25 years (for evaluating noncancer risk)
	=	365 days/year x 70 years (for evaluating cancer risk)

TABLE 10 (cont)

Model for Calculating Doses through the Ingestion of Groundwater

$$\text{Groundwater Ingestion Dose (mg/kg-day)} = \frac{CGW * GIR * EF * ED}{BW * AT}$$

Where:

CGW	=	Chemical concentration in groundwater (mg/L)
GIR	=	Groundwater ingestion rate (L/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Exposure Assumptions

Worker (Future):

CW	=	Groundwater exposure concentrations
IR	=	1 L/day (U.S. EPA, 1991)
EF	=	250 days/year (U.S. EPA, 1991)
ED	=	25 years (U.S. EPA, 1991)
BW	=	70 kg (U.S. EPA, 1991)
AT	=	365 days/year x 25 years (for evaluating noncancer risk)
	=	365 days/year x 70 years (for evaluating cancer risk)

chronic, subchronic, or lifetime). Thus, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause (carcinogenic and noncarcinogenic), and how the occurrence of these effects depends upon dose, route, and duration of exposure.

Slope factors (SF's) have been developed by EPA for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. SF's, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

References doses (RfD's) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminants of concern exhibiting non-carcinogenic adverse health effects. RfD's which are expressed in units of mg/kg-day, are estimates of daily (maximum) exposure levels for the human population, including sensitive subpopulations. Estimated intakes of contaminants of concern from environmental media (e.g., the amount of chemical ingested from drinking contaminated ground water) can be compared to the RfD. RfD's are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied to account for the use of animal data to predict effects on humans.

Toxicity information used to calculate the risk for carcinogenic risk including the slope factor, the weight of evidence, and source of the toxicity information can be found in **Tables 12 and 13**. Chronic and subchronic references doses used in the toxicity assessment can be found in **Tables 14 and 15**.

In numerous public forums over the past year, EPA has summarized the preliminary results from the dioxin reassessment study in order to accept public comment during the scientific peer review process. One of the major conclusions was that the "weight-of-evidence" suggested that dioxin, furans, and dioxin like compounds are likely to present a cancer hazard to humans, and that a risk specific dose of dioxin at 0.01 pico grams (pg) TEQ per kilogram (kg) of body weight per day, resulted in one additional cancer in one million. This risk specific dose estimate represents a plausible upper bound on risk based on the evaluation of both animal and human data. With regards to average intake, humans are currently exposed to background levels

U.S. EPA and IARC Categorizations of the Carcinogenic Substances of Potential Concern

Substance	EPA Carcinogenicity Category[a,b]	IARC Carcinogenicity Category[c,d]
Organics		
Chloroform	B2	2B
Methylene chloride	C	2B
2,3,7,8-TCDD	B2	2B
2,4,6-Trichlorophenol	B2	NC
Inorganics		
Arsenic	A	1
Lead	B2	2B

[a]References: IRIS, 1995; U.S. EPA, 1994b

[b]Category definitions (U.S. EPA, 1986b):

- A = Human carcinogen (sufficient evidence from epidemiologic studies).
- B2 = Probable human carcinogen (sufficient evidence from animal studies and inadequate or no human data).
- C = Possible human carcinogen (limited evidence from animal studies and no human data)

[c]Reference: WHO, 1987

[d]Category definition (WHO, 1987):

- 1 = Human carcinogen (sufficient evidence of carcinogenicity in humans).
- 2B = Possible human carcinogen (limited evidence of carcinogenicity in humans in the absence of sufficient evidence of carcinogenicity in experimental animals; inadequate evidence of carcinogenicity in humans or no human data and sufficient evidence of carcinogenicity in experimental animals; or inadequate evidence of carcinogenicity or no data in humans and limited evidence of carcinogenicity in experimental animals, with supporting evidence from other relevant data).

NC = Not categorized.

TABLE 12

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Cancer Slope Factors

Substance	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference or Basis	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference or Basis	Dermal Slope Factor[a] $(mg/kg\text{-}day)^{-1}$
Organics					
Chloroform	NC	—	6.1E-03	IRIS, 1995	NC
Methylene chloride	NC	—	7.5E-03	IRIS, 1995	NC
2,3,7,8 TCDD	1.5E+05	U.S. EPA, 1994b	1.5E+05	U.S. EPA, 1994b	3.0E+05
	9.7E+03	OSF	9.7E+03	ChemRisk, 1990	1.9E+04
2,4,6-Trichlorophenol	1.1E-02[b]	IRIS, 1995	1.1E-02	IRIS, 1995	2.2E-02
Inorganics					
Arsenic	NC	—	1.75E+00[c]	IRIS, 1995	NC
Lead	NC	—	NTV	-	NC

[a]Dermal slope factors were derived from the oral slope factors as described in Subsection 3.3.2.3.
[b]Derived from a unit risk, assuming the inhalation of 20 m^3 of air per day and a body weight of 70 kg (U.S. EPA, 1994b).
[c]Derived from a unit risk, assuming the consumption of 2 liters of water per day and a body weight of 70 kg (U.S. EPA, 1994b).

NC = Substance is not of concern through this exposure route.
NTV = A toxicity value was not available.
OSF = Oral slope factor was used (Subsection 3.3.2.2).

TABLE 13

TABLE 14

Chronic Reference Doses (RfDs)

Substance	Inhalation RfD (mg/kg-day)	Reference or Basis	Oral RfD (mg/kg-day)	Reference or Basis	Dermal RfD[a] (mg/kg-day)
Organics					
Acetone	NC	—	1.0E-01	IRIS, 1995	NC
Chloroform	NC	—	1.0E-02	IRIS, 1995	NC
2-Chlorophenol	5.0E-03	ORD	5.0E-03	IRIS, 1995	4.5E-03 (dw)
4-Chlorophenol	NC	—	5.0E-03	Isomer	4.5E-03 (dw)
2,4-D	1.0E-02	ORD	1.0E-02	IRIS, 1995	5.0E-03 (d)
2,6-D	NC	—	1.0E-02	Isomer	5.0E-03(d)
2,4-Dichlorophenyl	3.0E-03	ORD	3.0E-03	IRIS, 1995	2.7E-03 (dw)
2,6-Dichlorophenyl	3.0E-03	ORD	3.0E-03	Isomer	2.7E-03 (dw)
Methylene chloride	NC	—	6.0E-02	IRIS, 1995	NC
Phenol	NC	—	6.0E-01	IRIS, 1995	5.4E-01 (g)
Silvex	8.0E-03	ORD	8.0E-03	IRIS, 1995	4.0E-03 (d)
2,4,5-T	1.0E-02	ORD	1.0E-02	IRIS, 1995	5.0E-03 (d)
2,4,6-T	NC	—	1.0E-02	Isomer	5.0E-03(d)
2,3,7,8-TCDD	NTV	—	NTV	—	NTV
Tetrachlorobenzene	3.00E-04[b]	ORD	3.0E-04[c]	IRIS, 1995	NC
Toluene	NC	—	2.0E-01	IRIS, 1995	1.8E-01 (g)
2,3,6-Trichlorophenol	NC	—	1.0E-01	Isomer	5.0E-02 (d)

TABLE 14 (cont)

Chronic Reference Doses (RfDs)
(continued)

Substance	Inhalation RfD[b] (mg/kg-day)	Reference or Basis	Oral RfD (mg/kg-day)	Reference or Basis	Dermal RfD[a] (mg/kg-day)
Organics (continued)					
2,4,5-Trichlorophenol	1.0E-01	ORD	1.0E-01	IRIS, 1995	5.0E-02 (d)
2,4,6-Trichlorophenol	1.0E-01	ORD	1.0E-01	Isomer	5.0E-02 (d)
Inorganics					
Antimony	NC	—	4.0E-04	IRIS, 1995	NC
Arsenic	NC	—	3.0E-04	IRIS, 1995	NC
Chromium	NC	—	5.0E-03[d]	IRIS, 1995	NC
Copper	NC	—	3.7E-02[e]	U.S. EPA, 1994b	NC
Lead	NC	—	NTV	—	NC
Mercury	NC	—	3.0E-04	U.S. EPA, 1994b	NC
Nickel	NC	—	2.0E-02	IRIS, 1995	NC
Silver	NC	—	5.0E-03	IRIS, 1995	NC
Thallium	NC	—	NTV[f]	—	NC
Zinc	NC	—	3.0E-01	IRIS, 1995	NC

[a]Chronic dermal RfDs were calculated from the chronic oral RfDs as described in Subsection 3.3.3.3. The route by which the chemical was administered in the studies on which the oral RfD was based is indicated in parentheses as follows:

- d = diet
- dw = drinking water
- g = gavage

[b]The inhalation RfD was used only in the hot spot analysis (Subsection 3.5).

TABLE 15

Subchronic Reference Doses (RfDs)

Substance	Inhalation RfD (mg/kg-day)	Reference or Basis	Oral RfD (mg/kg-day)	Reference or Basis	Dermal RfD[a] (mg/kg-day)
Organics					
Acetone	NC	–	NC	–	NC
Chloroform	NC	–	NC	–	NC
2-Chlorophenol	5.0E-02	ORD	5.0E-02	U.S. EPA, 1994b	4.5E-02 (dw)
4-Chlorophenol	NC	–	5.0E-02(D)	Isomer	4.5E-02 (dw)
2,4-D	1.0E-02	ORD	1.0E-02	U.S. EPA, 1994b	5.0E-03 (d)
2,6-D	NC	–	1.0E-02	Isomer	5.0E-03(d)
2,4-Dichlorophenyl	3.0E-03	ORD	3.0E-03	U.S. EPA, 1994b	2.7E-03 (dw)
2,6-Dichlorophenyl	3.0E-03	ORD	3.0E-03	Isomer	2.7E-03 (dw)
Methylene chloride	NC	–	NC	–	NC
Phenol	NC	–	6.0E-01(D)	U.S. EPA, 1994b	5.4E-01 (g)
Silvex	8.0E-03	ORD	8.0E-03	U.S. EPA, 1994b	4.0E-03 (d)
2,4,5-T	1.0E-01	ORD	1.0E-01	U.S. EPA, 1994b	5.0E-02 (d)
2,4,6-T	NC	–	1.0E-01	Isomer	5.0E-02(d)
2,3,7,8-TCDD	NTV	–	NTV	–	NTV
Tetrachlorobenzene	NC	–	NC	–	NC
Toluene	NC	–	2.0E+00(D)	U.S. EPA, 1994b	1.8E+00 (g)
2,3,6-Trichlorophenol	NC	–	1.0E+00	Isomer	5.0E-01(d)

TABLE 15 (cont)

Subchronic Reference Doses (RfDs)
(continued)

Substance	Inhalation RfD (mg/kg-day)	Reference or Basis	Oral RfD (mg/kg-day)	Reference or Basis	Dermal RfD[a] (mg/kg-day)
Organics (continued)					
2,4,5-Trichlorophenol	1.0E+00	ORD	1.0E+00	U.S. EPA, 1994b	5.0E-01 (d)
2,4,6-Trichlorophenol	1.0E+00	ORD	1.0E+00	Isomer	5.0E-01 (d)

[a]Subchronic dermal RfDs were calculated from the subchronic oral RfDs as described in Subsection 3.3.3.3. The route by which the chemical was administered in the studies on which the oral RfD was based is indicated in parentheses as follows:

d = diet
dw = drinking water
g = gavage
(D) = The substance is not of concern for the trespasser scenario through the oral route. The oral RfD was used only to calculate the dermal RfD.
NC = The chemical is not a substance of potential concern through this exposure route.
NTV = A toxicity value was not available.
ORD = The subchronic oral RfD was used.

of dioxin-like compounds on the order of 3-6 TEQ's pg/kg/day. Therefore, plausible upper-bound risk estimates for general population exposures to dioxin and related compounds (at background levels) may be as high as 1 in 10,000 ($1X10^{-4}$) to 1 in 1,000 ($1X10^{-3}$). High end estimates of body burden of individuals in the general population (approximately the top 10% of the general population) may be greater than 3 times higher.

What should also be noted here is that the risk calculations presented in the baseline risk assessment (and reported in this summary) for dioxin are based on exposure to 2,3,7,8-TCDD only. Additional sampling performed by the PRP at the request of EPA shows that other dioxin and furan compounds are present at the site, and could contribute to approximately 20 percent greater risk than TCDD alone, i.e., the risk estimates presented could be adjusted upward by 20 percent.

It is also important to note that the non-cancer risks outlined in the baseline risk assessment and summarized here do not address the non-cancer risks associated with low level exposures to dioxin. As a result, the baseline risk assessment may underestimate the non-cancer risk associated with exposure to site contaminants. The reason being is that a reference dose (RfD) (the daily intake of a chemical to which an individual can be exposed without experiencing non-cancer health effects) has not been established by EPA for dioxin at this time. If a reference dose were to be calculated for dioxin based on human and animal data, it could result in an acceptable intake level for humans below the current level of daily intake in the general population. EPA's dioxin reassessment study has suggested that at some dose, and possibly within one order of magnitude of average background body burdens, dioxin exposure can result in noncancer health effects in humans. These effects include developmental and reproductive effects, immune suppression, and disruption of regulatory hormones.

6.3.4 Risk Characterization

Cancer Risk

The risk of getting cancer from exposure to a chemical is described in terms of probability that an individual exposed for his or her entire lifetime will develop cancer by the age 70. For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a life-time as a result of exposure to the carcinogen. Excess life-time cancer risk is calculated using the following equation:

$$\text{Cancer Risk} = \text{Lifetime Averaged Dose (mg/kg-day)} \times \text{Cancer Slope Factor (mg/kg-day)}^{-1}$$

These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6} or $1E^{-6}$). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a reasonable maximum estimate, and individual has a 1 in 1,000,000 chance of developing cancer as a result of site related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Tables 16, 17, and 18 summarize the potential lifetime cancer risk for the three exposure scenarios examined in the risk assessment.

The calculated excess lifetime cancer risk for the trespasser scenario was $8X10^{-5}$ or approximately 8 in 100,000. The exposure routes that posed the majority of the risk to the trespasser were through dermal absorption from surface water, incidental soil ingestion, and dermal contact with soil. TCDD dioxin was the only contaminant that contributed to an excess cancer risk greater that $1X10^{-6}$.

The calculated excess lifetime cancer risk for the current unprotected worker scenario based on all exposure routes was approximately 1 in 1,000 or $1X10^{-3}$. This risk exceeds EPA's acceptable risk range. The exposure routes that posed the majority of the risk to the current unprotected worker were through dermal contact with soil ($6X10^{-4}$), dermal contact with surface waters ($5X10^{-4}$), and incidental soil ingestion ($2X10^{-4}$).

The calculated excess lifetime cancer risk for the future unprotected worker scenario based on all exposure routes was approximately 5 in 100 or $5X10^{-2}$. This risk exceeds EPA's acceptable risk range. The exposure routes that posed the majority of the risk to the future unprotected worker were through soil ingestion ($2X10^{-4}$), dermal contact with soil ($6X10^{-4}$), dermal contact with surface water ($5X10^{-4}$), and ground water ingestion ($5X10^{-2}$).

Over 99 percent of the calculated risk for all exposure scenarios was contributed by 2,3,7,8-TCDD. As mentioned earlier, when all dioxin and furan congeners are factored into the risk estimates, those estimates may be 20 percent higher.

Non-cancer Risk

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g.,

TABLE 16

POTENTIAL LIFETIME CANCER RISK
TRESPASSER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	TOTAL
2,3,7,8-TCDD (U.S. EPA)	6.27E-06	1.47E-05	9.72E-09	1.94E-10	6.39E-05	8.48E-05
(ChemRisk)	4.05E-07	9.29E-07	6.28E-10	1.26E-11	4.05E-06	5.38E-06
2,4,6-Trichlorophenol	1.70E-10	3.31E-09	2.63E-13	2.50E-14	4.41E-10	3.92E-09
TOTAL (U.S.EPA)	6.27E-06	1.47E-05	9.72E-09	1.94E-10	6.39E-05	
TOTAL (ChemRisk)	4.06E-07	9.32E-07	6.29E-10	1.26E-11	4.05E-06	
				TOTAL LIFETIME CANCER RISK (U.S EPA)		8.49E-05
				TOTAL LIFETIME CANCER RISK (ChemRisk)		5.39E-06

TABLE 17

POTENTIAL LIFETIME CANCER RISK
CURRENT UNPROTECTED WORKER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	TOTAL
2,3,7,8-TCDD (U.S. EPA)	2.41E-04	5.79E-04	2.99E-06	5.98E-08	4.68E-04	1.29E-03
(ChemRisk)	1.56E-05	3.67E-05	1.93E-07	3.86E-09	2.97E-05	8.21E-05
2,4,6-Trichlorophenol	6.53E-09	1.31E-07	8.10E-11	7.69E-12	1.14E-06	1.28E-06
TOTAL (U.S. EPA)	2.41E-04	5.79E-04	2.99E-06	5.98E-08	4.70E-04	
TOTAL (ChemRisk)	1.56E-05	3.68E-05	1.93E-07	3.87E-09	3.08E-05	
					TOTAL LIFETIME CANCER RISK (U.S. EPA)	1.29E-03
					TOTAL LIFETIME CANCER RISK (ChemRisk)	8.34E-05

TABLE 18

POTENTIAL LIFETIME CANCER RISK
FUTURE UNPROTECTED WORKER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	GROUNDWATER INGESTION	TOTAL
Chloroform	NA	NA	NA	NA	NA	1.51E-07	1.51E-07
Methylene chloride	NA	NA	NA	NA	NA	3.41E-07	3.41E-07
2,3,7,8-TCDD (U.S. EPA)	2.41E-04	5.79E-04	2.99E-06	5.98E-08	4.68E-04	5.08E-02	5.21E-02
(ChemRisk)	1.56E-05	3.67E-05	1.93E-07	3.86E-09	2.97E-05	3.29E-03	3.37E-03
2,4,6-Trichlorophenol	6.53E-09	1.31E-07	8.10E-11	7.69E-12	1.14E-06	3.81E-04	3.82E-04
Arsenic	NA	NA	NA	NA	NA	3.42E-05	3.42E-05
Lead	NA	NA	NA	NA	NA	NTV	NTV
TOTAL (U.S. EPA)	2.41E-04	5.79E-04	2.99E-06	5.98E-08	4.70E-04	5.13E-02	
TOTAL (ChemRisk)	1.56E-05	3.68E-05	1.93E-07	3.87E-09	3.08E-05	3.70E-03	

TOTAL LIFETIME CANCER RISK (U.S. EPA)	5.26E-02
TOTAL LIFETIME CANCER RISK (ChemRisk)	3.79E-03

NA - Not applicable. Chemical is not of concern through this exposure route.
NTV - Not calculated because a slope factor was not available.

life-time) with a reference dose derived for a similar exposure period. The ratio of exposure to toxicity is called the hazard quotient. By adding the hazard quotients for all contaminants of concern which affect the same target organ (e.g., the liver) within a medium or across all media to which a population may reasonably be exposed, the Hazard Index (HI) can be generated. In general, a total hazard index of 1 is used as a benchmark of potential concern for non-cancer health effects.

$$\text{Hazard Quotient} = \text{Daily Intake} \div \text{Reference Dose}$$

Tables 19, 20, and 21 summarize the hazard quotients and indices calculated for the same potentially exposed individuals.

The total hazard index calculated for contaminants of concern other than dioxin for a trespasser was approximately 0.4, based on soil ingestion, soil inhalation, dermal contact with soil, and dermal contact with surface water. Again, the benchmark of concern for non-cancer health effects is 1. A total hazard index of approximately 4 was calculated for the current unprotected worker with dermal contact with 2,4-D contributing most of the risk. For the future unprotected worker a hazard index of 5,520 was calculated. The ground water ingestion pathway contributed most to the non-cancer risk for the future unprotected worker. Again, for this ROD EPA did not consider the ground water ingestion exposure route in developing the remediation goals for this site, because drinking water for the Jacksonville area is provided from sources near Little Rock, and it is doubtful that any wells on this property will ever be used for domestic purposes.

6.3.5 Uncertainty Analysis

Within the Superfund process, baseline risk assessments are developed to provide risk managers numerical representation of the severity of contamination present at a site, as well as to provide an indication of the potential for adverse public health effects. There are many inherent and imposed uncertainties in the risk assessment process. Some of these uncertainties may lend in the under estimation of site risk others in its overestimation.

Factors that Tend to Underestimate Exposure/Risk

- Lack of RfD's or SF's for all chemicals of concern;
- Nonquantification of some exposure pathways;
- Exclusion of chemicals present but not detected;

TABLE 19

HAZARD QUOTIENTS AND INDICES
TRESPASSER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	HAZARD INDEX (BY SUBSTANCE)
2-Chlorophenol	4.96E-07	9.67E-06	7.69E-10	1.34E-10	2.02E-06	1.22E-05
4-Chlorophenol	NA	NA	NA	NA	1.60E-05	1.60E-05
2,4-D	1.97E-02	3.84E-01	3.06E-05	NC	2.75E-04	4.04E-01
2,6-D	NA	NA	NA	NA	8.68E-05	8.68E-05
2,4-Dichlorophenol	1.06E-04	2.07E-03	1.64E-07	3.60E-08	3.62E-04	2.54E-03
2,6-Dichlorophenol	1.40E-05	2.73E-04	2.17E-08	6.04E-09	2.22E-05	3.09E-04
Phenol	NA	NA	NA	NA	4.38E-08	4.38E-08
Silvex	8.75E-04	1.71E-02	1.36E-06	5.96E-09	9.96E-05	1.80E-02
2,4,5-T	1.59E-04	3.10E-03	2.46E-07	3.18E-09	2.76E-05	3.29E-03
2,4,6-T	NA	NA	NA	NA	1.55E-05	1.55E-05
2,3,7,8-TCDD	NTV	NTV	NTV	NTV	NTV	NTV
Tetrachlorobenzene	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	5.01E-07	5.01E-07
2,3,6-Trichlorophenol	NA	NA	NA	NA	2.85E-07	2.85E-07
2,4,5-Trichlorophenol	1.91E-07	3.72E-06	2.96E-10	5.09E-10	1.58E-06	5.49E-06
2,4,6-Trichlorophenol	2.16E-07	4.22E-06	3.35E-10	3.18E-11	5.62E-07	5.00E-06
HAZARD INDEX (BY EXPOSURE ROUTE)	2.09E-02	4.07E-01	3.23E-05	5.19E-08	9.10E-04	
				TOTAL HAZARD INDEX		4.29E-01

NA - Not applicable. Chemical is not of concern through this exposure route.
NC - Not calculated because an exposure concentration could not be determined (Appendix E).
NTV - Not calculated because an RfD was not available.

TABLE 20

HAZARD QUOTIENTS AND INDICES
CURRENT UNPROTECTED WORKER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	HAZARD INDEX (BY SUBSTANCE)
2-Chlorophenol	3.82E-05	7.63E-04	4.73E-07	8.22E-08	5.06E-03	5.86E-03
4-Chlorophenol	NA	NA	NA	NA	1.16E-01	1.16E-01
2,4-D	1.52E-01	3.03E+00	1.88E-03	NC	4.72E-02	3.23E+00
2,6-D	NA	NA	NA	NA	1.50E-02	1.50E-02
2,4-Dichlorophenol	8.15E-04	1.63E-02	1.01E-05	2.22E-06	2.48E-01	2.66E-01
2,6-Dichlorophenol	1.08E-04	2.15E-03	1.33E-06	3.72E-07	3.09E-03	5.35E-03
Phenol	NA	NA	NA	NA	1.55E-05	1.55E-05
Silvex	[illegible] 73E-03	1.35E-01	8.34E-05	3.67E-07	1.20E-0[illegible]	1.53E-01
2,4,5-T	[illegible].22E-02	2.45E-01	1.52E-04	1.96E-06	3.98E-02	2.97E-01
2,4,6-T	NA	NA	NA	NA	7.99E-02	7.99E-02
2,3,7,8-TCDD	NTV	NTV	NTV	NTV	NTV	NTV
Tetrachlorobenzene	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	1.60E-03	1.60E-03
2,3,6-Trichlorophenol	NA	NA	NA	NA	2.24E-05	2.24E-05
2,4,5-Trichlorophenol	1 47E-05	2.94E-04	1.82E-07	3.13E-07	8.61E-03	8.92E-03
2,4,6-Trichlorophenol	1.66E-05	3.33E-04	2.06E-07	1.96E-08	2.91E-03	3.26E-03
HAZARD INDEX (BY EXPOSURE ROUTE)	1.72E-01	3.43E+00	2.13E-03	5.33E-06	5.79E-01	
				TOTAL HAZARD INDEX		4.19E+00

NA – Not applicable. Chemical is not of concern through this exposure route.
NC – Not calculated because an exposure concentration could not be determined (Appendix E).
NTV – Not calculated because an RfD was not available.

TABLE 21

HAZARD QUOTIENTS AND INDICES
FUTURE UNPROTECTED WORKER

SUBSTANCE	SOIL INGESTION	DERMAL ABSORPTION FROM SOIL	SOIL INHALATION	VAPOR INHALATION	DERMAL ABSORPTION FROM SURFACE WATER	GROUNDWATER INGESTION	HAZARD INDEX (BY SUBSTANCE)
Acetone	NA	NA	NA	NA	NA	1.57E-03	1.57E-03
Chloroform	NA	NA	NA	NA	NA	6.95E-03	6.95E-03
2-Chlorophenol	3.82E-05	7.63E-04	4.73E-07	8.22E-08	5.06E-03	3.13E+01	3.13E+01
4-Chlorophenol	NA	NA	NA	NA	1.16E-01	1.19E+02	1.19E+02
2,4-D	1.52E-01	3.03E+00	1.88E-03	NC	4.72E-02	1.57E+03	1.57E+03
2,6-D	NA	NA	NA	NA	1.50E-02	1.08E+03	1.08E+03
2,4-Dichlorophenol	8.15E-04	1.63E-02	1.01E-05	2.22E-06	2.48E-01	1.89E+03	1.89E+03
2,6-Dichlorophenol	1.08E-04	2.15E-03	1.33E-06	3.72E-07	3.09E-03	8.15E+01	8.15E+01
Methylene chloride	NA	NA	NA	NA	NA	2.12E-03	2.12E-03
Phenol	NA	NA	NA	NA	1.55E-05	1.24E-01	1.24E-01
Silvex	6.73E-03	1.35E-01	8.34E-05	3.67E-07	1.20E-02	1.35E+02	1.35E+02
2,4,5-T	1.22E-02	2.45E-01	1.52E-04	1.96E-06	3.98E-02	3.72E+02	3.72E+02
2,4,6-T	NA	NA	NA	NA	7.99E-02	2.05E+02	2.06E+02
2,3,7,8-TCDD	NTV	NTV	NTV	NTV	NTV	NTV	NTV
Tetrachlorobenzene	NA	NA	NA	NA	NA	3.26E+00	3.26E+00
Toluene	NA	NA	NA	NA	1.60E-03	2.15E+01	2.15E+01
2,3,6-Trichlorophenol	NA	NA	NA	NA	2.24E-05	9.30E-03	9.32E-03
2,4,5-Trichlorophenol	1.47E-05	2.94E-04	1.82E-07	3.13E-07	8.61E-03	1.27E+01	1.27E+01
2,4,6-Trichlorophenol	1.66E-05	3.33E-04	2.06E-07	1.96E-08	2.91E-03	9.69E-01	9.72E-01
Antimony	NA	NA	NA	NA	NA	7.09E-01	7.09E-01
Arsenic	NA	NA	NA	NA	NA	1.83E-01	1.83E-01
Chromium	NA	NA	NA	NA	NA	1.08E-02	1.08E-02
Copper	NA	NA	NA	NA	NA	3.70E-03	3.70E-03
Lead	NA	NA	NA	NA	NA	NTV	NTV
Mercury	NA	NA	NA	NA	NA	1.01E-02	1.01E-02
Nickel	NA	NA	NA	NA	NA	2.40E-02	2.40E-02
Silver	NA	NA	NA	NA	NA	1.17E-02	1.17E-02
Thallium	NA	NA	NA	NA	NA	NTV	NTV
Zinc	NA	NA	NA	NA	NA	2.05E-03	2.05E-03
HAZARD INDEX (BY EXPOSURE ROUTE)	1.72E-01	3.43E+00	2.13E-03	5.33E-06	.79E-01	5.52E+03	
					TOTAL HAZARD INDEX		5.52E+03

NA – Not applicable. Chemical is not of concern through this exposure route.
NC – Not calculated because an exposure concentration could not be determined (Appendix E).
NTV – Not calculated because an RfD value was not available.

Factors that Tend to Overestimate Exposure/Risk; 003052

- Use of conservative exposure assumptions;
- Use of conservative RfD's or SF's;
- Factors that could either Over or Underestimate Exposure/Risk;
- Use of 1/2 the detection limit; and
- Possible occurrence of hotspots.

6.3.6 Central Tendency Exposure

In February 1992 a guidance memorandum from the Deputy Administrator of EPA required that all Superfund risk assessments evaluate both reasonable maximum exposure (RME) and central tendency exposures. Exposure assumptions in the ROD up to this section have been based on RME. The central tendency scenario represents the risk from more of an "average" exposure (<u>see</u> **Table 22**).

6.4 ECOLOGICAL RISK ASSESSMENT

The objective of the ecological risk assessment is to identify and estimate the potential for adverse ecological effects to terrestrial and aquatic flora and fauna from exposure to hazardous substances found in the soil and surface waters at the Vertac site, including Rocky Branch Creek. An ecological risk assessment is subject to a wide variety of uncertainties. Virtually ever step in the risk assessment process involves numerous assumptions that contribute to the total uncertainty in the final evaluation of risk. The uncertainty incorporated in this assessment may result in an increase or decrease of the estimation of potential ecological risks. However, when possible, conservative approaches are used in uncertain situations. The conservative method tends to increase the estimated risk and therefore is protective of ecological resources. The substance of potential concern concentration data, exposure assessment factors, and toxicity value selection are the major contributors to uncertainty in the risk assessment. Therefore, the ecological risk assessment for the OU2 media used conservative, yet realistic, assumptions.

In general, the approach for conducting the ecological risk assessment parallels that used in the human health risk assessment. Habitats and organisms potentially affected by site-related chemicals were identified. For some organisms, the risk estimated was due to direct exposure to site chemicals, such as through ingestion of site surface water, and for other organisms simple models were used to determine exposure to site

Summary of Potential Cancer Risks and Hazard Indices[a] — Central Tendency Case

Scenario	Total Lifetime Cancer Risk[b]	Total Hazard Index
Trespasser	4E-06 (ChemRisk) 7E-05 (U.S. EPA)	2E-02
Current Unprotected Worker	1E-05 (ChemRisk) 2E-04 (U.S. EPA)	2E-01
Future Unprotected Worker	2E-04 (ChemRisk) 2E-03 (U.S. EPA)	2E+03

[a]Values are rounded to one significant figure.
[b]ChemRisk = Cancer risk was calculated using the slope factor for 2,3,7,8-TCDD developed by ChemRisk.
U.S. EPA = Cancer risk was calculated using the slope factors for 2,3,7,8-TCDD developed by U.S. EPA.

TABLE 22

contaminants through indirect exposure routes, such as eating contaminated vegetation. The potential for effects to occur was evaluated by comparing benchmark criteria, such as acceptable daily intakes to estimated exposures. This comparison resulted in the calculation of hazard quotients. In general, a hazard quotient greater than 1 indicated a potential for impacts to occur as a result of exposure to a particular chemical.

Potential ecological risks were evaluated for two mammalian species and three avian species. The potential for adverse ecological effects on aquatic fauna of the Rocky Branch Creek were also estimated. The results of the ecological risk assessment showed that each of the organisms evaluated had a hazard index exceeding the benchmark of 1. The total hazard indices for the ecological receptors evaluated ranged between 3.4 and 54.

While this data suggests that dioxin contaminated sediments in Rocky Branch Creek have resulted in ecological impacts, until the site is remediated and the source of dioxin contamination eliminated, the potential for continuing impacts exists through contaminated surface soils, sediment transport and groundwater seeps. However, with this remedy, the primary source will be removed through consolidation of dioxin contaminated soils in the on-site landfill and sediment transport resulting from the sump overflows and storm water runon/runoff will be reduced or eliminated through storm water management.

Groundwater seeps from the contaminated areas of the site into Rocky Branch Creek are currently impeded by the French Drain system installed along the western edge of the site and bordering the on-site burial grounds, thereby preventing another potential source of contamination for Rocky Branch Creek. Stream data indicates no measurable dioxin concentrations, for example, following rain events. Since Rocky Branch Creek is not a perennial waterbody and does not flow through the site, the removal of the contaminated soils and elimination of untreated discharges and possible groundwater seeps will essentially eliminate future impacts. While data suggests that existing impacts in Rocky Branch Creek are on the decline, any actions to remove contaminated sediments in Rocky Branch Creek would be cost prohibitive, but more importantly, any disturbance of the existing sediment could prove catastrophic, possible even destroying the entire existing ecosystem. As such, this remedy in addition to the other on-going remedies at the site will effectively remove the contamination source and the storm water transport concern allowing Rocky Branch Creek to continue, in essence, a natural attenuation process.

In addition to the Ecological Risk Assessment, fish tissue data collected for TCDD from the Rocky Branch Creek/Bayou Meto watershed areas near the site suggest that contaminants of concern continue to pose an actual threat to local ecological receptors. EPA issued a ROD in September 1990 addressing the Vertac off-site areas. One of the ROD requirements was to monitor fish in the streams for dioxin and continue the ban on commercial fishing and the advisory that discouraged sport fishing as long as fish tissue dioxin levels are above Food and Drug Administration (FDA) alert levels. FDA issued a health advisory stating that fish with 2,3,7,8-TCDD $\geq$ 50 parts per trillion (ppt) should not be consumed, and levels below 25 ppt pose no serious health threat. Based on this guidance, the Arkansas Department of Health (ADH) has established an advisory level of 25 ppt in fish flesh. The current advisory encompasses Bayou Meto from Arkansas Highway 13, upstream to the mouth of the discharge from Jacksonville West Wastewater Treatment Plant, including Rocky Branch Creek and Lake Dupree.

Based on 1994 fish tissue sampling results, dioxin concentrations appeared to generally decrease with increasing distance from the site. The highest dioxin concentrations were found in Big Mouth Buffalo from Rocky Branch Creek and Bayou Meto upstream of Hwy 67-167. The concentrations found were 73 ppt and 94 ppt as TCDD TEQ's, respectively. Concentrations of TCDD for White Crappie at the Rocky Branch Creek location was 26 ppt, and 19 ppt for Large Mouth Bass at the Bayou Meto 67-167 location. At the Arkansas Highway 161 location, TCDD concentrations ranged from 22 to 36 ppt depending upon the species of fish sampled.

In comparison, as a part of EPA's National Bioaccumulation Study (EPA, 1992), fish data were collected to help identify background levels of dioxin in fish. Sixty fish samples were collected from fresh and estuarine waters at a total of 34 sites away from points of obvious industrial activity. The average TEQ was 1.2 ppt (assuming half the detection limit for non-detects). When looking at all areas (not just pristine or background) EPA (1992) found an average of 11 ppt TEQ for 314 stations sampled.

6.5 REMEDIAL ACTION GOALS

A Remedial Action Goal (RG) is a chemical-specific concentration for each chemical of concern that helps determine whether a contaminated medium may be left in place or must be addressed in the site remediation effort. Media exhibiting contaminant concentrations below the RG's may be left in place without treatment. Those wastes that exceed the RG's at the site will be addressed to meet requirements set out in the performance standards for each medium.

Two different risk assessment approaches were conducted for Vertac soils in order to realistically evaluate appropriate Remediation Goals (RG's) for site contaminants based on given land use and exposure assumptions. The first method, Reasonable Maximum Exposure (RME), is based on EPA risk assessment guidance

003056

(see Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part A) (Interim Final, EPA/540/1-89/002, December 1989), and the second method was based on Monte Carlo probabilistic risk modeling. Soil cleanup levels derived from these two risk assessment methodologies can differ for any given exposure scenario. Examples of assumptions that go into the models to develop cleanup standards include how often a person visits a site, how long the person stays there during each visit, how much soil or dust a person is exposed to at the site, how contaminated the soil is, and how hazardous the contamination in the soil is. One of the principle differences between the two risk assessment methodologies is that RME uses one combination of values for each of these input assumptions (which is high but reasonably possible), and Monte Carlo uses a wide range of values for each input parameter.

Over the past year, EPA has met on numerous occasions with various local civic groups and community leaders to discuss cleanup activities at the Vertac site. One common element from those discussions included concern over the potential for future commercial redevelopment of the site, or portions of the site. <u>See</u> discussion at Sections 3.0 and 4.0 above. With that in mind, EPA has developed soil cleanup goals for dioxin at the Vertac Site that would be protective for a worker in a commercial/industrial setting. EPA acknowledges that certain portions of the site will be unavailable for potential future redevelopment, <u>i.e.</u>, areas that house landfills, and areas that are otherwise encumbered by long-term remediation or other perpetual operations and maintenance. Also, input from the community stressed that the workers required to maintain these restricted portions of the site should also be protected to a commercial/industrial level and not be required to wear "moonsuits" to conduct their activities in the community. Another community concern is that the smallest area possible be fenced so that future potential commercial/industrial development is possible. EPA expects the fence along Marshall Road will be moved west in phases as the remedial action completion allows. However, EPA will not know until the remedial design phase of the OU2 remediation the precise location of the fence it will require Hercules, Inc., to install. With this in mind EPA analyzed the risk for a "casual passerby". EPA has concluded that any future passerby is fully protected by any risks from the site. <u>See</u> Section 6.3.2 - Casual Passerby.

The two primary contaminants in Vertac soils that will require remediation are dioxins and furans as 2,3,7,8-TCDD toxicity equivalents (TEQ's), and tetrachlorobenzene (TCB). TCDD contamination is present across a wide area of the site and was an unwanted byproduct from the production of the herbicide 2,4,5-T. TCB contamination, however, is only found in a localized area or "hot spot" and is the result of a railroad tank car spill. RG's were not developed for other contaminants of concern at the site because they will be well below health-based action levels after dioxin remediation takes place.

Following is a summary of EPA's risk evaluation used to set site remediation goals for dioxin and furans (TEQ) at Vertac.

EPA evaluated a 50 ppb, 20 ppb, and a 5 ppb as not-to-exceed cleanup values for TCDD (TEQ) at the Vertac site using both RME and Monte Carlo risk analysis. Some of the assumptions used in the modelling included a worker scenario, non-detects were counted as 0.15 ppb (1/2 the detection limit), and that all remediated grids would be replaced with clean fill. **Table 23** presents all the parameters and values used in the RME calculations and **Table 24** presents the parameters and values used in the Monte Carlo calculations. An RME and Monte Carlo simulation was run for each of the soil cleanup levels and the results of those analyses are shown in **Table 25**.

The RME results show that the excess lifetime cancer risk associated with an average exposure point concentration of 50, 20, and 5 ppb, are 7.6 x 10-3, 3.0 x 10-3, and 7.6 x 10-4 respectively. Compared to RME risks, the Monte Carlo simulation risks were 3.1 x 10-3, 1.2 x 10-3, and 3.1 x 10-4 respectively using the 95% probability distribution point when Monte Carlo analyses are run with the fixed point concentrations of 50, 20, and 5 ppb respectively. These results also support the conclusion that any risk posed to a casual passerby is well within EPA's acceptable risk range.

In order to more realistically evaluate the exposure concentration of a person at the site, grid averaging was employed to determine the actual exposure concentration, rather than defaulting to the cleanup goal as the exposure point concentration. In order to accomplish this, EPA next ran both the RME and Monte Carlo simulations on the arithmetic mean (using the 95% upper confidence limit (UCL95) of dioxin that would be present at the site after remediation. For not-to-exceed cleanup values of 50, 20, and 5 ppb, arithmetic mean values of 2.92, 1.8 and 0.676 ppb were obtained. The RME excess cancer risks associated with 2.92, 1.8, and 0.675 ppb were 4.4 x 10-4, 2.7 x 10-4 and 1.0 x 10-4 respectively.

For the Monte Carlo analysis, the lognormal distribution of these residual grids were used as the concentration term, and the excess lifetime cancer risk at the 95% probability distribution were 1.8 x 10-4, 1.1 x 10-4, and 4.1 x 10-5 for not to exceed values of 50, 20, and 5 ppb. **Table 26** depicts the RG's developed for the Vertac site.

TABLE 23

Parameters and Values Used in the RME Risk Calculations Assuming a Hypothetical Worker Scenario Exposed Through Oral and Dermal Routes to Soil Contaminated with 2,3,7,8-TCDD TEQS at Vertac, Inc. Superfund Site.

Parameter	Units	Value	Source
Concentration (C_s)	mg/kg	0.005	Soil Cleanup level
Conversion Factor (CF)	kg/mg	1E-06	US EPA, 1989[1]
Skin Surface Area Available for Contact (SA)	cm^2	5000	US EPA, 1992[2]
Soil to Skin Adherence Rate (AF)	mg/cm^2-day	1	US EPA, 1992
Dermal Absorption (ABS_d)	Unitless	0.03	US EPA, 1992
Exposure Duration (ED)	years	25	US EPA, 1991[3]
Exposure Frequency (EF)	days/year	250	US EPA, 1991
Soil Ingestion rate (IR)	mg/day	50	US EPA, 1991
Oral Absorption (ABS_o)	Unitless	0.2	US EPA, 1992
Fraction Soil Contaminated (FI)	Unitless	0.5	US EPA, 1989
Body Weight (BW)	kg	70	US EPA, 1991a[4]
Averaging Time (AT)	days	25550	US EPA, 1991a
Dermal Slope Factor (SF_d)	/mg/kg/day	284000	US EPA, 1992
Oral Slope Factor (SF_o)	/mg/kg/day	156000	US EPA, 1994[5]

Risk was calculated by the following equations, adapted from EPA guidances[1,2,3,4]

$$\text{Risk} = \left(\frac{C_s * CF * SA * AF * ABS_d * EF * ED}{BW * AT} * SF_d \right) + \left(\frac{C_s * CF * IR * FI * ABS_o * EF * ED}{BW * AT} * SF_o \right)$$

TABLE 24

Parameters and Values used in Monte Carlo Simulations and RME Risk Calculations Assuming a Hypothetical Worker Scenario Exposed Through Oral and Dermal Routes to Soil Contaminated with 2,3,7,8-TCDD TEQs at Vertac, Inc. Superfund Site.							
Parameter	Units	RME	Monte Carlo Average	Monte Carlo 95th %le	Distribution Type	Distribution parameters	Source
2,3,7,8,-TCDD TEQs	ng/g (ppb)	5.0	0.674	2.1	Lognormal	M = 0.674 SD = 0.8739	Site data
Adult Skin Surface Area	cm2	20000	18149	18194	Lognormal	Males M = 19400 SD = 37.4 Females M = 16900 SD = 37.4	USEPA, 1992
Fraction of Skin Exposed	Unitless	0.25	0.249	0.329	Uniform	Min. = 0.161 Max. = 0.338	USEPA, 1992
Adherence Factor	mg/cm2-day	1.0	0.64	1.2	Triangular	Min. = 0.2 Best = 0.2 Max. = 1.5	USEPA, 1992
Dermal Absorption	Unitless	0.03	0.0155	0.0286	Uniform	Min. = 0.001 Max. = 0.03	USEPA, 1992
Exposure Frequency	days/ year	250	250	250	Fixed Point Estimate		USEPA, 1991
Exposure Duration	Years	25	7.88	34.4	Cumulative	Min. = 0 Max. = 48	HERCULES 1994
Adult Body Weight	kg	70	71.9	88.5	Lognormal	Males GM =ln 76.71 GSD = ln1.19 Females GM =ln 64.72 GSD =ln1.22	Smith, 1994
Averaging Time	days	25550	25550	25550	Fixed Point Estimate		USEPA, 1991
Oral Absorption	Unitless	0.2	0.176	0.287	Uniform	Min. = 0.05 Max. = 0.3	HERCULES 1994
Ingestion Rate	mg/day	50	50	50	Fixed Point Estimate		USEPA, 1991

TABLE 24 (cont)

Parameters and Values Used in Monte Carlo Simulations and RME Risk Calculations Assuming a Hypothetical Worker Scenario Exposed Through Oral and Dermal Routes to Soil Contaminated with 2,3,7,8-TCDD TEQs at Vertac, Inc. Superfund Site. (Contd.)							
Parameter	Units	RME	Monte Carlo Average	Monte Carlo 95th %le	Distribution Type	Distribution parameters	Source
Fraction Soil Contaminated	Unitless	0.5	0.5	0.5	Fixed Point Estimate		USEPA, 1989
Oral Risk	Unitless	1.4E-05	1.0E-06	4.1E-06			
Dermal Risk	Unitless	7.4E-04	1.0E-05	4.1E-05			
Total Risk	Unitless	7.5E-04	1.0E-05	4.1E-05			

M = Mean , SD = Standard Deviation, GM = Geometric Mean, GSD = Geometric Standard Deviation.

TABLE 25

Comparison of Fixed-Point (RME) and Monte Carlo Risk Estimates - Worker Scenario Exposure Pathways Considered - Oral Ingestion Plus Dermal Contact with Soil.*			
Type of Risk Estimate	Lifetime Cancer Risk Soil ≥50 ppb Removed	Lifetime Cancer Risk Soil ≥20 ppb Removed	Lifetime Cancer Risk Soil ≥5 ppb Removed
Fixed Point RME	Cleanup = 50 ppb 7.6E-03	Cleanup = 20 ppb 3.0E-03	Cleanup = 5 ppb 7.6E-04
Fixed Point RME Using 95% UCL on the Arithmetic mean of residual grids.	Cleanup = 2.92 ppb 4.4E-04	Cleanup = 1.8 ppb 2.7E-04	Cleanup = 0.675 ppb 1.0E-04
Monte Carlo			
Lognornal Distribution of Residual Grids	Ave =3.210, SD=6.840 Monte Carlo Ave=3.12 Monte Carlo 95%=11.1	Ave=1.933, SD= 3.610 Monte Carlo Ave=1.90 Monte Carlo 95%=6.6	Ave=0.674, SD=0.8739 Monte CarloAve=0.674 Monte Carlo 95%=2.1
Average	4.5E-05	2.7E-05	1.0E-05
Maximum	3.9E-03	3.8E-03	1.3E-03
Minimum	5.1E-09	8.5E-09	4.7E-09
Percentiles			
25 %	3.1E-06	2.0E-06	9.3E-07
50 %	1.0E-05	6.5E-06	2.8E-06
75 %	3.3E-05	2.0E-05	8.4E-06
90 %	9.6E-5	6.1E-05	2.3E-05
95 %	1.8E-04	1.1E-04	4.1E-05
100 %	3.9E-03	3.8E-03	1.3E-04

* Risk from inhalation of soil was not considered since risk through this route is negligible.

Table 26. Remediation Goals for Contaminated Soil Media.

CONTAMINANT	REMEDIATION GOAL
Dioxins & Furans (TEQ)	5 ppb
Tetrachlorobenzene	500 ppm

Information from EPA's site specific risk assessment showed that a RG of 5 ppb TEQ for dioxin was necessary to be protective for a worker exposure scenario. The risk associated with a not-to-exceed soil cleanup value of 5 ppb dioxin ranged from between $1X10^{-4}$ to $4X10^{-5}$.

A second soil RG was also established for tetrachlorobenzene (TCB) associated with a spill area at the site. All crystalline TCB, and TCB in site soils greater than 500 ppm would be excavated and treated off-site.

7.0 DESCRIPTION OF ALTERNATIVES

7.1 ALTERNATIVES

Alternatives for remediation were developed in the FS by assessing technologies and the range of media to which they would be applied. The FS considered separate "stand alone" alternatives for the two media addressed by Operable Unit 2, they are:

- Soils - There are two components to the soils alternatives. The first component involves both on-site surface and subsurface soils that have not yet been excavated and bagged soils excavated from contiguous off-site residential properties as part of an earlier removal action. These bagged soils are discussed in the FS for OU1, and the OU1 ROD deferred the treatment of those soils until all site soils were to be addressed.

  The second component involves an amendment to the 1990 ROD for Off-Site Areas, which had selected incineration as the treatment method for contaminated soils and debris from contiguous portions of Rocky Branch Creek, sludges removed from the sewage treatment plant and sediments from the sewer interceptor lines. The sewage treatment plant sludges and the sediments from the sewer lines are considered to be contiguous to and within the site's area of contamination (AOC) due to the continuous connection from the site to the sewage treatment plant by way of the sewer line.

The Agency intentionally deferred treating those materials from the Off-Site ROD until all site soils were to be addressed. In addition, the on-site incinerator is no longer operational, the 1990 Off-Site ROD materials came from contiguous areas within the site's AOC, and the materials are similar to the contaminated soils and debris addressed in this ROD. Therefore, EPA has determined that these materials are appropriately addressed in a manner consistent with the remedy selected for this operable unit. For those reasons, in conjunction with this ROD, the EPA will also amend the 1990 Off-Site ROD to reflect the change in approach.

- Underground Structures - this includes underground utilities, foundations, curbs, and pads. (As discussed above, Hercules, Inc., has recently addressed the fuel storage tanks by draining them and filling the drained tanks with flowable grout so as to prevent any possible leakage of residues. Therefore, this ROD need not address those tanks as had been proposed in the FS.)

SOILS

The following is a summary of the soils alternatives presented in the FS. A more detailed description of the alternatives can be found in the OU2 FS report itself.

The alternatives evaluated in the FS differed from one another principally in two ways: First by the cleanup level presented for TCDD in soils (i.e., the level of TCDD that would be left on the ground after remediation to be protective for a specific future site use), and secondly; by the concentration of TCDD in soils that would be subjected to various treatment, containment, and/or capping options.

Three series of action levels for TCDD in site soils were presented in the FS for many of the alternatives evaluated. These action levels were presented by Hercules in the FS as a guide for costing purposes only. The cleanup levels for the site, however, were established by EPA after evaluating the risk assessment. EPA made those decisions after the completion of the FS, which presented the entire universe of possible alternatives. However, not all of those alternatives remain under consideration after initial screening by EPA.

Table 27 presents a summary of the soils alternatives evaluated for this ROD, and **Table 28** presents a summary of the quantities of materials addressed by the various treatment options.

This ROD will address on-site soils and underground utilities and the contaminated soils and debris from the 1990

Table 27
SUMMARY SURFACE SOILS ALTERNATIVES

Alternative	No Action	Capping	Consolidation	Desorption	Dechlorination	Onsite Incin	Offsite Incin
S-1	All Soils						
S-2	TCDD≤50	50<TCDD≤500	TCDD>500 Bagged Soils				Crystalline TCB & Spill Soils
S-2, Option A	TCDD≤20	20<TCDD≤200	TCDD>200 Bagged Soils				Crystalline TCB & Spill Soils
S-3	TCDD≤50	50<TCDD≤500	500<TCDD≤2000	TCDD>2000 TCB Spill Soils	Desorbed TCDD-related liquids		Crystalline TCB desorbed TCB
S-3, Option A	TCDD≤20	20<TCDD≤200	200<TCDD≤1000 Bagged Soils	TCDD>1000 TCB Spill Soils	Desorbed TCDD-related liquids		Crystalline TCB desorbed TCB
S-3, Option B	TCDD≤35	35<TCDD≤350	350<TCDD≤2000 Bagged Soils	TCDD>2000 TCB Spill Soils	Desorbed TCDD-related liquids		Crystalline TCB desorbed TCB
S-4	TCDD≤50	50<TCDD<500	500<TCDD≤2000 Bagged Soils			TCDD>2000	Crystalline TCB & Spill Soils
S-4, Option A	TCDD≤20	20<TCDD<200	200<TCDD<1000			TCDD>1000	Crystalline TCB & Spill Soils
S-5	TCDD≤50		Bagged Soils	TCDD>50 TCB Spill Soils			Crystalline & desorbed TCB & TCDD condensate
S-5, Option A	TCDD≤20			TCDD>20 Bagged Soils TCB Spill Soils			Crystalline & desorbed TCB & TCDD condensate
S-6	TCDD≤50		Bagged Soils				TCDD>50 Crystalline TCB & Spill Soils
S-6, Option A	TCDD≤20						TCDD>20 Bagged Soils Crystalline TCB & Spill Soils
S-7	TCDD≤50	TCDD>50	Bagged Soils				Crystalline TCB & Spill Soils
S-7, Option A	TCDD≤20	TCDD>20	Bagged Soils				Crystalline TCB & Spill Soils
S-8	TCDD≤50		TCDD>50 Bagged Soils				Crystalline TCB & Spill Soils
S-8, Option A	TCDD≤20		TCDD>20 Bagged Soils				Crystalline TCB & Spill Soils

TABLE 28

Table 28
SUMMARY OF QUANTITIES OF MATERIALS UNDER SOILS ALTERNATIVES

		Surface Soils				TCB Spill		Bagged Soils		
Alt	Vegitative Cover	Cover (sf)	CCU (cy)	Desorption (cy)	Incineration (cy)	Desorption (cy)	Incineration (cy)	CCU (cy)	Desorption (cy)	Incineration (cy)
S-2	700,000	89,000	800				1,400	2,800		
S-2A	570,000	197,000	1,300				1,400	2,800		
S-3		89,000	600	200		700	700	2,800		
S-3A		197,000	1,000	400		700	700	2,800		
S-3B		113,000	800	200		700	700	2,800		
S-4		89,000	600		200		1,400	2,800		
S-4A		197,000	1,000		400		1,400	2,800		
S-5				4,100		700	700	2,800		
S-5A				8,600		700	700		2,800	
S-6					4,100		1,400	2,800		
S-6A					8,600		1,400			2,800
S-7	700,000	111,000					1,400	2,800		
S-7A	570,000	233,000					1,400	2,800		
S-8			4,100				1,400	2,800		
S-8A			8,600				1,400	2,800		

Off-Site Areas ROD (sludges from the sewage treatment plant and sediments from the interceptor lines), soils that will be excavated from Rocky Branch Creek flood plain deferred in the 1993 OU1 ROD, and bagged soils removed from contiguous residential areas as part of a removal action conducted by Hercules, Inc. The disposition of the 1990 Off-Site Areas ROD materials and the bagged residential soils Hercules had excavated as part of a 1990 removal action was deferred in both the 1990 Off-Site Areas and the 1993 OU1 RODs, and also was evaluated in the Operable Unit 2 FS, because those materials are essentially identical media as OU2 soils in that they also constitute low level threat media as discussed in Section 4.0 above. One should note that the decision to address the disposition of the 1990 Off-Site Areas ROD materials as part of the ROD for OU2 does not alter any other aspects of the 1990 Off-Site Areas ROD, such as the 1 ppb TCDD cleanup level for flood plain soils.

Alternative 1 No Action

DESCRIPTION

The no action alternative for OU2 media at the site provides a basis for comparing existing site conditions with those resulting from implementation of the other proposed alternatives. Under the no action alternative, no additional measures would be used to remediate contaminant sources. Access to the site would be prohibited only by the existing site fence. Therefore, public access would only be passively restricted. No institutional controls, facility maintenance, or monitoring would be implemented, except for those being performed in accordance with the 1984 Court Order.

Implementing no remedial activities for the OU2 media at the site allows the existing contaminant sources to remain in place. The potential for exposure to contaminants is not reduced under this alternative.

The Superfund program requires that a no action alternative be considered at every site as a basis of comparison when evaluating other alternatives. This alternative would not decrease the toxicity, mobility, or volume of contaminants or reduce public health or environmental risks to acceptable levels. Also, this alternative would not comply with State and Federal environmental regulations, and therefore, is not favored by EPA.

COST AND TIME OF IMPLEMENTATION

Capital Cost:	$0
Operation and Maintenance:	$0
Total Cost:	$0
Time of Implementation:	0 years

Alternative S-2 Containment and Consolidation

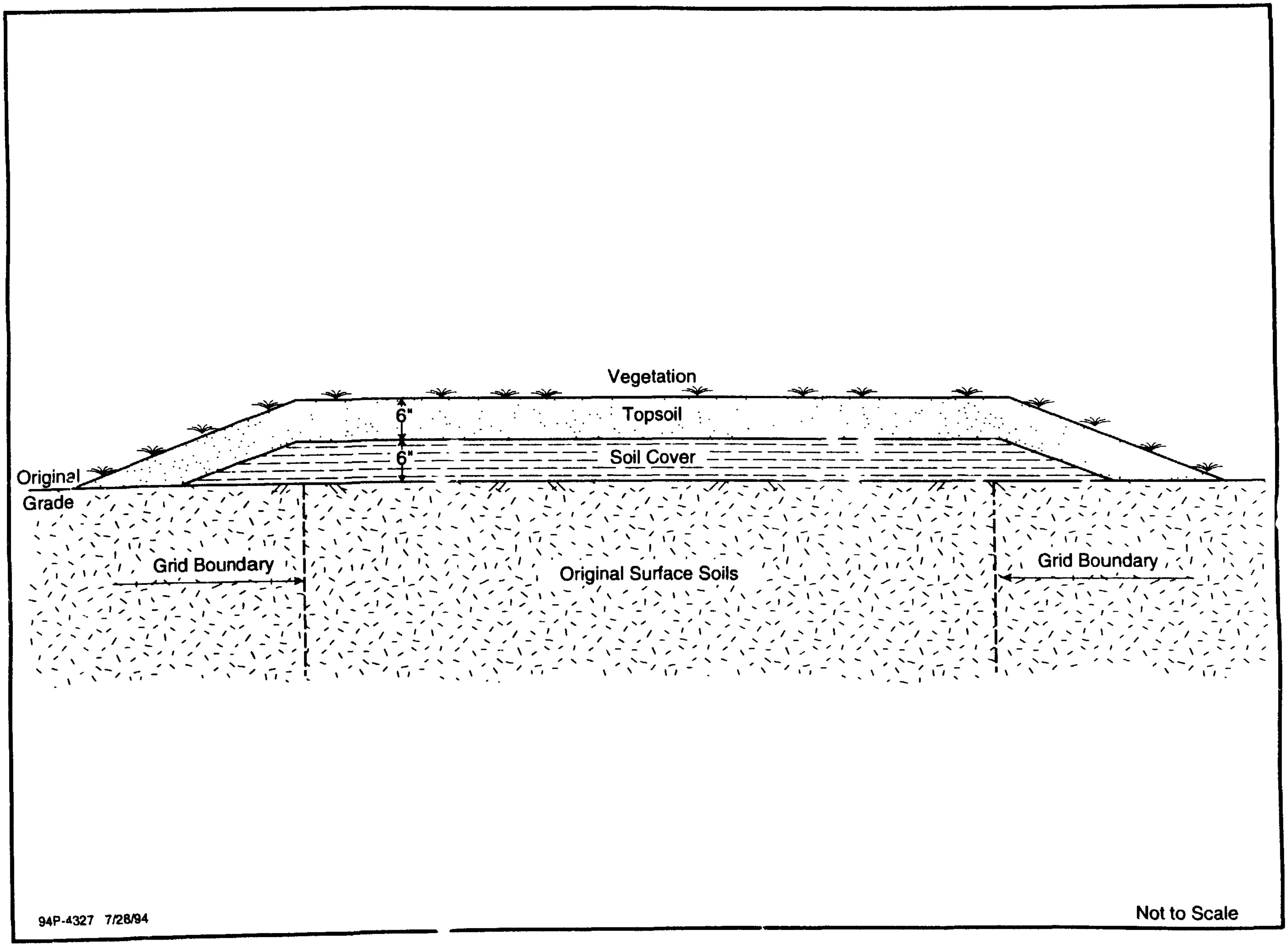
DESCRIPTION

Under this alternative, no action would be applied to surface soils with a TCDD concentration of 50 ppb or less. Surface soils exceeding the action level of 50 ppb but less than 500 ppb TCDD would be covered with a 12 inch thick layer of clean soil to prevent direct exposure and to reduce the potential for surface migration of contaminated soil (see **Figure 11**).

The 10-fold range in the action level addressed by the soil cover is based on the assumption that if the soil is disturbed by site workers, the contaminated soil would be diluted by a ratio of 10 to 1 dilution with the clean soil before exposure to workers occurs. The 10 to 1 dilution would yield an exposure concentration and therefore an equivalent risk of exposure to below the action level. This approach is consistent with that applied by EPA for dioxin-contaminated soils at other CERCLA sites in Region 6, such as the related RODs for both the Jacksonville and Rogers Road Municipal Landfill sites. In addition, a 10-fold increase in the dioxin level for soils below a depth of 1 foot was also used by EPA for the Missouri dioxin sites.

Under this alternative, surface soils to a depth of one foot below ground surface exceeding 500 ppb TCDD and bagged residential soils Hercules had excavated as part of a 1990 removal action from contiguous residential areas would be consolidated (landfilled) on-site. Excavated areas would be backfilled to grade using clean soil and revegetated. The excavated materials would be placed into the consolidation/containment unit (CCU) which was included as part of the selected remedy for certain OU1 materials. As described in greater detail in the portion of Section 7.2 below entitled "Consolidation," although dioxin-contaminated media constitute a listed RCRA waste whose applicable land disposal restriction (LDR) treatment standard is defined at 40 CFR § 268.31, those requirements are not applicable due to the fact that placement, the triggering element for the imposition of LDR's, will not take place. This is due to the fact that all media proposed to be consolidated within the on-site RCRA Subtitle C hazardous waste landfill come from within the site's area of contamination (AOC), or fall below the 5 ppb treatability variance range EPA has selected for dioxin-contaminated Vertac media in a July 18, 1996, Action Memorandum found in the Administrative Record. The CCU presented in the OU2 FS would be a modification or enlargement of the CCU to be constructed for OU1 materials. Modifications to the CCU would incorporate design standards required for a RCRA Subtitle C hazardous waste landfill (see **Figure 12**). Nonetheless, the CCU will meet all applicable substantive RCRA

FIGURE 11



CONCEPTUAL DIAGRAM OF SOIL COVER - CROSS-SECTION

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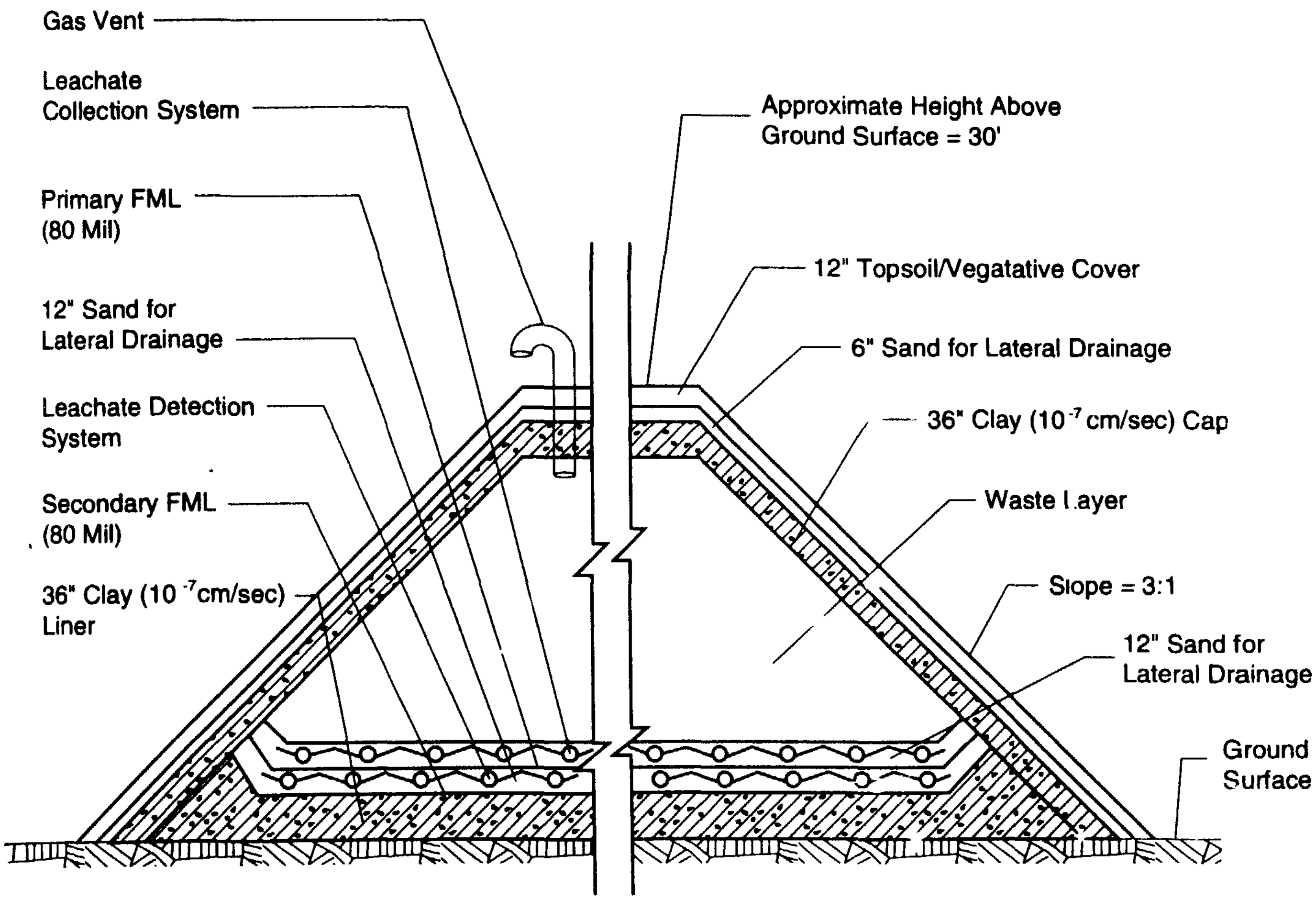
FIGURE 12



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DOUBLE-LINED CONSOLIDATION/CONTAINMENT UNIT - CONCEPTUAL CROSS-SECTION

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standards for the design, construction, and operation of a hazardous waste landfill found at 40 CFR Part 264.

Except for the TCB spill area, subsurface soils at depths greater than 1 foot below the ground surface would remain in place because there are no direct exposure pathways to subsurface soils. An indirect exposure pathway is present through the potential migration of site compounds from these soils into ground water. However, site-related compounds, especially TCDD, bind tightly to the soils and are not considered very mobile.

The crystalline TCB and associated soils exceeding the action level of 500 ppm will be excavated and transported off-site for incineration at a RCRA-permitted facility. The treatment residuals from the TCB and related soils would be disposed of by the off-site facility that performs the treatment.

Administrative and engineering control of site access would be implemented. Administrative controls would include deed notifications to limit future land use for the portion of the property that will remain fenced. Engineering controls would include maintenance of the following: The site fence, engineered structures proposed under OU1 (i.e., the CCU), and the soil and vegetative cover over areas that received clean backfill after excavation of the dioxin-contaminated soil, and any other backfill necessary to achieve final site grading to facilitate positive drainage. Monitoring and maintenance of the site would also be performed.

Alternative S-2 reduces potential exposure to target compounds at the site through off-site treatment of TCB contamination and consolidation or containment of TCDD-contaminated soils. Under this alternative approximately 83 percent of the TCDD-contaminated soil will be covered or isolated. Implementation of this alternative and the options to this alternative effectively address the low level threats posed by the media subject to the OU2 ROD by containing, versus treating, those media within the RCRA Subtitle C hazardous waste landfill. This approach is expressly endorsed for low level threat wastes whose treatment is impracticable at NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B), which states:

> EPA expects to use engineering controls, such as containment, for wastes that pose a relatively low long-term threat or where treatment is impracticable.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$5,896,000
Operation and Maintenance:	$37,700
Total Present Worth:	$6,500,000 (rounded)
Time of Implementation:	2 years

Alternative S-2, Option A

DESCRIPTION

Option A provides the same remedial actions for the OU2 soils as Alternative S-2 except with different action levels for TCDD. Bagged soils from contiguous residential areas and crystalline TCB and spill-related soils would be the same as that described for Alternative S-2. For Alternative S-2A, only surface soils with TCDD concentrations above 20 ppb would be addressed. Those surface soils greater than 200 ppb TCDD would be excavated and placed in the on-site CCU, and those soils with concentrations greater than 20 ppb, but less than or equal to 200 ppb, would be covered (capped with clean backfill) in place.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$6,398,000
Operation and Maintenance:	$37,700
Total Present Worth:	$7,000,000 (rounded)
Time of Implementation:	2 years

Alternative S-3 Containment, Consolidation and On-site Desorption and Chemical Treatment

DESCRIPTION

This alternative is the same as S-2, with the following key differences. Surface soils with concentrations of TCDD exceeding 2,000 ppb will be treated on-site. Two options to this alternative are evaluated, Alternatives S-3A and S-3B, which use the same remedial approach but are based on different action levels. Treating soils with concentrations of TCDD greater than 2,000 ppb would permanently reduce toxicity, mobility, and volume of a large portion of the TCDD. The on-site treatment process would consist of thermal desorption of the soils to extract the organic compounds, including TCDD. The organic compounds would exit the treatment process as a condensate which will be treated by chemical dechlorination. Chemical dechlorinate residuals would be incinerated off-site. The treated soil residuals would be considered to be clean and would be used in the CCU as fill, or they would be delisted and used on the site for grading purposes.

Soils associated with the TCB spill would be desorbed on-site, with the desorption residuals incinerated off-site. Crystalline TCB would be sent off-site for treatment at a permitted facility.

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COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$8,546,000	
Operation and Maintenance:	$37,700	
Total Present Worth:	$9,100,000	(rounded)
Time of Implementation:	3 years	

Alternative S-3, Option A

DESCRIPTION

Alternative S-3A would address surface soils with TCDD concentrations greater than 20 ppb. Surface soils with TCDD concentrations greater than 1,000 ppb would be subjected to on-site thermal desorption. Soils with TCDD concentrations greater than 200 ppb and less than or equal to 1,000 ppb would be excavated and consolidated in the on-site CCU. Surface soils with TCDD concentrations greater than 20 ppb but less than or equal to 200 ppb would be left in place and covered with a one foot thick soil cover. Other media such as the bagged soils from contiguous residential areas, crystalline TCB, and spill-related soils would be treated the same as under Alternative S-3.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$9,396,000	
Operation and Maintenance:	$37,700	
Total Present Worth:	$10,000,000	(rounded)
Time of Implementation:	3 years	

Alternative S-3, Option B

DESCRIPTION

Alternative S-3B provides for on-site thermal desorption of surface soils with TCDD concentrations in excess of 2,000 ppb, consolidation in the on-site CCU of surface soils with TCDD concentrations between 350 ppb and 2,000 ppb, and covering of surface soils with TCDD concentrations greater than 35 ppb. Other media such as the bagged soils from contiguous residential areas, crystalline TCB, and spill-related soils would be treated the same as Alternative S-3.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$8,687,000	
Operation and Maintenance:	$37,700	
Total Present Worth:	$9,300,000	(rounded)
Time of Implementation:	3 years	

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Alternative S-4 Containment, Consolidation and On-site Incineration

DESCRIPTION

The actions described under Alternative S-3 would be implemented under this alternative except that on-site incineration would be used in place of thermal desorption and dechlorination for surface soils with TCDD concentrations exceeding 2,000 ppb. One option to this alternative, Alternative S-4A, was also evaluated. The soils associated with the TCB spill exceeding 500 ppm and the crystalline TCB would be transported to an off-site incineration facility for treatment because of their non-F listing. Residuals resulting from on-site incineration would be consolidated with other OU2 media in the CCU.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$8,900,000
Operation and Maintenance:	$37,700
Total Present Worth:	$9,500,000 (rounded)
Time of Implementation:	3 years

Alternative S-4, Option A

DESCRIPTION

Surface soils with TCDD concentrations in excess of 1,000 ppb would be treated by an off-site incinerator. Surface soils with TCDD concentrations greater than 200 ppb but less than or equal to 1,000 ppb would be placed into the on-site CCU. Soils exceeding 20 ppb TCDD but less than or equal to 200 ppb would be covered in place.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$10,959,000
Operation and Maintenance:	$37,700
Total Present Worth:	$11,500,000 (rounded)
Time of Implementation:	3 years

Alternative S-5 On-site Desorption with Off-site Incineration

DESCRIPTION

Under this alternative, surface soils with TCDD concentrations above 50 ppb and soils associated with the TCB spill would be excavated and treated on-site by thermal desorption. One option to this alternative, Alternative S-5A, was also evaluated. The condensate from the thermal desorption process would be transported off-site for incineration at a RCRA-permitted facility. The treatment residues would be disposed of by the treatment facility. The soils from OU1 would be placed into the on-site CCU.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$14,603,000
Operation and Maintenance:	$10,400
Total Present Worth:	$14,800,000 (rounded)
Time of Implementation:	4 years

Alternative S-5, Option A

DESCRIPTION

Alternative S-5A provides for the same excavation, on-site treatment, and off-site incineration for the surface soils as Alternative S-5, except that a lower action level of 20 ppb for TCDD applies. Bagged soils from contiguous residential areas and TCB spill soils would also be treated using the on-site thermal desorption process.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$26,636,000
Operation and Maintenance:	$10,400
Total Present Worth:	$26,800,000 (rounded)
Time of Implementation:	4 years

Alternative S-6 Off-site Incineration

DESCRIPTION

Under this alternative, surface soils with TCDD concentrations above 50 ppb, crystalline TCB, and the soils associated with the TCB spill exceeding 500 ppm would be excavated and incinerated off-site at a RCRA permitted facility. One option to this alternative, Alternative S-6A, was also evaluated. Treatment residues from off-site incineration would be disposed of by the off-site treatment facility. The bagged soils from contiguous residential areas would be consolidated into the on-site CCU.

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COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$62,089,000
Operation and Maintenance:	$10,400
Total Present Worth:	$62,200,000 (rounded)
Time of Implementation:	5 years

Alternative S-6, Option A

DESCRIPTION

Alternative S-6A provides for the same excavation and off-site incineration for the surface soils, but applies to a lower action level of 20 ppb TCDD.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$164,601,000
Operation and Maintenance:	$10,400
Total Present Worth:	$164,800,000 (rounded)
Time of Implementation:	5 years

Alternative S-7 Containment (Capping)

DESCRIPTION

Under this alternative, no action would be applied to surface soils with a TCDD concentration of 50 ppb or less. The surface soils exceeding the action level of 50 ppb TCDD would be covered with a 12 inch layer of clean soil to prevent direct exposure and reduce the potential for migration of surface soils due to rainfall and wind. An option to this alternative, S-7A, would use the same remedial approach but with different TCDD action levels was also evaluated.

The crystalline TCB and associated TCB spill-related soils exceeding the action level of 500 ppm would be excavated and transported off-site for incineration at a RCRA permitted facility. Following treatment of the TCB and associated soils, the residuals would be disposed of by the off-site treatment facility.

Administrative and engineering control of site access as described in Alternative S-2 would also be implemented.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$5,698,000
Operation and Maintenance:	$37,700
Total Present Worth:	$6,300,000 (rounded)
Time of Implementation:	2 years

Alternative S-7, Option A

DESCRIPTION

Alternative S-7A provides for the same remedial actions as Alternative S-7, except with different action levels for TCDD. Surface soils with TCDD concentrations above 20 ppb would be addressed by the remedial action. Specifically, those surface soils with TCDD concentrations above 20 ppb would be covered in place with a 12 inch layer of clean soil to prevent direct exposure and reduce the potential for migration of surface soils due to rainfall and wind.. Bagged soils from contiguous residential areas and crystalline TCB and TCB spill-related soils would be addressed in the same manner as described under Alternative S-7.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$6,076,000
Operation and Maintenance:	$37,700
Total Present Worth:	$6,700,000 (rounded)
Time of Implementation:	2 years

Alternative S-8 Consolidation (Landfilling)

DESCRIPTION

Under this alternative, no action would be applied to surface soils with a TCDD concentration of 50 ppb or less. The surface soils exceeding the action level of 50 ppb TCDD would be excavated to a depth of 1 foot and consolidated on-site in the CCU. As an option to this alternative, Alternative S-8A would employ the same remedial approach as under S-8, but with different TCDD action levels.

The crystalline TCB and associated TCB spill-related soils exceeding the action level of 500 ppm would be excavated and transported off-site for incineration at a RCRA permitted facility. Following treatment of the TCB and associated soils, the residuals would be disposed of by the off-site treatment facility.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$6,720,000
Operation and Maintenance:	$19,500
Total Present Worth:	$7,000,000 (rounded)
Time of Implementation:	2 years

Alternative S-8, Option A

DESCRIPTION

Alternative S-8A provides for the same remedial actions for the OU2 surface soils as under S-8, except with different action levels for TCDD. Bagged soils from contiguous residential areas and crystalline TCB and TCB spill-related soils would addressed in the same manner as that described for Alternative S-8. Surface soils with TCDD concentrations above 20 ppb would be excavated and placed into the on-site CCJ.

COST AND TIME OF IMPLEMENTATION

Total Capital Cost:	$8,220,000
Operation and Maintenance:	$19,500
Total Present Worth:	$8,500,000 (rounded)
Time of Implementation:	2 years

UNDERGROUND UTILITIES

Following is a summary of the underground utilities alternatives presented in the FS. A more detailed description of the alternatives can be found in the OU2 FS report itself.

Table 29 presents a summary of the underground utilities alternatives.

Alternative U-1 No Action

DESCRIPTION

The no action alternative for underground structures would involve no additional measures employed to address those items. The underground utilities would remain buried with their contents in place. Access to the site would be prohibited by the existing site fence so that public access would be passively restricted. Specific institutional controls, maintenance, or monitoring would not be implemented, except for those that would be performed in

TABLE 29

Table 29

SUMMARY OF THE UNDERGROUND UTILITIES ALTERNATIVES

Alt	No Action	Aqueous Flush	Concrete/Sand Plug	Hydroblast/ Scarification	Surface Seal	Aqueous Phase Treatment[1]	Solid Phase Treatment[2]
U-1	All underground structures						
U-2		Chemical sewer	Underground storage tanks	Foundations and curbs		Rinse materials from flush, hydroblast	Recovered solids from flush, scarification, and/ or hydroblast
U-3		Chemical sewer	Chemical sewer, Underground storage tanks	Foundations and curbs	Foundations and curbs with persistent stains	Rinse materials from flush, hydroblast	Recovered solids from flush, scarification, and/ or hydroblast

NOTES:

[1] Aqueous phase treatment at onsite treatment plant.

[2] Solid phase treatment will be selected with soils alternative.

accordance with the monitoring and maintenance plan set out in the 1984 Court Order.

Implementing no remedial activities for the OU2 underground utilities and foundations at the site allows the existing contaminant sources to remain in place. The potential for exposure to contaminants is not reduced in this alternative.

The Superfund program requires that a no-action alternative be considered at every site as a basis of comparison when evaluating other alternatives. This alternative would not decrease the toxicity, mobility, or volume of contaminants or reduce public health or environmental risks. Also, this alternative would not comply with State and Federal environmental regulations, and therefore, it is not favored by EPA.

COST AND TIME OF IMPLEMENTATION

Capital Cost:	$0
Operation and Maintenance:	$0
Total Cost:	$0
Time of Implementation:	0 years

Alternative U-2 Equipment Plugging and Cleaning

DESCRIPTION

Under this alternative, corrective measures would be implemented to reduce the risk associated with the underground structures. The chemical sewer would be hydraulically flushed to remove solids from the line. After flushing, the access to the sewer would be restricted by installing plugs at all available access locations. In conjunction with line plugging, subsurface cut-off barriers would be installed across the line and bedding cross-section. These cut-off barriers would be constructed of materials such as clay, membrane sheeting, or other low permeability material. The purpose of these barriers is to eliminate potential preferential contaminant migration pathways. They would be located in the field at points where plugging is conducted or where migration may occur off-site. Any excess contaminated soil from the excavation process would be handled in accordance with the soil alternative.

The foundations and curbs would be cleaned by hydroblasting using high pressure, low volume water. In areas with persistent staining, surface scoring (such as scarification) will be used to remove visible contamination from the exposed foundations and curbs. Water generated from the sewer flushing and concrete hydroblasting would be treated in the on-site wastewater treatment plant. Solids generated from flushing, hydroblasting, and scarification would be handled in accordance with the selected alternative for soils.

COST AND TIME OF IMPLEMENTATION

Capital Cost:	$1,229,000
Operation and Maintenance:	$0
Total Cost:	$1,229,000 (rounded)
Time of Implementation:	1.5 years

Alternative U-3 Equipment Plugging, Cleaning, and Sealing

DESCRIPTION

This alternative is similar to Alternative U-2, with the following additions. After flushing, the sewer would be filled with grout to improve the structural integrity of the line and prevent migration of contaminants through the pipe. In addition, a surface sealant would be applied to foundations and curbs in areas of persistent staining, i.e., visible staining that is not removed by scarification.

COST AND TIME OF IMPLEMENTATION

Capital Cost:	$1,359,000
Operation and Maintenance:	$0
Total Cost:	$1,359,000 (rounded)
Time of Implementation:	1.5 years

7.2 ARAR's

In conducting a remedial action, EPA is required to attain a degree of cleanup for a given site that assures protection of human health and the environment. "Applicable or relevant and appropriate requirements" (ARAR's) are the federal, state, or local requirements that ensure such a cleanup standard. (See CERCLA Section 121(d), 42 U.S.C. § 9621(d), and NCP Section 300.410(g), 40 CFR § 300.410(g).) Applicable requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that, while not "applicable" to hazardous substances, pollutants, contaminants, remedial actions, locations, or other circumstances

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at a CERCLA site, address problems or situations so that their use may be suited to the particular site. Factors that may be considered in making this determination, when the factors are pertinent, are discussed at NCP Section 300.440(g)(2), 40 CFR § 300.400(g)(2). They include, among other considerations, examination of: The purpose of the requirement and the purpose of the CERCLA action; the actions or activities regulated by the requirement and the remedial action contemplated at the site; and the potential use of resources affected by the requirement and the use or potential use of the affected resource at the CERCLA site.

ARAR's are divided into chemical-specific, location-specific, and action-specific requirements. Chemical-specific requirements govern the release to the environment of materials possessing certain chemical or physical characteristics or containing specific chemical compounds. Chemical-specific ARAR's are numerical standards. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

Location-specific ARAR's relate to the geographic or physical position of the site, rather than to the nature of site contaminants. These ARAR's place restrictions on the concentration of hazardous substances or the conduct of cleanup activities due to the site's location in the environment (i.e., a site located in a flood plain).

Action-specific ARAR's are usually technology- or activity-based requirements, or are limitations on actions taken with respect to hazardous substances. A particular remedial activity will trigger an action-specific ARAR. Action-specific ARAR's dictate how the selected remedy must be implemented.

Only the substantive portions of requirements are ARAR's. Administrative requirements are not ARAR's and, thus, do not apply to actions conducted entirely on-site. Administrative requirements are those that are non-substantive requirements that involve such actions as consultation, issuance of permits, documentation, reporting, record keeping, and enforcement. The CERCLA program has its own set of administrative procedures that assure proper implementation of CERCLA because the application of additional or conflicting administrative requirements could result in delay or confusion. Provisions of statutes or regulations that contain general goals that merely express legislative intent about desired outcomes or conditions, but are non-binding, are not ARAR's.

State standards that are identified in a timely manner by the state in which a Superfund site is located and are more stringent than federal requirements may be applicable or relevant and appropriate. To be an ARAR, a state standard must be "promulgated," which means that the standards are of general applicability, are legally enforceable, and have been equally applied.

Additional standards may be identified as "to be considered" (TBC). The TBC category consists of advisories, criteria, or guidance which was developed by EPA, other federal agencies, states, or local agencies that may be useful in developing CERCLA remedies. These may be considered as appropriate in selecting and developing cleanup actions.

The potential ARAR's for OU2 media are listed in **Table 30.** These potential ARAR's were identified based on site-specific conditions and are described in more detail in the remainder of this section.

In identifying ARAR's for OU2, it is important to recognize that the Vertac site has three existing burial areas that are closed under a 1984 Court Order. In that Order, dated July 18, 1984, in the matter styled <u>U.S. v. Vertac Chemical Corporation and Hercules, Inc</u>., E.D. Ar., Western Division, No. LR-C-80-109, Judge Henry Woods concluded that the Vertac Plan, which EPA opposed, but which the State of Arkansas supported, was superior to an alternative plan submitted by EPA. Specifically, the Vertac plan allowed the burial in the North Burial Area of barrelled waste containing up to 100 ppm dioxin and allowed the burial in that location of chlorinated phenols, anisoles, chlorinated benzenes, 2,4-D, 2,4,5-T, and the burial of aldrin, dieldrin and DDT in the Reasor-Hill Burial Area. In addition, the Court in its Order concluded that the dioxin-containing barrels buried in the North Burial Area do not pose a serious danger of moving off-site underground. <u>See</u> Order of July 18, 1984, at page 4. Therefore, pursuant to a final order of the Court, the containment by burial of dioxin wastes in concentrations up to 100 ppm do not constitute a principal threat to the public health or the environment.

Table 30. Potential ARAR's for the Vertac Site, Jacksonville, Arkansas

<u>Chemical-Specific</u>

- Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 <u>et seq.</u>
- Clean Water Act (CWA), 33 U.S.C. § 1251 <u>et seq.</u>
- Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f <u>et seq.</u>
- Clean Air Act (CAA), 42 U.S.C. § 7401 <u>et seq.</u>
- Arkansas Water and Air Pollution Control Act, ACA 8-4-101 - 106 and 8-4-201 - 229, and 8-4-301 - 313
- Arkansas Non-Criteria Air Pollutants Control Strategy

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Table 30 - Continued.

- Arkansas State Ground Water Quality Protection Strategy
- State Implementation Plan for Air Pollution Control, ADPC&E Reg. No. 19
- Water Quality Standards for Surface Waters of the State of Arkansas, ADPC&E Reg. No. 2
- State Administration of the National Pollutant Discharge Elimination System, ADPC&E Reg. No. 6
- Hazardous Waste Management, ADPC&E Reg. No. 23
- Arkansas Air Pollution Control Code (Minor Source, ADPC&E Reg. No. 18), (Operating Air Permit Program, ADPC&E Reg. No. 26)

Location-Specific

- Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq.
- Arkansas Solid Waste Management Code, ADPC&E Reg. No. 22
- State Administration of the National Pollutant Discharge Elimination System, ADPC&E Reg. No. 6
- Hazardous Waste Management (Arkansas), ADPC&E Reg. No. 23
- Arkansas Air Pollution Control Code (Minor Source, ADPC&E Reg. No. 18), (Operating Air Permit Program, ADPC&E Reg. No. 26)

Action-Specific

- Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq.
- Clean Water Act (CWA), 33 U.S.C. § 1251 et seq.
- Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f et seq.
- Clean Air Act (CAA), 42 U.S.C. § 7401 et seq.
- Arkansas Solid Waste Management Code, ADPC&E Reg. No. 22
- State Implementation Plan for Air Pollution Control, ADPC&E Reg. No. 19

7.2.1 Federal ARAR's

Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.):

- RCRA Subtitle C established a comprehensive regulatory program to control and manage hazardous waste from the time of generation to disposal.

- Under RCRA Subtitle D, EPA promulgated regulations containing guidelines to assist in the development and implementation of state non-hazardous solid waste management plans.

RCRA requirements may be ARAR's because some materials at the Vertac site are solid wastes and also may be considered RCRA hazardous wastes. In general, RCRA regulations apply to the management of RCRA hazardous wastes and RCRA waste management facilities. Regulations promulgated under RCRA generally provide the basis for management of hazardous waste and establish technology-based requirements for hazardous waste facilities. RCRA facility design standards may also be consulted if considered relevant and appropriate for wastes other than RCRA hazardous wastes containing significant concentrations of hazardous constituents.

Chemical-Specific Requirements

Hazardous Waste Identification

The regulations governing the identification and classification of RCRA hazardous wastes are found at 40 CFR Part 261. The two basic classifications of RCRA hazardous waste are:

- Characteristic hazardous wastes (defined at Subpart C of 40 CFR Part 261), which involve evaluation of the following general waste characteristics:

    Ignitability (D001 waste)
    Corrosivity (D002 waste)
    Reactivity (D003 waste)
    Toxicity (D004 - D043 wastes) due to specific chemical-specific compounds.

- Listed hazardous wastes (defined at Subpart D of 40 CFR Part 261), which involve specific identification of the following regulatory listings:

    Hazardous Waste from Non-specific Sources (F- series wastes listed at 40 CFR § 261.31).

    Hazardous Waste from Specific Sources (K- series wastes listed at 40 CFR § 261.32).

    Commercial Chemical Products (P- and U- series wastes listed at 40 CFR § 261.33).

Specific tests cited in the regulations are used to determine if a solid waste also constitutes a RCRA characteristic hazardous waste. The maximum concentrations of contaminants allowed in the leachate of a solid waste before the solid waste is considered hazardous for the toxicity characteristic (TC) are presented in 40 CFR § 261.24. Site-related compounds for which a TC level has been identified include:

Waste Code	Compound Name	TC Level
D016	2,4-Dichlorophenoxyacetic Acid	10.0 mg/L
D041	2,4,5-Trichlorophenol	400 mg/L
D042	2,4,6-Trichlorophenol	2.0 mg/L
D017	Silvex	1.0 mg/L

To determine if a solid waste is a listed RCRA hazardous waste, it is necessary to examine the source of the waste. At the Vertac site, the manufacture and formulation of insecticides and herbicides resulted in the generation of process wastes containing chlorinated benzenes, chlorinated phenols, chlorophenoxy herbicides, and dioxin. These substances have been found in the environmental media (soils, ground water, and surface water) at the site. A comprehensive listing of mechanisms that released these substances into these environmental media is unavailable. However, material handling practices, waste management practices and material releases during the 45 years of plant operation are the most probable cause.

A number of mechanisms could be hypothesized based on the types of activities performed during site operation, but most of the releases cannot be confirmed and likely occurred prior to the promulgation of RCRA. An exception is the tetrachlorobenzene (TCB) spill, which resulted from a known release while transferring tetrachlorobenzene from a rail car to a material storage tank and occurred after RCRA's promulgation. Where spills or releases occurred after the promulgation of RCRA and its hazardous waste listings found at 40 CFR Part 261, RCRA standards are applicable. Where that is not the case, RCRA standards would be either relevant or appropriate.

Some of the production processes performed at the Vertac site would have generated wastes given hazardous waste numbers F020, F022, F023, F026, or F027 (40 CFR § 261.31, dioxin-related hazardous wastes from non-specific sources). These waste numbers are referred to in this document as "F-02X" wastes and are defined at 40 CFR § 261.31.

Some of the substances found in the site soils and other OU2 media may have resulted from the release of wastes other than the F-02X wastes. These wastes could potentially be classified as follows:

- Listed hazardous wastes from specific sources that are related to 2,4-D and 2,4,5-T production are defined at 40 CFR § 261.32 as K042, K043, and K099 wastes .

- Wastes defined at 40 CFR § 261.33 as discarded commercial chemical products, off-specification species, container residues, and spill residues thereof. The hazardous waste identification code U240 (2,4-D salts, and esters) may be applicable to some of the OU2 media at the site.

- The soils containing residues from a rail car spill containing still bottoms from the production of chlorobenzenes (called throughout this FS as the "tetrachlorobenzene spill soils") may be listed as a K085 specific source listed hazardous waste. K085 listed hazardous wastes are identified at 40 CFR § 261.32 as distillation or fractionation column bottoms from the production of chlorobenzenes.

  Historically, some chlorobenzene still bottoms were purchased from an off-site facility (generated at the off-site facility during the production of dichlorobenzene) and were transported via rail car to the site. The still bottoms contained high levels of tetrachlorobenzene and were dechlorinated on-site as part of the 2,4,5-trichlorophenol manufacturing process. Prior to use on-site, a hose leading from a rail car containing the still bottoms to a storage tank ruptured spilling the chlorobenzenes onto the ground surface along the rail spur immediately north of the central process area. These soils are included as part of the OU2 remedial action and may require management as a K085 waste.

- Residues from the treatment of a listed RCRA hazardous waste are themselves considered RCRA hazardous wastes unless delisted. Residues resulting from the incineration or thermal treatment of the F-02X materials would be considered F028 wastes per 40 CFR § 261.31.

The regulations pertaining to the dioxin-containing F-listed wastes are more stringent than for the other listed wastes. For example, 99.9999 percent (six 9's) destruction removal efficiency (DRE) is required for incineration of these dioxin-containing wastes, while only 99.99 percent (four 9's) DRE is required for most other wastes. Regulatory requirements for the land disposal of the F-02X are also more stringent than for other wastes. Therefore, complying with the regulations applicable to the F-listed wastes ensures compliance with less stringent regulations applicable to non-F02X listed RCRA wastes.

Mixture Rule/Contained-In Policy

The "mixture rule" found at 40 CFR § 261.3 states that a mixture of a solid waste and a listed RCRA hazardous waste may be considered a RCRA hazardous waste. This may be applicable to the solids in the underground piping if the contents are determined to be mixture of a solid waste and a listed RCRA hazardous waste.

In the "contained in" policy, the EPA has further expanded the mixture rule to include environmental media (not considered a "solid waste" under RCRA) mixed with a listed RCRA hazardous waste. In this policy, EPA has stated that the mixture of a listed RCRA hazardous waste and an environmental medium shall be a listed RCRA hazardous waste until decontaminated and should be managed as a hazardous waste for as long as the medium contains the listed waste. As a result of this policy, on-site soils containing listed RCRA hazardous waste may be required to be managed as a listed RCRA hazardous waste. See 40 CFR §§ 261.3(c)(1) and 261.3(d)(2). Also see the discussion in the preamble to the proposed NCP revisions, Federal Register volume 53, page 51444 (December 21, 1988).

RCRA Maximum Contaminant Levels (MCL's)

As part of the ground water protection requirements for RCRA treatment, storage, or disposal facilities (TSD's), EPA has promulgated at 40 CFR § 264.94 maximum concentrations of constituents in ground water (RCRA MCL's). The constituents, and their associated concentrations in ground water, addressed by this requirement are presented at 40 CFR § 264.94. The standards for site-related compounds are as follows:

- 2,4-D 0.1 mg/L
- Silvex 0.01 mg/L

These ground water protection standards are equal to MCL's established in the National Primary Drinking Water Standards promulgated pursuant to the Safe Drinking Water Act (SDWA), 42 U.S.C. § 300f et seq. The basic jurisdictional prerequisites for RCRA MCL's are part of the RCRA ground water monitoring and response requirements, which apply to RCRA-regulated units subject to permitting (e.g., landfills, surface impoundments, waste piles, and land treatment units) that received RCRA hazardous waste after July 26, 1982. Therefore, RCRA MCL's would be considered as part of any long-term monitoring program for most on-site remedial measures. EPA will address the long-term monitoring of ground water in the ROD for OU3, which will focus on ground water issues and which EPA has yet to issue.

RCRA Location-Specific Requirements

Location-specific ARAR's within RCRA are location standards detailed at 40 CFR § 264.18 that are potentially applicable to the siting of a new on-site TSD unit managing RCRA hazardous waste as part of a remedial alternative.

These location standards are specified and addressed as follows:

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- Seismic considerations restricting TSD facilities within 200 feet of a fault that has had a displacement within Holocene time. Because the Vertac site is not located in jurisdictions listed in Appendix VI of 40 CFR Part 264, such an on-site facility would be in compliance with this requirement as per 40 CFR § 270.14(b)(11).

- Flood plain considerations requiring TSD facilities located within a 100-year flood plain to be designed, constructed, operated, and maintained to prevent washout (the movement of hazardous waste from the active portion of the facility as a result of flooding). Part of the site contains portions of the 100-year flood plain. Approximately 150 feet to the east and west of Rocky Branch Creek are included within the 100-year flood plain.

- Salt dome formations, salt bed formations, underground mines and caves are locations where placement of non-containerized or bulk liquid hazardous waste is prohibited. This requirement is not applicable to the Vertac site because these features are not located within the area of the site.

RCRA Action-Specific ARAR's

Action-specific ARAR's are usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements may be triggered by the particular remedial action that is selected to accomplish the selected alternative. Because there is more than one alternative action for the OU2 media at the site, many different requirements may be applicable.

General TSD Facility Requirements

General TSD facility requirements under RCRA apply to those facilities that treat, store, or dispose RCRA hazardous wastes. The requirements that could potentially be ARAR's at the site include:

- General facility standards (40 CFR Part 264, Subpart B) including those for waste analysis.

- Preparedness and prevention standards (40 CFR Part 264, Subpart C) addressing facility design and operation and required equipment.

- Contingency plan and emergency procedures (40 CFR Part 264, Subpart D).

- Manifest system recordkeeping and reporting (40 CFR Part 264, Subpart E) to continuously track off-site hazardous waste transport.

- Releases from solid waste management units (40 CFR Part 264, Subpart F) for new landfills, land treatment, and waste pile units. This includes provision for ground water monitoring programs.

- Closure and post-closure requirements (40 CFR Part 264, Subpart G) requiring removal of waste and residuals to an extent that controls, minimizes, or eliminates post-closure release of hazardous constituents.

- Use and management of containers (40 CFR Part 264, Subpart I) which provides standards for the condition of containers, waste compatibility, inspections, storage building design and construction, and closure.

- Landfills (40 CFR Part 264, Subpart N).

- Incinerators (40 CFR Part 264, Subpart O).

Land Disposal Restrictions

The land ban, promulgated pursuant to RCRA Section 3004, 42 U.S.C. § 6924, on 7 November 1986 and codified at 40 CFR Part 268, Subparts A, C, and D, stipulates that no hazardous wastes (as defined at 40 CFR § 261.31) may be land disposed unless treated. RCRA requires that the treatment of wastes that are subject to the ban on land disposal attain levels achievable by the best demonstrated available technology (BDAT). BDAT requires that a treated F-02X material have less than 1 ppb TCDD, as measured by the Toxicity Characteristic Leaching Procedure (TCLP) found at 40 CFR Part 261, App. II, prior to disposal in a RCRA-permitted landfill.

The land disposal restrictions (LDR's) also apply to the storage of certain hazardous wastes on-site. These restrictions prohibit the on-site storage of "banned" wastes for longer than 1 year unless the owner/operator can prove that the extended storage is solely for the purpose of accumulating enough waste for proper treatment. Thus, all materials potentially subject to LDR's that have been stored on-site and whose disposition is the subject of this ROD have been accumulated in such a manner.

Consolidation

As long as contaminated material remains within a CERCLA Area of Contamination (AOC), EPA generally does not consider placement to have occurred. See 55 Fed. Reg. 8760 (March 6, 1990). The Agency has codified that principal in the RCRA corrective action regulations, such as the Corrective Action Management Unit Rule, 58 Fed. Reg. 8658 (Feb. 16, 1993), which generally may permit movement of contaminated material outside an AOC for on-site handling or treatment without triggering placement and the associated LDR treatment and disposal requirements.

For LDR's to be applicable requirements, EPA must first determine whether consolidation activities considered or contemplated at the Vertac site constitute placement. To assist in defining when placement does and does not occur for CERCLA actions involving on-site disposal of wastes, EPA uses the concept of AOC's, which may be viewed as equivalent to RCRA units, for the purposes of LDR applicability determinations. An AOC is delineated by the areal extent of contiguous contamination. Such contamination must be continuous, but may contain varying types and concentrations of hazardous substances. Depending upon site characteristics, one or more AOC's may be delineated.

Placement does not occur wher wastes are consolidated within a land-based unit, when they are treated *in situ*, when they are left in place, or when they are moved within an AOC. See 55 FR 8666, 8758-8760 (March 8, 1990), and "Determining When Land Disposal Restrictions (LDR's) Are Applicable to CERCLA Response Actions," OSWER Directive 9347.3-05FS (July 1989). Also see 61 FR 18804-18805 (April 29, 1996). Specifically, placement does not occur when the wastes are consolidated within the AOC.

EPA considers the entire landmass of the Vertac site to be contaminated due to the fact that TCDD levels in the soils found on-site and on contiguous contaminated off-site areas exceed the background TCDD level found in Jacksonville of 0.3 ppb or less. Therefore, all consolidation actions contemplated in this ROD that will apply to excavated on-site soils and debris, or to soils and debris removed from areas contiguous to the site, are within the AOC for purposes of determining the applicability of LDR's due to the fact that TCDD concentrations within the AOC and contiguous contaminated areas exceed background TCDD concentrations by substantial orders of magnitude. Thus, during the on-site consolidation activities, materials will be consolidated within the AOC, and therefore, the land disposal restrictions are not applicable.

However, if the materials are treated on-site within the AOC in a manner that would constitute "treatment" as that term is defined at RCRA Section 1004(34), 42 U.S.C. § 6903(34), and then redeposited within the AOC such as in the consolidation unit, then placement has occurred and the land disposal restrictions apply, unless a treatability variance under 40 CFR § 268.44 is obtained, or unless the ARAR is waived under CERCLA Section 121(d)(4)(A), 42 U.S.C. § 9621(d)(4)(A), and NCP Section 300.430(f)(1)(ii)(C)(1), 40 CFR § 300.430(f)(1)(ii)(C)(1).

On July 18, 1996, the EPA Region 6 executed an Amended Non-Time Critical Action Memorandum that, among other things, granted

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a treatability variance pursuant to 40 CFR § 268.44, of the 1 ppb LDR treatment standard for dioxin-contaminated wastes set out at 40 CFR § 268.31, to allow the on-site disposal of treatability residues from the on-site incineration of TCDD-contaminated Vertac wastes. That treatability variance allows the on-site disposal of Vertac site-related dioxin-contaminated materials, such as some of the incinerator ash and possibly some shredded pallets and incinerator salt residuals, that exceed the 1 ppb LDR treatment standard but that fall below the 5 ppb alternative treatment standard selected in the treatability variance section of the Action Memorandum.

Therefore, should placement occur with respect to Vertac TCDD wastes within the AOC, the treated materials cannot exceed the 5 ppb TCDD alternate LDR treatment standard selected in the July 18, 1996, Action Memorandum. In addition, EPA has established LDR treatment standards for most of the hazardous wastes associated with the Vertac site, but, as discussed above, they will not be applicable where consolidation within the CCU occurs since placement will not have occurred.

Finally, substantive, versus procedural, minimum technology requirements (MTR's) are applicable for the CCU to be constructed within an AOC, due to the fact that the CCU will be constructed on-site, within the AOC.

Incinerators

Incineration of a RCRA hazardous waste is regulated under 40 CFR Part 264, Subpart O. These regulations include provisions for:

- Conduct of a trial burn (40 CFR §§ 270.19(b) and 270.62(b)(6).

- Incinerator start up/shut down requirements (40 CFR § 264.345(d).

- Waste feed analysis (40 CFR §§ 264.341 and 270.62(b)(2).

- Operating requirements (40 CFR § 264.345). This includes a control of fugitive emissions either by keeping the combustion zone totally sealed or maintaining a combustion zone pressure lower than atmospheric pressure. In addition, an automatic cutoff system must be provided to stop the waste feed when operating conditions deviate from design conditions.

- Monitoring and inspections (40 CFR § 264.347(a)). This includes monitoring of the following operating parameters:

  - Combustion temperature.
  - Waste feed rate.

- Combustion gas velocity.
- Carbon monoxide (CO) emissions.

- Closure with disposal of hazardous waste and residues, including ash, scrubber water, and scrubber sludge (40 CFR § 264.351).

- Compliance with additional general TSD facility requirements.

In addition, the regulations set the following performance standards for incineration at 40 CFR § 264.343 that require that the incinerator:

- Achieves a destruction and removal efficiency (DRE) of 99.9999 percent (six 9's) for each principal organic hazardous constituent (POHC) in the waste feed for F-02X wastes. A DRE of 99.99 percent (four 9's) is required for non-F-02X wastes. For F-02X wastes, the DRE must be demonstrated on POHC's that are more difficult to incinerate than tetra-, penta-, and hexachlorodibenzo-p-dioxins and dibenzofurans. In addition, the owner or operator of the incinerator must notify the Regional Administrator of his intent to incinerate F-02X wastes.

- Reduces hydrogen chloride (HCl) emissions to 1.8 kg/hr or 1 percent of the HCl in the stack gas before entering any pollution control device.

- Does not release particulate matter in excess of 180 mg/dscm (milligrams per dry standard cubic meter), corrected for the amount of oxygen in the stack gas.

The ability to meet these performance standards must be demonstrated during the trial burn period.

Furthermore, as discussed above, monitoring of various parameters during operation of the incinerator is required per 40 CFR § 264.347. These operating parameters include:

- Combustion temperature

- Waste feed rate

- An indicator of combustion gas velocity

- Carbon monoxide emissions

Finally, fugitive emissions must be controlled (40 CFR 364.345) either by:

- Keeping the combustion zone totally sealed.

- Or maintaining a combustion zone pressure lower than atmospheric pressure.

The EPA has Standards for Owners and Operators of Hazardous Waste Incinerators (40 CFR Parts 260, 261, 264, and 270). The standards establish risk-based emission limits for individual toxic metals (Appendix VIII of 40 CFR Part 261). The EPA also regulates hydrochloric acid (HCl) emissions using the same risk-based approach proposed for metals. The limits are back - calculated from ambient levels that the EPA believes pose an acceptable health risk. To simplify this process, the EPA has developed conservative screening limits based on terrain and effective stack height. If the screening limits are not exceeded, the Agency has determined that emissions do not pose unacceptable risk. If the screening limits are exceeded, however, site-specific dispersion analysis is required to demonstrate that emissions will not result in an exceedance of acceptable ambient levels. The risk-based controls are applied on a case-by-case basis to ensure that the existing technology-based standard is protective.

Existing regulations control organic emissions by the DRE standard in 40 CFR § 264.343(a). This standard limits stack emissions of POHC's to 0.0001 percent (for dioxin-containing waste) of the quantity of the POHC fed into the incinerator. The standard considers a POHC to be destroyed (or removed in ash or scrubber water) if it is not present in the stack emissions.

Given that stack gas carbon monoxide (CO) is a conventional indicator of combustion efficiency and a conservative indicator of combustion upsets (i.e., poor combustion conditions), emissions to a de minimis level (100 ppmv - parts per million by volume) ensures high combustion efficiency and low unburned hydrocarbon emissions. The owner or operator would be required to demonstrate that higher CO levels would not result in high hydrocarbon emissions, in cases where the CO limit is exceeded.

Delisting

If residues from treatment are delisted, they are no longer considered to constitute RCRA hazardous wastes, and the wastes could be placed in any landfill permitted to receive non-RCRA hazardous solid waste. Delisting of the material would involve petitioning the EPA Regional Administrator of Region 6 to remove the site-specific waste from the list of RCRA hazardous wastes and to consider it nonhazardous. The petition must state the need and justification for the delisting, and it must include supportive documentation that demonstrates to the Administrator why the material does not meet any of the criteria under which the original waste was listed. A rotary kiln was used to incinerate wastes from the Vertac site at the U.S. EPA Combustion Research Facility (CRF) in Jefferson, Arkansas as a pilot project. Scrubber brines and ash generated in that pilot burn have been delisted by the U.S. EPA (Federal Register Vol. 54, No. 71, 14 April 1989). A similar delisting procedure would be required for any F-Listed materials treated at the site prior to disposal in a landfill not permitted to accept these F-listed wastes.

Hazardous Waste Landfills

The technical requirements for an on-site consolidation unit may, but are not required to, be considered as relevant and appropriate certain design guidance (such as requirements for such things as covers/caps, drainage, liners, stability) pertaining to RCRA-permitted facilities. RCRA-specific requirements for a hazardous waste landfill are found at 40 CFR § 264.300 (Subpart N), which could be considered for a consolidation unit. These requirements would be applicable to an on-site containment unit if residues from treatment were to be put into the unit without delisting. 40 CFR § 264.301 states that a RCRA landfill must have two or more liners that are designed, constructed, and installed to prevent migration of wastes out of the landfill to the adjacent soil or subsurface soil or ground water during the active life of the landfill. Other liner system requirements include:

- Construction with materials that have appropriate chemical properties and sufficient strength to prevent failure.
- Placement upon a base capable of providing support to the liner.
- Installation to cover all earth likely to be in contact with the waste or leachate.

Furthermore, leachate collection systems are required above and between the liners that are designed, constructed, maintained, and operated to collect and remove any leachate from the landfill. For a RCRA landfill, the leachate collection and removal systems must be:

- Chemically resistant to the waste managed or leachate expected in the landfill.
- Of sufficient strength and thickness to prevent collapse under the pressure exerted by the overlying waste.
- Designed and operated to prevent clogging through the scheduled closure of the landfill.

Furthermore, RCRA presents specific requirements for F-02X wastes. In order to place F-02X wastes into a landfill, the landfill must be operated in accordance with a management plan for these wastes that is approved by the Regional Administrator (40 CFR § 264.317). Approval of the management plan would be based on the following factors:

- The volume, physical, and chemical characteristics of the waste, including migration potential.
- The attenuative properties of the underlying and surrounding soils.
- The effectiveness of additional treatment, design, or monitoring requirements.

Finally, RCRA also presents monitoring, inspection, surveying, record-keeping, closure, and post-closure care requirements (40 CFR §§ 264.303 - 264.310), and general facility management requirements.

A RCRA-equivalent consolidation/containment unit (CCU) will be constructed on-site as part of the remediation for OU1 for on-site disposal of demolition debris. The CCU will be designed to meet substantive RCRA requirements, and it will be designed to contain adequate capacity to hold whatever volumes of contaminated soil and debris this ROD may propose to consolidate within that CCU, which will lie within the AOC.

Treatment Standards for Hazardous Debris

Treatment of hazardous debris is required if the debris is to be land disposed, assuming that the debris does not remain within the CERCLA area of contamination (AOC). As discussed earlier, as long as contaminated material remains within a CERCLA Area of Contamination (AOC), EPA generally does not consider placement to have occurred. See 55 Fed. Reg. 8760 (March 6, 1990). RCRA corrective action regulations, such as the Corrective Action Management Unit Rule, 58 Fed. Reg. 8658 (Feb. 16, 1993), may permit movement of contaminated material outside an AOC for on-site handling or treatment without triggering placement and the associated LDR treatment and disposal requirements. However, where "placement" does occur, debris must be treated using the technology or technologies identified in Table 1 of 40 CFR § 268.45, or the waste-specific treatment standards for the waste contaminating the debris.

In addition, 40 CFR § 268.44 allows EPA to apply alternative treatment standards under the Land Disposal Restrictions (LDR's) found at 40 CFR Part 268 where best demonstrated available technology (BDAT) treatment standards are in effect, but where resort to the waste-specific BDAT LDR treatment standard is not appropriate for the treatment of the waste in question. The National Contingency Plan (NCP), 40 CFR Part 300, has expressly approved, on a site-by-site basis, the use of the LDR treatability variance for CERCLA response actions involving contaminated soil and debris. See preamble to the NCP at pages 8761 and 8762, 55 Fed. Reg. 8761 and 8762, March 8, 1990.

In general, the treatment standards for hazardous debris are not applicable if the OU2 debris (i.e., manholes, sumps, sewers, and foundations) is consolidated and not land disposed. If this debris is managed in place, the hazardous debris standards may be relevant and appropriate.

Clean Water Act (CWA)

The Clean Water Act (CWA), 33 U.S.C. § 1251 et seq., required EPA to establish regulations to protect the quality of surface waters across the nation. The CWA may be applicable to treatment and discharge of water used as part of a remedial action where the treatment and discharge occurs on-site. For any off-site discharges, both procedural and substantive CWA requirements would apply. "On-site" discharges should meet substantive requirements but are exempt from federal, state and local permitting requirements. See CERCLA Section 121(e)(2), 42 U.S.C. § 9621(e)(2), and 40 CFR 300.400(e). A discharge of CERCLA wastewaters is considered "on-site" if the receiving water body is in the area of contamination or is in very close proximity to the site and is necessary for the implementation of the response action (even if the water body flows off-site).

Under the CWA, three interrelated areas were identified for regulation:

- Establishment of water quality standards;
- Establishment of storm water runoff control; and
- Establishment of effluent standards (discharge limitations) intended to ensure compliance with applicable water quality standards.

Water quality standards represent chemical-specific requirements, while storm water runoff controls and effluent standards are action-based requirements. Each is addressed separately below.

Chemical-Specific Requirements

Water Quality Criteria (WQC)

CERCLA Section 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A), states that remedial actions shall attain Federal water quality criteria where they are relevant and appropriate under the circumstances of the release or threatened release. Water quality criteria are non-enforceable guidance developed under the

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Clean Water Act (CWA) Section 304, 33 U.S.C. § 1314, but are used by the state, in conjunction with a designated use for a stream segment, to establish water quality standards under CWA Section 303, 33 U.S.C. § 1313. In determining the applicability or relevance and appropriateness of water quality criteria, the most important factors to consider are the designated uses of the water and the purposes for which the potential requirements are intended. Water quality criteria have been developed based on:

- Protection of human health. These levels have been developed based on two separate potential exposure pathways. The first criterion is based solely on consumption of fish, while the second criterion considers both consumption of fish and consumption of water.

- Protection of aquatic life. These levels have been developed based on acute toxicity and chronic toxicity effects to aquatic organisms.

Whether a water quality criterion is appropriate and which form of the criterion is appropriate depends on the likely route(s) and receptors of exposure.

Action-Specific Requirements

Storm Water Runoff Control

The EPA has issued regulations setting forth the NPDES permit application requirements for discharges of storm water from industrial activities (40 CFR 122, 123, and 124). An NPDES permit is required for all discharges of storm water from industrial activities as defined in the November 1990 regulations, as amended. In states which have been granted NPDES permitting authority by the EPA, all NPDES permits are issued and administered by the state regulatory agency. The ADPC&E has been granted authority over the NPDES program. The requirements of the state NPDES program are discussed in Subsection 2.3.3. However, for all on-site discharge activity, only substantive, versus procedural (such as obtaining a permit), is required. <u>See</u> CERCLA Section 121(e)(2), 42 U.S.C. § 9621(e)(2).

As a result of previous on-site remedial actions, the central process area is surrounded by a series of five concrete-lined drainage ditches and collection sumps. During a storm event the drainage ditches divert run-off to the sumps. The initial sump volume (first flush) for each of the five sumps is diverted to the on-site treatment plant. Overflow from the sumps currently discharges to Rocky Branch Creek without treatment. Therefore, after soils remediation is complete, Hercules, Inc. will develop a storm water management plan called a Storm Water Pollution Prevention Plan (SWPPP) to address, in part, elimination or significant reduction of the sump overflows and develop management controls for storm events. The SWPPP will be developed in accordance with criteria contained in EPA's Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities. (60 FR 50804)

Direct Discharge of Treatment System Effluents

Direct discharge of wastewaters to a surface water is governed by the NPDES permitting requirements. 40 CFR Parts 122, 125, and 129 as applicable to point source discharges to waters of the United States, which require:

- The use of the Best Available Technology (BAT) economically achievable to control toxic and nonconventional pollutants.
- Use of best conventional control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.
- 40 CFR § 122.44 and state regulations approved under 40 CFR Part 131 require compliance with applicable Federally-approved state water quality standards. These standards may be in addition to or more stringent than other Federal standards under the CWA.
- 40 CFR § 122.44(e) requires that discharge limitations must be established at more stringent levels than technology-based standards for toxic pollutants.
- 40 CFR § 125.100 requires that Best Management Practices (BMP) be developed and implemented to prevent the release of toxic constituents to surface waters.
- 40 CFR § 122.41(i) requires that discharges must be monitored to assure compliance. The discharger will monitor the mass of each pollutant, the volume of effluent, and the frequency of discharge and other measurements as appropriate.

The direct discharge requirements may be applicable if waters generated during the remediation are discharged to Rocky Branch Creek. ADPC&E has established discharge limitations which would apply to the site wastewaters if they are discharged to Rocky Branch Creek. Water generated during OU2 and as a result of perpetual operation and maintenance will need to be treated to meet applicable water-quality based, effluent discharge limits.

The Clean Air Act (CAA), 42 U.S.C. § 7401 et seq.

The Clean Air Act (CAA) and the 1990 CAA Amendments required EPA to establish regulations to protect ambient air quality. In response to this mandate, the EPA directed the following:

- Establishment of National Ambient Air Quality Standards (NAAQS).
- Establishment of maximum emission standards as expressed under the National Emission Standards for Hazardous Air Pollutants (NESHAP). These standards apply to emissions from specific sources, and do not constitute an ARAR for activities that are expected to take place at the Vertac site.
- Establishment of maximum emission standards as expressed under the New Source Performance Standards (NSPS).

Chemical-Specific Requirements

National Ambient Air Quality Standards

National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) have been developed by the EPA for seven classes of pollutants: Particulates, sulfur oxides, nitrogen oxides, hydrocarbons, oxidants (ozone), carbon monoxide, and lead. The NAAQS focus on two levels of control: Primary and secondary. The primary standards apply exclusively to the protection of human health, while the secondary standards are set to protect welfare, including wildlife, climate, recreation, transportation, and economic values. A listing of NAAQS primary and secondary standards is included in 40 CFR Part 50. The NAAQS specify maximum primary and secondary 24 hour concentrations for particulate matter in the ambient air. These ambient air concentrations are not designed to apply to specific sources; rather, states may promulgate State Implementation Plan (SIP) emission limits applicable to sources, which will result in attainment and maintenance of the NAAQS. While not ARAR's, NAAQS provide guidance with respect to appropriate levels of particulate airborne emissions.

It should be noted that these standards are not emission (i.e., discharge) standards, but are standards to be met for the ambient air, after allowing for mixing of the particular discharge with the ambient air. NAAQS attainment requirements are applicable only to "major sources," which are pollutant-specific, or sources which emit 10 tons/year of a single regulated hazardous air pollutant (HAP) or 25 tons/year of any combination of regulated pollutants (HAP's). The definition of "major sources" is also dependent on the local attainment classification. Pulaski County, Arkansas, is designated as an ozone maintenance area, and therefore a "major source" is defined as any source with the uncontrolled potential to emit 100 tons/year of volatile organic compounds (VOC's).

State Implementation Plans (SIPs) are developed by individual states and contain the actual abatement requirements necessary to achieve compliance with the NAAQS.

Ambient air monitoring during remediation may be part of the selected remedial action for OU2. Perimeter air samplers and real-time ambient air monitors may be used to monitor ambient air quality on-site. Particulates would be the NAAQS contaminant of greatest concern on-site if soil excavation is required. Engineering controls would be necessary if particulate concentrations in ambient air become a concern. VOC emissions would be the NAAQS contaminant of concern if incineration were part of a remedial action.

Action-Specific Requirements

New Source Performance Standards (NSPS)

NSPS regulations found at 40 CFR Part 60 have been promulgated to cover particulate discharges from a number of different types of facilities, including incinerators. Incineration regulations are listed under 40 CFR Part 60, Subpart E, Standard of Performance for Incinerators. The operating standard found at 40 CFR § 60.52 is that the discharge of particulate matter shall not exceed 180 mg/dscm (milligrams per dry standard cubic meter), corrected to 12% C02. This provision applies to incinerators with a charging rate exceeding 50 metric tons per day. It should be noted that this performance standard for particulate matter matches that listed under the RCRA regulations for incinerators found at 40 CFR Parts 264 and 270.

If the treatment process selected for OU2 has a charging rate exceeding 50 tons per day, the NSPS may be applicable. However, the particulate standard stated above should be easily attained using commercially available air pollution control equipment.

7.2.2 STATE ARAR's

Regulation No. 2: Water Quality Standards for Surface Waters

Pursuant to the Arkansas Water and Air Pollution Control Act (AWAPCA), ACA 8-4-101 - 106, 8-4-201 - 229, and 8-4-301 - 313, and in compliance with the requirements of the Federal Water Pollution Control Act, the State of Arkansas has developed water quality standards for all surface waters, interstate and intrastate. Established water quality standards are based upon present, future, and potential uses of the surface waters of the state and criteria developed from statistical evaluations of past water quality conditions and a comprehensive study of least-disturbed, ecoregion reference streams. The standards are designed to enhance the quality, value, and beneficial uses of the water resources of the state; aid in the prevention, control, and abatement of water pollution; provide for the protection and propagation of fish and wildlife, and; provide for recreation in and on the water.

General standards for color, taste and odor, solids, toxics, and oil/grease have been developed. In addition, specific standards for temperature, turbidity, pH, dissolved oxygen, radioactivity, bacteria, toxics, nutrients, oil/grease, and mineral quality have been developed depending on the individual ecoregions within the state. The site is situated within the Arkansas River Valley Ecoregion.

Water quality standards relate to the existing on-site treatment plant and its off-site discharges. As part of OU2, the existing treatment plant may be utilized to treat collected storm water and wastewaters generated as part of the remediation. Although the existing treatment plant currently discharges to a local Publicly-Owner Treatment Works (POTW), discharge limitations for discharge to Rocky Branch Creek have been proposed by ADPC&E.

Regulation 3: Certification of Wastewater Utilities Personnel

Operators in responsible charge of wastewater treatment facilities are required to be licensed and certified by ADPC&E in order to safeguard the public health and protect the waters of the state from pollution. Certification typically includes training, classifying, and licensing of treatment plant operators.

Regulation 6: State Administration of the National Pollutant Discharge Elimination System (NPDES)

The technical, versus procedural, requirements of an NPDES permit may apply if wastewaters generated at the site are directly discharged off-site into Rocky Branch Creek. Further, the technical, versus procedural, requirements of a storm water permit may apply if storm water discharges associated with the site remedial activities that involve disturbing more than five (5) acres are discharged off-site to Rocky Branch Creek. An individual NPDES permit may be issued by the ADPC&E, or general permit coverage may be obtained under the Department's General NPDES Permit No. ARROOA000. Obtaining NPDES coverage for off-site storm water discharges requires submission of an individual application, or Notice-of-Intent (NOI), development and implementation of a Storm Water Pollution Prevention Plan, and possibly storm water sampling and monitoring.

The existing treatment plant on-site may be used to treat wastewaters generated as part of the OU2 remediation. Currently this treatment plant discharges to a local POTW in accordance with a previous permit. However, as part of the off-site remedial action, the treated effluent will go to Rocky Branch Creek. The system will allow compliance with discharge limitations which have been proposed to control the discharge to Rocky Branch Creek.

Regulation 23: Hazardous Waste Management Code

The Arkansas Hazardous Waste Management Act of 1979 and the Arkansas Resource Reclamation Act of 1979 are known together as the Arkansas Hazardous Waste Management Code (amended June 1992), ADPC&E Reg. No. 23. This code resembles the federal hazardous waste management regulations promulgated under RCRA. The Arkansas Hazardous Waste Management Code does contain siting criteria (Section S) for a hazardous waste management facility. Such a facility may not be sited in the following areas:

- An active fault zone.
- A "regulatory floodway" as adopted by communities participating in the National Flood Program.
- A 100-year flood plain.
- A recharge zone of sole source aquifer designated pursuant to the SDWA.
- Wetlands areas that are inundated or saturated by surface water or ground water.

In addition, no permit shall be issued for a hazardous waste landfill facility or surface impoundment if such a facility is located in the following areas:

- Areas of high earthquake potential.
- Areas having a soil that would be classified as vertisol.
- Areas in which a stratum of limestone or similar rock of an average thickness of more than 1 meter lie within 30 meters of the base of the proposed liner system.
- Areas in which the liner bottom or in-place barrier soil is less than 10 feet above the historically high water table.
- Areas near a functioning private or public water supply that would constitute an unacceptable risk to the public health or safety.

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- Areas one-half mile from any occupied dwelling, church, school, hospital, or similarly occupied structure.

- Areas where the active portion of the facility is less than 200 feet from the facility's property line, and less than 300 feet from right-of-ways for roads and utilities.

Section 13 of the Code includes performance standards in addition to the provisions of 40 CFR Parts 264, 265, and 270. Within Section 13, it states that when it is technically feasible, destruction of hazardous waste should be accomplished by incineration utilizing currently available technology. No acutely hazardous waste shall be disposed of in landfills in the State of Arkansas.

The consolidation/containment unit (CCU), which is a component of many alternatives for OU2 media, will be designed and constructed as part of OU1. Therefore, while those siting criteria discussed above are applicable, they have been addressed in the ROD for OU1, under which authority the CCU's siting will be addressed.

<u>Regulation 22: Arkansas Solid Waste Management Code</u>

Pursuant to the Arkansas Solid Waste Management Act of 1971, the Arkansas Solid Waste Management Code of 1984 (as amended March 1984), ADPC&E Reg. No. 22, has been divided into six main chapters including (1) preliminary provisions, (2) local solid waste management systems (3) permit application procedures, (4) permitting and operational standards, (5) enforcement and (6) other provisions. Of particular interest are the substantive components of the permitting and operational standards to be followed when planning/designing a solid waste landfill within the State including:

- <u>Testing</u> - Geological characteristics would be required to indicate soil conditions, ground water elevation and movement, and subsurface characteristics.

- <u>Equipment</u> - Verification of proper equipment available to properly operate the landfill facility.

- <u>Geologic Structure</u> - The subsoil and lithological structure shall be such that there is reasonable assurance that leachate from the landfill will not contaminate the ground waters or surface waters of the state.

- <u>Sedimentation and Surface Water Control</u> - The surface contour of the area shall be such that surface runoff will not flow through/into the fill area.

- Water Table - Landfill operations will maintain a safe vertical distance between deposited refuse and the maximum seasonal water table elevation and shall include such measures necessary to prevent contamination of the ground water.

- Flooding - sites subjected to flooding shall be avoided.

- Site Improvements - The following physical improvements shall be made before a landfill site is placed in operation:

  The Site shall be adequately fenced, with an entrance gate that can be locked and posted; all-weather operational roads shall be provided, and; arrangements shall be made for fire-protection services.

- Operation - All operations of the landfill shall be in accordance with the approved plans and the Arkansas Solid Waste Management Code.

The consolidation/containment unit (CCU), which is a component of many alternatives for OU2 media, will be designed and constructed as part of OU1. Therefore, while those siting criteria discussed above are applicable, they have been addressed in the ROD for OU1, under which authority the CCU's siting will be addressed.

Arkansas Water and Air Pollution Control Act (AWAPCA)

Subchapter 2 of the AWAPCA, ACA 8-4-101 - 106, 8-4-201 - 229, and 8-4-301 - 313, (relating to water pollution) provides the Arkansas Pollution Control and Ecology Commission the authority to prescribe:

- Effluent standards specifying the maximum amounts or concentrations and nature of the contaminants being discharged into the waters of the State of Arkansas or into POTW's.

- Requirements and standards for equipment and procedures for monitoring contaminant discharges at their sources.

- Water quality standards, performance standards, and pretreatment standards.

In compliance with the requirements of Federal Water Pollution Control Act, the Arkansas Commission on Pollution Control and Ecology has established water quality standards for all surface waters, interstate and intrastate, of the State of Arkansas.

Arkansas air pollution control regulations (ACA Subchapter 3) resemble the national standards set forth by the EPA under the CAA, but require preconstruction review by the State. Section 5 of the Arkansas Air Pollution Control Regulations outlines specific limitations for particulate emissions and for visible emission from new or modified sources. Particulate emission limits are based on the rate of material being processed (lb/hr), visible emission standards are action specific.

Regulations 18 and 26: Arkansas Air Pollution Control Code

The Arkansas Air Pollution Control Code (Minor Source, ADPC&E Reg. No. 18), (Operating Air Permit Program, ADPC&E Reg. No. 26) was derived from the AWAPCA and outlines permit requirements, and emission limits for small or nuisance sources not covered by the SIP. Of particular interest are Section 4 - Visible Emissions; Section 6 -Emission of Particulate Matter from Incinerators; Section 7 - Emission of Particulate Matter from Equipment; Section 8 - Emission of Particulate Sulfur Compounds; Section 10 - Emission of Air Contaminants Such as to Constitute Air Pollution; and Section 11 - Control of Fugitive Emissions.

Regulation 19: Arkansas State Implementation Plan for Air Pollution Control

Promulgation and enforcement of the SIP (Regulation No. 19, September 1993) is necessary for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS)(40 CFR Part 50), New Source Performance Standards (NSPS)(40 CFR Part 60), Prevention of Significant Deterioration (PSD)(40 CFR § 52. 21), and the National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61). The SIP is formatted into the following sections:

- Protection of the National Ambient Air Quality Standards;
- Applicability, Permitting Procedure;
- General Emissions Limitations Applicable to Equipment;
- Upset Conditions, Revised Emissions Limitations;
- Sampling, Monitoring, and Reporting Requirements;
- Prevention of Significant Deterioration Supplement;
- 111(d) Designated Facilities; and,
- Regulations for the Control of volatile organic compounds (VOC's).

The SIP was developed primarily to satisfy the requirements of the Clean Air Act.

Arkansas Non-criteria Air Pollutants Control Strategy

ADPC&E has implemented an evaluation of the emissions of non-criteria air pollutants from all sources in order to determine if a permit should be issued or if an existing source should be required to retrofit control equipment. The Non-criteria Air Pollutants Control Strategy (NAPCS) allows applicants to apply a 3 level evaluation of the emission source. The three levels are as follows:

- Level 1 Analysis - This analysis is based upon Threshold Limit Values (TLV's) for chemical substances adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). According to NAPCS, the predicted ambient air concentration of gases and vapors is considered acceptable if it is less than 1/100 of the ACGIH TLV. The ambient concentration is determined by using appropriate atmospheric dispersion models over a 24-hour average. The spacing between receptors used in the model is 100 meters (in the area of the highest concentration). The NAPCS may consider 8 and 24-hour averages, first highs, as well as annual averages for use in assessing risk.

TLV's have been established for the following OU2-related site compounds:

Compound	TLV
2,4-D	10 mg/m3
2,4,5-T	10 mg/m3

When the substance emitted is a particulate compound and persistence in the environment is expected, the predicted annual average concentration is considered acceptable if it does not exceed the dosage mass of the lethal dose 50 (LD50) (or where 50% of a study species dies upon exposure to a specific dosage) expression divided by 10,000.

If the substance emitted is an herbicide, pesticide, or fungicide, the recommended application rate (in pounds/m2) is divided by 30,000 to obtain the maximum allowable 24 hour average ambient concentration.

- Level 2 Analysis - If the source fails the Level 1 analysis, the applicant must demonstrate it is using control techniques equivalent to lowest achievable emission rate (LAER) and submit toxicological and/or other data sufficient to demonstrate the ground level concentration predicted in Level 1 will not adversely affect the public's health or welfare.

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- Level 3 Analysis - If the applicant is unable to successfully demonstrate acceptance under Level 1 or 2 analyses, then more appropriate mathematical models (using site-specific information), or ambient air monitoring can be performed. Information gathered during Level 3 analysis is then plugged back into the Level 1 and/or 2 analysis to determine acceptance.

The substantive component of NAPCS may be applicable to remedial actions performed on-site. A site-wide air monitoring program may be required to ensure compliance with this control strategy.

Arkansas State Ground Water Quality Protection Strategy

The objective of Arkansas' ground water strategy is to formulate and recommend a management program to protect the quality of ground water resources.

Arkansas' Ground Water Quality Protection Strategy outlines water quality criteria for ground water (drinking water) within the State. Arkansas has adopted the recommended standards for drinking water set by the SDWA. The Arkansas Department of Health uses the National Primary Drinking Water Standards in setting the criteria to which public water supplies must adhere.

The Arkansas State Ground water Quality Protection Standard is not directly applicable to OU2 media, but may be indirectly relevant as a result of the migration of site-related compounds migrating from OU2 media into ground water.

7.2.3 TO-BE-CONSIDERED (TBC's)

City of Jacksonville Ordinances 604, 620, 684, and 877

Ordinance No. 620 sets forth uniform requirements for direct discharge and indirect contributors into the wastewater collection and treatment system for the City of Jacksonville, Arkansas, and enables the City to comply with all applicable state and Federal laws required by the CWA and its General Pretreatment Regulations (40 CFR Part 403).

Ordinance No. 684 is an ordinance amending Ordinance No. 620 that specifically lists additional chemical-specific pollutant limitations for contributors into the wastewater and treatment system for the City of Jacksonville.

Ordinance No. 877 is an ordinance that amends Ordinances 620 and 684, specifying that no industrial user shall discharge wastewater of sufficient strength to cause the 24-hour loading to the POTW to exceed background levels by more than those specified, under this ordinance, for selected chemicals.

Ordinance No. 604 is an ordinance regulating the Jacksonville sewer system and sets forth requirements and regulations for the use of public sewers and private sewage disposal.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

EPA is required to analyze each of the individual alternatives against a set of 9 criteria and develop a comparative analysis that focuses upon the relative performance of each alternative against those criteria.

The nine evaluation criteria are as follows:

1. Overall Protection of Public Health and the Environment

This criterion addresses the way in which a potential remedy would reduce, eliminate, or control the risks posed by the site to human health and the environment. The methods used to achieve an adequate level of protection may be through engineering controls, treatment techniques, or other controls such as restrictions on the future use of the site. Total elimination of risk is often impossible to achieve. However, a remedy must minimize risk to assure that human health and the environment would be protected.

2. Compliance with ARAR's

Compliance with ARAR's, or "applicable or relevant and appropriate laws and regulations," assures that a selected remedy will meet all related federal, state, and local requirements. The requirements may specify maximum concentrations of chemicals that can remain at a site; design or performance requirements for treatment technologies; and, restrictions that may limit potential remedial activities at a site because of its location.

3. Long-Term Effectiveness or Permanence

This criterion addresses the ability of a potential remedy to reliably protect human health and the environment over time, after the remedial goals have been accomplished.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants

This criterion assesses how effectively a proposed remedy will address the contamination problems. Factors considered include the nature of the treatment process; the amount of hazardous materials that will be destroyed by the treatment process; how effectively the process reduces the toxicity, mobility, or volume of waste; and, the type and quantity of contamination that will remain after treatment.

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5. Short-Term Effectiveness

This criterion addresses the time factor. Technologies often require several years for implementation. A potential remedy is evaluated for the length of time required for implementation and the potential impact on human health and the environment during the remediation.

6. Implementability

Implementability addresses the ease with which a potential remedy can be put in place. Factors such as availability of materials and services are considered.

7. Cost

Costs (including capital costs required for design and construction, and projected long-term maintenance costs) are considered and compared to the benefit that will result from implementing the remedy.

8. State Acceptance

The State of Arkansas has had an opportunity to review the FS, the Proposed Plan and the ROD, and offer comments to EPA. The State of Arkansas fully supports EPA's preferred alternative.

9. Community Acceptance

During the public comment period, interested persons and organizations have commented on the alternatives. EPA has carefully considered these comments in making its final selection. The comments received in response to EPA's initial Proposed Plan for OU2, issued in May 1995, are addressed in a document called "The Original Responsiveness Summary," which was released to the public on March 5, 1996, when EPA issued its Supplemental Proposed Plan for OU2, and is included as Attachment A as part of this Record of Decision. EPA received additional formal and informal comments following the release of the March 5, 1996, Supplemental Proposed Plan, and these comments are addressed in "The Supplemental Responsiveness Summary" which is included as Attachment B to this ROD. For additional information on community participation, refer to Section 3.0 of this document.

The nine criteria are categorized into three groups: Threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied in order for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major tradeoffs among alternatives. The modifying criteria are taken into account after public comment is received on the Proposed Plan.

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Threshold Criteria

- Overall protection of human health and the environment.
- Compliance with ARAR's (applicable or relevant and appropriate requirements of other Federal and State environmental statutes).

Primary Balancing Criteria

- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, and volume through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.

Modifying Criteria

- State acceptance.
- Community acceptance.

8.1 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

1. Overall Protection of Human Health and the Environment

Alternative S-1 (no action), does not provide adequate protection of human health and the environment. Alternatives S-2 through S-8 do not provide for adequate protection of human health and the environment when considering the proposed TCDD cleanup standards of 50 ppb, 35 ppb, and 20 ppb presented in the FS (see EPA risk evaluation of soil cleanup levels for 2,3,7,8-TCDD at the Vertac Superfund site). EPA has determined that a 5 ppb action level, based on site-specific risk factors for TCDD TEQ, is necessary to be protective of a future on-site unprotected worker exposure scenario. However, in examining the protectiveness of Alternatives S-2 through S-8 the following comparisons were made:

Alternatives S-2 through S-8 pose varying degrees of potential short term risk during the construction phase of the remedial actions associated with the various alternatives proposed. Those short term risks will be addressed in greater detail in Section 8.1.5, "Short-Term Effectiveness," below. However, through appropriate health and safety measures and proper engineering controls that would be implemented in connection with any of the alternatives, adequate protection would be provided to the community and the workers during the remedial actions.

However, containment of the low level risk media addressed in this ROD, particularly when a 5 ppb cleanup level is applied to the on-site consolidation remedy proposed in Alternative S-2, will be fully protective of the human health and the environment. Containment of low level threat wastes within a properly engineered RCRA-compliant hazardous waste landfill has been shown to be a reliable technology that prevents or minimizes the potential for exposure to on-site workers and to trespassers or casual passersby. In addition, the use of such a landfill to contain site media above a 5 ppb dioxin action level, coupled with the implementation of such institutional site controls as deed restrictions or the placement of appropriate land use controls through the enactment of zoning ordinances, will ensure the overall protection of the human health and the environment.

In addition, the containment in a RCRA Subtitle C hazardous waste landfill of the low level threat media addressed in this ROD will effectively address the ecological risks those media pose. As discussed above, RCRA Subtitle C hazardous waste landfills have proven to be effective means of eliminating exposure to the hazardous wastes contained within them. Therefore, the remedy proposed in Alternative S-2, when implemented using a 5 ppb cleanup level, and when appropriate institutional controls are implemented, will effectively address the risks that exposure to those low level threat media above that 5 ppb cleanup level currently pose.

Alternatives S-2 (on-site containment), S-7 (capping in place), and S-8 (on-site containment at dioxin levels above 50 ppb) provide adequate long term protection after completion of the remedial actions by isolating the contaminated soil, either by consolidation in the on-site RCRA Subtitle C hazardous landfill or by capping the waste in place. Alternative S-8 provides additional protection over S-2 and S-7 because all soil above a 50 ppb action level would be excavated and consolidated in the CCU, versus the capping in place of all soils exceeding a 50 ppb action level under S-7, or the capping in place of soils between a 50 and 500 ppb action level and the excavation and consolidation within the CCU of soils exceeding 500 ppb action level under S-2. Alternatives S-3 and S-4 provide additional long term protection as a result of permanent destruction of concentrations of TCDD above 2,000 ppb, with soils having dioxin concentrations between 50 and 500 ppb being capped in place and soils having dioxin concentrations between 500 and 2,000 ppb being consolidated within the CCU. Alternatives S-5 and S-6 provide the greatest long term protection by treating the largest volume of contaminated soil, where soils having dioxin concentrations above 50 ppb being permanently destroyed by either on-site desorption or off-site incineration technologies.

However, the long term benefits associated with these alternatives are offset by the additional short term risks posed by material handling associated with on-site desorption or with material handling and transportation to an off-site incineration facility, as well as substantial additional costs associated with implementing Alternatives S-5 and S-6.

Alternative U-1 (no further action with respect to equipment and underground utilities), would not provide adequate protection to the human health and the environment. Potential risks would continue at current conditions for an extended period of time. Alternatives U-2 (equipment plugging and cleaning) and U-3 (equipment plugging, cleaning and sealing) would provide overall protection to the human health and the environment due to the fact that both would substantially remove sources of future contamination. However, Alternative U-3 provides a greater degree of overall human health and environmental protection by sealing off the cleansed and flushed equipment, sewer lines and curbs and foundations, further ensuring that those objects not be a source of future recontamination.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR's)

At present there are no State or Federal regulations that are applicable to Alternative S-1 (no action), although this alternative is not protective of human health. Land disposal restrictions (LDR's) are not applicable to consolidated or containerized soils for the on-site landfilling component of Alternatives S-2 through S-8, as they would be consolidated within an area of containment (AOC) without treatment, and therefore placement will not occur. <u>See</u> discussion of consolidation within Section 7.2.1, Federal ARAR's. For alternatives S-3 through S-6, thermally-treated soils would need to comply with land disposal restrictions prior to on-site disposal due to the fact that placement would occur with respect to treated wastes, as opposed to untreated contaminated soil and debris. Treatment and disposal of TCB spill-related material would comply with all applicable requirements with respect to pre-transportation and manifesting requirements. Because TCB spill-related materials above a 500 ppm action level would be treated and disposed of off-site, further ARAR's analysis is inapposite, and all applicable requirements would apply once the material leaves the site.

Leachate collected from the on-site landfill in Alternatives S-2 through S-8, and condensed water from Alternative S-3, would be treated at the on-site treatment system, and the resulting discharge to Rocky Branch Creek would have to meet treatment/discharge requirements. Organic condensate generated from on-site thermal desorption in Alternative S-5 would be transported off-site for incineration, and would have to be in compliance with appropriate incineration and disposal requirements.

Off-site transportation of crystalline TCB and associated spill soils in Alternatives S-2 through S-6 and desorbed liquids generated in Alternative S-5 would comply with all applicable manifesting and transportation regulations.

Alternatives U-2 and U-3 would comply with ARAR's. The LDR treatment standards for hazardous debris are not applicable to underground structures such as manholes, sumps, and sewers because the proposed actions do not involve placement within a unit, and therefore land disposal will not have occurred. However, RCRA treatment and disposal requirements are applicable to the wastewater generated during the remedial actions. Wastewater generated from flushing of the industrial sewer, and from hydroblasting of foundations and curbs, would be treated at the on-site treatment plant in compliance with applicable treatment and standards, and the treated water would be discharged into Rocky Branch Creek in compliance with applicable State water quality standards. Solids removed from the sewer lines or removed from foundations and curbs would be placed in the on-site consolidation unit. Because those solids constitute contaminated debris from within the site's AOC, placement will not occur when they would be consolidated within the CCU, and therefore RCRA's LDR's do not apply as an ARAR.

3. Long-Term Effectiveness and Permanence

Alternative S-1 (no action) does not provide for long-term protection. Alternative S-2 (on-site containment), S-7 (capping in place), and S-8 (on-site containment of site media with dioxin concentrations above 50 ppm) provide for the reduction in the migration and exposure pathways through capping and/or landfilling contaminated soils. As discussed earlier, containment of low level threat wastes in a RCRA Subtitle C hazardous waste landfill has proven to be an effective and reliable technology, but one that requires long term operation and maintenance (O & M) and the imposition of institutional controls to remain effective. Alternatives S-3 and S-4 provide for more reliable long term protection through additional reduction in toxicity by permanently destroying some of the contaminants through treatment. Alternatives S-5 and S-6 involve the greatest treatment components and would be more effective in the long term because they would permanently destroy site contaminants. However, the high cost to implement the off-site incineration alternative (S-6) and increased length of time to implement the on-site thermal desorption alternative (S-5) make these options problematic.

For Alternative U-1 (no action with respect to underground utilities, equipment, and curbs and foundations), the quantity of site-related compounds in underground structures is expected to remain constant for the foreseeable future. For Alternatives U-2 (plugging and cleaning underground utilities, equipment, and curbs and foundations),and U-3 (plugging, cleaning, and sealing underground utilities, equipment, and curbs and foundations) the residual contaminant concentrations remaining after remediation would be minimal. Alternative U-3 would provide an additional level of effectiveness by the grouting up of the sewer line, which would reduce the potential for collapse and transmission of groundwater, and the sealing of foundations and curbs would prevent contact with contaminants that cannot be removed by scarification.

4. Reduction of Toxicity, Mobility, or Volume of the Contaminants through Treatment

A significant reduction in toxicity, mobility and volume of TCDD is not expected under Alternative S-1 (no action), since any reduction under the no action alternative would occur through natural attenuation mechanisms. Alternatives S-2, S-7 and S-8 rely on capping and/or excavation and landfilling. Therefore, this criterion is not applicable because neither involves treatment. Alternative S-8 provides the greatest reduction of the mobility of the three alternatives due to extensive soil isolation, yet does not involve treatment. Alternatives S-3 (on-site desorption and chemical treatment) and S-4 (on-site containment, consolidation, and on-site incineration), which incorporate capping, landfilling, and treatment options, address reducing the toxicity, mobility and volume of TCDD at the site to some extent. Alternatives S-5 (on-site desorption), and S-6 (off-site incineration) address soils with TCDD concentrations greater than 50 ppb or 20 ppb depending upon the option considered, would provide for the greatest reduction in toxicity, mobility and volume of TCDD of all the options reviewed. However, drawbacks to these options include the estimated 4 years of on-site treatment time required under Alternative S-5 and the extremely high cost of implementation associated with Alternative S-6.

Alternative U-1 would not provide for the reduction of toxicity, mobility and volume of contaminants associated with the on-site structures. Under Alternatives U-2 and U-3, contaminants are removed from these structures, thereby significantly reducing their toxicity, mobility and volume.

5. Short-Term Effectiveness

All action alternatives require between 2 and 5 years to implement. Remedial actions involving capping and excavation and landfilling are generally faster to implement than those options requiring combinations of on-site/off-site treatment, capping, and landfilling.

Alternative S-1 (no action) poses no short term impact to the community and site workers. Alternatives S-2 through S-8 pose some potential short term impacts to the community and workers from dust generated during material handling activities. Alternatives S-3 through S-6 pose additional impacts associated with the operation of treatment systems. Short term impacts posed by Alternatives S-5 and S-6 are greater than for the other alternatives due to the relatively large volume of soil to be excavated and treated, which could create a longer period of time for potential exposure. Alternative S-5 involves transportation of relatively small amounts of high concentration liquids off-site, and poses the additional risks associated with excavation and treatment of a large volume of contaminated soil, both of which actions could create a longer period of time for potential exposure. However, with respect to all alternatives that involve excavation and material handling that generate dust, appropriate engineering controls would be used for dust suppression, along with other measures necessary to detect and prevent airborne releases

No short term impact would result from implementation of Alternative U-1 (no action). Short term impacts associated with Alternatives U-2 and U-3 are primarily from dust generated during remedial activities. Appropriate engineering controls will be used for dust suppression, along with other measures necessary to detect and prevent airborne releases.

6. Implementability

Alternative S-1 is the easiest to implement because it requires no further action. Alternatives S-2, S-7, and S-8 (capping and landfilling options) are relatively simple to implement because they use conventional construction techniques. Alternatives S-3, and S-4 are more difficult because they require temporary soil storage and on-site treatment of soils. The requirements for implementing Alternative S-6 are similar to S-3 and S-4 except that the volume of soils requiring excavation and treatment is substantially larger. Alternative S-5 is the most difficult to implement because it involves the same amount of soil involved in S-6, except that both on-site and off-site treatment options would be in effect.

Alternative U-1 can easily be implemented as it does not require any further action. Alternatives U-2 and U-3 can be implemented using standard and specialized equipment. Technologies and technical expertise associated with the alternatives are readily available.

7. Cost

The costs associated with the alternatives described ranged from $5,896,000 (Alternative S-2) to $164,601,000 (Alternative

S-6). Annual operation and maintenance costs ranged from $10,400 (Alternatives S-5 and S-6) to $37,700 (S-2 to S-4).

The cost to implement Alternatives U-2 and U-3 are $1,229,000 and $1,359,000, respectively.

8. State Acceptance

Under the Superfund law, EPA is required to ensure that states have a meaningful and continuing role in remedy selection and execution. While states are not required to concur formally with EPA-selected remedies, if the remediation is funded by the Superfund, the state where the site is located must contribute 10 percent of the remedy's construction cost. States are required to formally concur with the deletion of a site from the National Priorities List (NPL) upon completion of the remediation process. For these reasons, EPA has kept ADPC&E staff informed regarding the remedy selection process and has briefed the State on several occasions concerning the remedial alternatives considered in the FS and the preferred option set out in the original and Supplemental Proposed Plan for OU2 and this ROD.

The ADPC&E has reviewed the FS, the May 1995 Proposed Plan and the March 1996 Supplemental Proposed Plan, and has provided EPA with comments on this ROD. The ADPC&E is in full agreement with this ROD.

9. Community Acceptance

EPA recognizes that the community in which a Superfund site is located is the principal beneficiary of all remedial actions undertaken. EPA also recognizes that it is its responsibility to inform interested citizens of the nature of Superfund environmental problems and solutions, and to learn from the community what its desires are regarding those sites.

EPA has undertaken an extensive effort to solicit input from the community on the various remedial options considered for this operable unit. The concerns the community raised at various times during discussions with EPA include the following: 1) The on-site landfill should be located at the greatest distance away from the nearest residences, its size should be minimized, and its height should not exceed 25 feet; 2) For the restricted access portion of the site (the area that would remain fenced) workers should not have to wear "moonsuits" (the highest level of protective clothing) to conduct their daily activities; 3) An attempt should be made to return a substantial portion of the site to commercial/industrial productivity; 4) The cleanup level for dioxin within the fenced area should be no greater than 5 ppb; 5) For the area outside the fence, the dioxin cleanup level should be a maximum of 1 ppb; and, 6) That the smallest area possible be fenced to provide the maximum acreage for potential future commercial/industrial redevelopment.

EPA, in the remedy selected in this document, has made an effort to address these community objectives within Statutory guidelines. While the community desired that the strip of property along Marshall Road be cleaned to 1 ppb dioxin to promote what they believed was a more attractive draw for prospective land developers, they understand that the 5 ppb cleanup level is justified by the risk assessment and defensible, and that a lower cleanup level, like 1 ppb, for example, is not. As such, the community understands that EPA cannot mandate a lower cleanup level than is justified. However, through discussions and meetings regarding the communities desire for 1 ppb along Marshall Road, Hercules, Inc., has indicated it would evaluate this additional cleanup. Such action on the part of Hercules, Inc., would be fully supported by EPA and totally voluntary.

9.0 THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine evaluation criteria, consultation with the Arkansas Department of Pollution Control and Ecology, and public comments, EPA has determined that Alternatives S-2 (with the modifications described below for on-site surface soils) and U-3, are the most appropriate remedies for the Vertac Operable Unit 2 media. Given the reasonably anticipated future land use for the site and the low level threats at the site that this ROD addresses, and consistent with the NCP's preference for EPA to implement containment remedies when addressing low level threat wastes where treatment of those wastes is impracticable (see NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B)), on-site consolidation of OU2 media, including those similar media from the 1990 Off-Site Areas ROD and the bagged soils Hercules, Inc., had excavated in a 1990 removal action from contiguous residential areas, is fully protective and appropriate.

A component of the selected remedy uses excavation and landfilling to address low level threats posed by contaminated soil media. In addition, as discussed earlier, the remedy selected also addresses contaminated soil originally intended to be incinerated on-site. These materials consist of soils to be removed from the Rocky Branch Creek flood plain, sludges removed from the on-site sewage treatment plant and sediments from the interceptor line as part of the 1990 Off-Site Areas ROD, and residential bagged soil from the 1990 Hercules-performed removal action whose disposition the 1993 OU1 ROD expressly deferred until EPA executed the OU2 ROD. Because the on-site incinerator is no longer operational and because those contaminated soils and debris described above came from a contiguous area of contamination and constitute low level threat media, and therefore in no way differ from the contaminated soil and debris addressed in this ROD, EPA has determined that it is appropriate to amend the 1990 Off-Site Areas ROD to reflect this change.

After remediation, the northern portion of the site will have unrestricted access for commercial/industrial development. EPA cannot determine the permanent fence locations on the southern portion along Marshall Road until the remedial design/remedial action phases begin. However, fence locations on this portion of the property may be phased in order to provide unrestricted access in the future for commercial/industrial development. **Figure 13** depicts the approximate areas of the site that will remain fenced in relation to the portion of the site that will have unrestricted commercial access. It should be emphasized that the area shown on this drawing is approximate, and the fencing will be conducted in phases, since a continuous effort will be made to provide the maximum amount of property for commercial redevelopment.

EPA acknowledges that contaminated sediments in Rocky Branch Creek have resulted in ecological impacts. However, until the site is remediated and the source of dioxin contamination eliminated, the potential for continuing impacts exists through contaminated surface soils, sediment transport and groundwater seeps. With this remedy, the primary source will be removed through consolidation of dioxin contaminated soils in the on-site landfill and sediment transport resulting from the sump overflows and storm water run-on and run-off will be reduced or eliminated through storm water management, thereby eliminating ecological risk.

Groundwater seeps from the contaminated areas of the site into Rocky Branch Creek are currently impeded by the French drain system installed along the western edge of the site and bordering the on-site burial grounds, thereby preventing another potential source of contamination for Rocky Branch Creek. Stream data indicates no measurable dioxin concentrations, for example, following rain events. Since Rocky Branch Creek is not a perennial waterbody and does not flow through the site, the removal of the contaminated soils and elimination of untreated discharges and possible groundwater seeps will essentially eliminate future impacts. While data suggests that existing impacts in Rocky Branch Creek are on the decline, any actions to remove contaminated sediments in Rocky Branch Creek would be cost prohibitive, but more importantly, any disturbance of the existing sediment could prove catastrophic, possible even destroying the entire existing ecosystem. As such, this remedy in addition to the other on-going remedies at the site will effectively remove the contamination source and the storm water transport concern allowing Rocky Branch Creek to continue, in essence, a natural attenuation process.

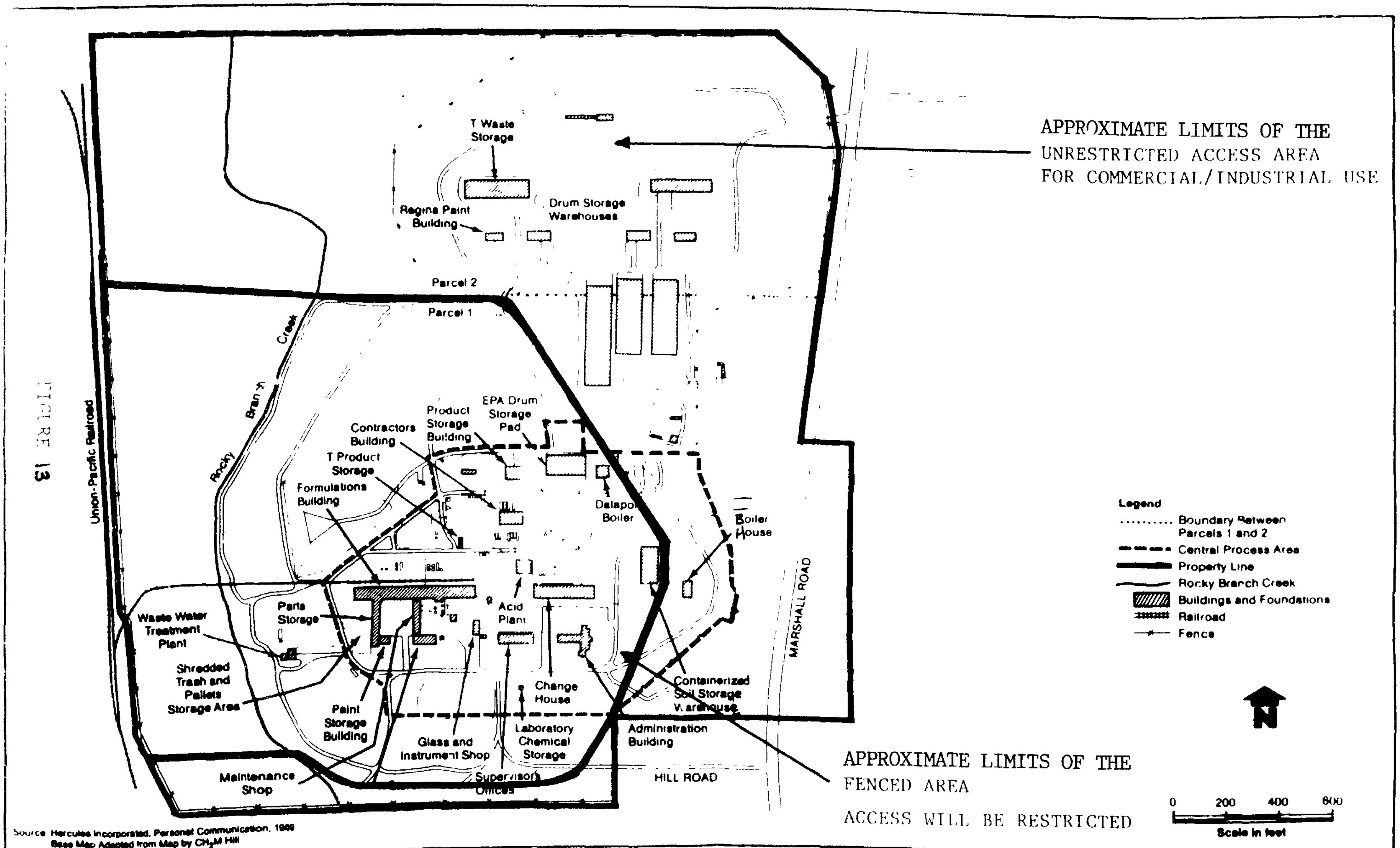

FIGURE 13

SITE MAP, VERTAC SITE
JACKSONVILLE, ARKANSAS

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A summary of the selected remedy is presented below.

9.1 SOILS AND SEDIMENT MEDIA

1) On-site Surface Soils

The selected remedy for the Vertac on-site soils media is Alternative S-2, with the following modifications.

All soils on both the northern and southern parcels with dioxin concentrations at or above the action level of 5 ppb will be excavated and disposed of in the on-site landfill. While EPA did not include this 5 ppb cleanup level in the description of Alternative S-2 in the OU2 FS, EPA has received substantial public comment regarding the use of a 5 ppb dioxin cleanup level. In addition, EPA has reevaluated its risk assessment taking into account the reasonably anticipated future land use for the site and considering the low level threat media addressed by this ROD for OU2. Therefore, EPA now selects 5 ppb as the appropriate and fully protective action level for the implementation of Alternative S-2.

The OU2 on-site soils area includes the area around the existing Regina Paint Building, which is targeted for demolition under the OU1 ROD. Sampling results indicate that some excavation will be necessary in the areas around the Regina Paint Building. Following remediation, the entire northern parcel will be available for redevelopment.

All excavated site areas will be backfilled with clean soil, compacted and revegetated. Some surface drainage modifications may be used to control runon and runoff, thereby minimizing the potential for erosion, and to facilitate positive drainage to eliminate the possibility for ponding water.

During remedial action for this remedy, there is a possibility of dust being created which could suspend dioxin contamination. As part of the remedial action, continuous air monitoring will be conducted and dust suppression measures will be implemented to ensure that no airborne contaminants migrate off-site to a receptor point. Therefore, no-site related contaminants will be allowed to pose a threat to nearby citizens or a casual passerby.

EPA will work with the Vertac Receiver and City of Jacksonville to impose deed restrictions and notifications, or to enact specific land use restrictions to limit the future use of the property as appropriate for the long term remediation efforts. Finally, upon completion of the remedy for OU2, long term operations and maintenance measures will be instituted to ensure, in part, that the integrity of the RCRA Subtitle C hazardous waste landfill will be maintained.

Another element of this portion of the remedy is a "phased fencing" approach for the southern parcel. Once initial remediation is complete, the smallest possible area of the site will be fenced. A continuous effort will be made to provide the maximum amount of property possible for potential commercial redevelopment, as long term remediation efforts allow the restricted area to be reduced.

2) Crystalline Tetrachlorobenzene (TCB) and Soils associated with the TCB spill

This component of the remedy calls for the excavation and off-site incineration of the crystalline TCB and TCB-associated spill soils where the TCB concentrations exceed a 500 ppm health-based action level. Excavated areas will be backfilled with clean fill, graded and revegetated to prevent future contact with the remaining soils that fell below the 500 ppm TCB action level. It has been estimated in the RI that there are approximately 1,400 cubic yards (2,100 tons) of crystalline TCB and associated soils for costing purposes. The actual volume of material will be determined during the remedial action.

3) Bagged Soils from Residential Areas Excavated by Hercules, Inc., During a 1990 Removal Action

This component of the remedy calls for the consolidation of approximately 2,770 cubic yards (4,155 tons) of dioxin-contaminated soils removed from residential yards in 1990 into the on-site RCRA-compliant CCU. As discussed earlier, the Agency's 1993 ROD had deferred treating these contaminated low level threat soils and debris until all site soils were to be addressed. Due to the similarity of the on-site soils addressed in this ROD and the bagged soils from residential areas, EPA has determined that it is appropriate to treat all low level threat media in a manner consistent with the approach selected for the on-site soils in this ROD, that is, on-site disposal in the RCRA Subtitle C Landfill. Dioxin concentrations in the bagged soils range between 13 ppb and 55 ppb TCDD, which is consistent with the dioxin concentrations found in the soil and debris principally addressed in this ROD.

4) Off-site Soils from the Residential Portions of Bayou Meto and Rocky Branch Creek Flood Plain Areas from the 1990 Off-Site Areas ROD

This component of the remedy calls for the excavation of 1 ppb or greater (approximately 4,100 cubic yards or 6,150 tons) dioxin-contaminated soils from along Rocky Branch Creek and Bayou Meto and consolidation of this material into the on-site RCRA compliant CCU that is being constructed as part of the remedial action phase of the 1993 OU1 ROD. As discussed earlier, these contaminated soils and debris constitute low level threat media and had originally been addressed in the 1990 ROD for Vertac Off-Site Areas, which had required that they be incinerated in the now-defunct on-site incinerator. Due to the similarity to the on-site soils addressed in this ROD, EPA has determined that it is appropriate to treat all low level threat media in a manner consistent with the approach selected for the on-site soils in this ROD, that is, on-site disposal in the RCRA Subtitle C Landfill.

5) Dewatered Sludges from the Old Sewage Treatment Plant Sludge Digester and Sediments from the Interceptor line from the 1990 Off-Site Areas ROD

This component of the remedy calls for the consolidation of approximately 890 cubic yards (1,200 tons) of digester sludge from the Old Sewage Treatment Plant into the on-site RCRA compliant CCU. Also, about 2 cubic yards of contaminated sediment from the interceptor lines will be disposed in the CCU. The dioxin concentrations found in the sewage treatment plant digester are consistent with those being landfilled from on-site areas. As discussed earlier, these contaminated soils and debris had originally been addressed in the 1990 ROD for Vertac Off-Site Areas, which had proposed that they be incinerated in the now-defunct on-site incinerator. Due to the similarity to the on-site soils addressed in this ROD, EPA has determined that it is appropriate to treat all low level threat media in a manner consistent with the approach selected for the on-site soils in this ROD, that is, on-site disposal in the RCRA Subtitle C Landfill.

The cost to implement Alternative S-2, with above-mentioned changes in action levels, is estimated to be $12.25 million.

9.2 UNDERGROUND UTILITIES, FOUNDATIONS AND CURBS

The selected remedy for addressing the contaminants associated with these structures at the site is Alternative U-3. In addition to the elements already described in Alternative U-3, the underground chemical sewer lines will be cleaned to remove solids and filled with grout. Cut-off barriers will be installed around various underground utility lines to prevent shallow water migration along these lines. Foundations and curbs will be cleaned through surface scarification, and for areas where persistent staining exists, surface sealing will also be employed. Further, the foundations and curbs will be covered with adequate soil (typically between 18 and 24 inches) to support a vegetative cover and contoured to prevent erosion and prevent ponding of storm water. (The USTs were targeted to be addressed in this component of the selected remedy, but as previously discussed in Section 5.4.6 of this ROD, Hercules, Inc., has recently pumped dry and backfilled these tanks with grout. Therefore, the five USTs no longer require remedial action.)

The cost to implement Alternative U-3 for the underground utilities lines, building and equipment foundations, and curbs is estimated at $1.56 million.

The total estimated cost to implement both components of the selected remedy is $13.81 million. The annual operation and maintenance costs are estimated at $37,700. A more detailed estimate of the annual operation and maintenance cost will be provided in the site opertaion and maintenance plan to be developed during the remedial design.

10.0 STATUTORY DETERMINATIONS

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), requires that EPA select remedial actions that are protective of human health and the environment, that are cost effective, and that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA Section 121(d)(1), 42 U.S.C. § 9621(d)(1), requires EPA to select remedies that comply with applicable or relevant and appropriate environmental standards (ARAR's) established under Federal and State environmental laws, unless a waiver is granted. The following sections discuss how the selected remedy meets the statutory requirements.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy is protective of human health and the environment. The remedial action objectives and goals specified in section 6.5 of this ROD will be met.

The selected containment remedy for the low level threat site soils, sediments and sludges, underground utility lines, and foundations is protective of human health and the environment because:

1) All soils contaminated with dioxin concentrations of 5 ppb and greater will be excavated and consolidated within an on-site RCRA Subtitle C hazardous waste landfill. Excavation and consolidation of that low level threat material into the RCRA landfill will substantially reduce the mobility of the site contaminants and will prevent direct exposure through dermal contact, inhalation, or ingestion by future site workers maintaining the restricted access area and individuals passing by the site. Excavation and consolidation of the contaminated soil will also prevent the threat of leaching to ground water due to the engineering of the landfill, and will reduce potential sediment transport from runon and runoff. Such on-site

consolidation of low level threat media is consistent with the NCP's preference for containment remedies for low level threat media where treatment is impracticable. See NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B).

2) Concentrations of dioxin-contaminated soil that will remain in place will be below 5 ppb, and are estimated to be on average less than 1 ppb, which is well below the concentration required to be protective of human health and the environment. EPA data indicate that such an average dioxin concentration will result due to the excavation of grids containing dioxin concentrations above 5 ppb and due to the fact that there already exist grids that contain dioxin concentrations below 1 ppb. Commercial access will be possible for much of the site so as to allow redevelopment of the maximum amount of acreage.

3) Crystalline TCB and TCB-contaminated soils above the 500 ppm health-based limit will be excavated and transported off-site for incineration. By permanently treating these wastes at an off-site facility, the possibility of direct contact exposure is completely eliminated. In addition, the replacement of clean topsoil will eliminate the contact exposure pathway for the TCB-contamination below the 500 ppm action level.

4) Soils excavated from the contiguous areas of Rocky Branch Creek, bagged soils from the contiguous residential areas, and sediments and sludges from the old on-site sewage treatment plant will be consolidated within the on-site RCRA Subtitle C landfill. Excavation and consolidation of these sediments within a RCRA Subtitle C hazardous waste landfill will substantially reduce the mobility of these contaminants and will prevent direct exposure through dermal contact, inhalation, or ingestion by members of the public, who will be excluded from the landfill.

5) Underground utility lines will be closed and/or grouted to prevent the possibility of ground water contaminant migration and leaching through those lines. As discussed earlier, the USTs have already been addressed, which has eliminated the possibility of future leaching of any petroleum contaminants.

6) Building foundations and curbed areas will be cleaned using hydroblasting, scarification, epoxy sealing, and covered with adequate soil to provide vegetative cover and contoured to prevent erosion and ponding water. After such remediation, these structures will not present an exposure hazard to future workers.

Short-term risks associated with the selected remedy can be controlled by closely monitoring the design and implementation of remedial measures and employing continuous air monitoring and dust suppression measures during construction phases. No adverse cross-media impacts are expected from implementation of the selected remedy.

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10.2 COMPLIANCE WITH ARAR's

The selected remedy for site soils, sediments and sludges, underground utility lines, and foundations, will comply with all ARAR's identified for the site. The ARAR's applicable to the selected remedy are presented below:

Due to the fact that the excavation of the contaminated soils and debris proposed in this ROD and their subsequent consolidation within the CCU will occur entirely within the area of contamination, and because no treatment will occur that would result in those materials' placement under LDRs within the CCU, RCRA's land disposal restrictions do not apply. In addition, those restrictions do not apply to the soil and debris from the 1990 Off-Site Areas ROD or to the bagged residential soils Hercules had excavated from contiguous areas as part of a 1990 removal action, because they were also removed from within the area of contamination (AOC) and have not been treated. The substantive (versus procedural) RCRA minimum technology requirements (MTR's) for hazardous waste landfills are applicable to the CCU, due to the fact that all soil and debris consolidation actions will occur entirely within AOC. See 40 CFR §§ 264.301(a, c, g-j), 264.302(a), 264.310(a) and (b) 264.312, 264.313, 264.314, 264.315, 264.316, 264.317. Therefore, design, construction, and operation of the CCU will substantively comply with MTR's. Finally, no ARAR exists for the backfill of clean soil over areas with dioxin contamination.

Crystalline TCB and spill-related soils will be excavated and taken off-site for treatment, and therefore ARAR's do not apply to the off-site component of this action. However, RCRA manifesting and pre-transportation requirements are applicable to the elements of this action that occur on-site. Those RCRA requirements concerning manifesting, waste packaging, labeling, waste analysis and notification to treatment, storage and disposal facilities subject to land disposal restrictions are found at 40 CFR §§ 262.20 - 262.23 and 262.30 - 262.32, and 40 CFR 268.7, and apply in their entirety to off-site shipments of hazardous wastes.

In addition, while not constituting an ARAR, compliance with the CERCLA Off-Site Rule, promulgated pursuant to CERCLA Section 121(d)(3), 42 U.S.C. § 9621(d)(3), and formally entitled "Amendment to the National Oil and Hazardous Substances Pollution Contingency Plan; Procedures for Planning and Implementing Off-Site Response Action: Final Rule," 58 FR 49200 (September 22, 1993), and codified at 40 CFR 300.440, is mandatory for off-site disposal actions.

The RCRA classification and listing as a K085 waste is applicable, based on the TCB material's exhibiting the characteristic of toxicity pursuant to analysis under 40 CFR §

261.32. The land disposal restrictions require that K085-listed wastes be treated to concentrations of constituents specified in 40 CFR § 268.43, which applies treatment standards set out at 40 CFR § 268.40, prior to land disposal. Such treatment will occur at the off-site disposal facility. Transportation of crystalline TCB and spill-related soils for off-site treatment/disposal would need to comply with all the requirements set forth under 40 CFR §§ 107,171-177, and 263, the Hazardous Materials Transportation Act, 49 U.S.C. § 1801 et seq., and state hazardous waste transportation regulations.

The Clean Air Act's (CAA's) National Ambient Air Quality Standards (NAAQS), 40 CFR § 50.06, as administered through Arkansas' State Implementation Plan (SIP), may not be applicable to this component of the remedy since these standards are applicable only to "major sources" or sources that emit over 10 to 25 tons per year of a regulated pollutant. The standards, however, are relevant and appropriate because respirable dust will be generated during the cleanup. In addition, the Arkansas ambient air quality standards as described in the Non-criteria Pollution Control Strategy are applicable.

Aqueous waste generated during the remediation activities and during perpetual operation and maintenance, such as decontamination water or leachate from the CCU, will be processed through the on-site water treatment system. Water from this treatment system will be discharged to Rocky Branch Creek, monitored for compliance with State water quality criteria, and self-reported in accordance with State-developed effluent discharge limitations.

Erosion and sediment controls during excavation, backfilling, regrading, and revegetation would have to comply with local regulations.

10.3 COST EFFECTIVENESS

The selected remedy for Operable Unit 2 media is cost effective and is fully protective of human health and the environment based on reasonably anticipated future land use for the site and the community objective of commercially redeveloping the greatest amount of the site's acreage. Section 300.430 (f)(ii)(D) of the NCP, 40 CFR § 300.430(f)(ii)(D), requires EPA to determine cost effectiveness by evaluating the following three of the five balancing criteria to determine overall effectiveness: Long-term effectiveness and permanence, reduction of toxicity, mobility, or volume, and short term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective. For the reasons described in greater detail in discussions above, the selected remedy meets these criteria.

The total estimated present worth of the selected remedy for soils, sediments and sludges for the northern and southern parcels, including underground utilities and foundations, is $13,810,000. The variation in remedy costs evaluated for these media ranged from $5,896,000 for Alternative S-2, with higher site action levels to $164,601,000 for a total incineration remedy. Even though the selected remedy does not provide for a reduction in the toxicity or volume of dioxin in site soils, landfilling will substantially reduce the mobility of the contaminants of concern. As stated earlier, the NCP favors containment remedies for low level threat media, or where treatment is impracticable. NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B). Due to the extreme cost of the treatment remedies, EPA has concluded that such treatment is impracticable. However, previously implemented remedies associated with other operable units have accomplished a reduction in toxicity and volume of dioxin as a site contaminant where those dioxin-contaminated media were considered to constitute a principal threat. As discussed earlier, however, containment is deemed to be the preferred method of addressing low level threat media, and the remedy selected in this ROD cost effectively accomplishes that by utilizing the on-site RCRA Subtitle C hazardous waste landfill being constructed as part of the remedy for OU1.

10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for this operable unit.

Of those alternatives that were protective of human health and the environment, and that comply with ARAR's, EPA has determined that the selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, and taking into consideration short-term effectiveness, implementability, costs, and State and community concerns. The selected remedy is consistent with the NCP's preference of employing containment remedies when addressing low level threat media. NCP Section 300.430(a)(iii)(B), 40 CFR § 300.430(a)(iii)(B).

10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Due to the fact EPA has determined that principal threats, as defined at NCP Section 300.430(a)(iii)(A), 40 CFR § 300.430(a)(iii)(A), are not at issue in this operable unit, the remedy selected for OU2 does not require treatment to be implemented. Therefore, EPA has determined that containment by consolidating the low level threat media within an on-site RCRA Subtitle C hazardous waste landfill will effectively and protectively address those low level threat media. Therefore, it is not necessary or appropriate for the OU2 remedy to meet the general statutory preference for treatment as a principal element. Thus, EPA has determined that neither on-site thermal desorption, on-site incineration, or off-site incineration for the low level threat media are appropriate. TCB-contaminated soils, however, will be excavated and transported off-site for treatment.

All soils that contain concentrations of dioxin equal to or greater than 5 ppb will be excavated and placed into the on-site landfill. By landfilling all grids having dioxin contamination levels of 5 ppb or more, approximately 99 percent of all dioxin in site soils and debris will be contained. Thus, completion of the remedy selected in this ROD, in conjunction with other operable unit remedies and related CERCLA response actions, will either contain or immobilize over 99 percent of the dioxin found in the Vertac soils and debris. The total amount of dioxin present in site soils and debris covered under this operable unit's remedy selected herein comprises only about 1 to 5 percent of the amount of dioxin that was buried in on-site landfills under the 1984 Court-ordered remedy.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Original Proposed Plan for Operable Unit 2 media at the Vertac site was released to the public in May 1995. As a result of the Superfund Administrative Reforms issued in October 1995, a Supplemental Proposed Plan was issued in March 1996. The section of the ROD that follows explains the differences from the original proposal and the selected remedy contained in this document.

The modifications that have been made to the Record of Decision for Operable Unit 2 media are the result of two fundamental changes: The preference for treatment of principal threats has been met through other remedial actions undertaken or to be undertaken at the site, while this ROD addresses low level threat media for which the NCP prefers containment remedies, and the future land use scenario for only about two thirds of the southern portion of the site will involve long term restricted access due to the on-site containment of hazardous wastes. Otherwise, the reasonably anticipated future land use, which is commercial/industrial, for much of the site will be attainable under the selected remedy.

In the original May 1995 Proposed Plan, EPA had envisioned that approximately 50 percent of the southern 93 acres of the site would eventually be returned to commercial/industrial use. However, after reevaluating the long term operation and maintenance requirements for that area of the site, which will involve maintaining the caps on the existing site burial areas, the new RCRA Subtitle C hazardous waste landfill, and operation and maintenance of a ground water treatment system, EPA believes that a more realistic estimate would be that only a portion of the property along Marshall Road could be available for future redevelopment opportunities on the southern portion of the site. Because access to about two thirds of the southern property will remain restricted, except for site maintenance workers, the selected remedy provides a more cost effective remedy that is fully protective of human health and the environment.

The selected remedy for the Operable Unit 2 media differs significantly from EPA's original May 1995 Proposed Plan and the March 1996 Supplemental Proposed Plan in several areas. Those differences are:

1) Off-site incineration of dioxin-contaminated soil is no longer a component of the selected remedy.

The original Proposed Plan called for the excavation and off-site incineration of the 8 most highly-contaminated soil grids at the site (approximately 2,000 tons).

EPA's original rationale for incinerating the 8 most highly-contaminated grids (out of a total of 461) at the site was based on EPA's preference for treatment of principal threats and for permanent remedies, and those eight grids had initially been regarded to constitute a principal threat. Approximately 72 percent of the TCDD in site soils would have been treated at an off-site facility.

After reevaluating all remedial options for the site, EPA has determined that the preference for treatment of principal threats is not necessary due to the fact that this ROD addresses low level threat media, not principal threats, when all of the media addressed in the ROD are considered as a whole. See Section 10.5 of this ROD. One should note, however, that the off-site incineration of the TCB-contaminated soil has remained unchanged.

2) The volume of TCDD-contaminated material that was proposed for consolidation into the on-site RCRA Subtitle C hazardous waste landfill within the fenced portion of the site has been increased.

The original May 1995 Proposed Plan called for the excavation and consolidation of approximately 104 grids, or approximately 17,059 cubic yards, of TCDD-contaminated soil into the on-site landfill. The March 1996 Supplemental Proposed Plan called for the excavation and on-site landfilling of TCDD-contaminated soils with TCDD concentrations of 50 ppb or greater.

Under that proposal, approximately 4,259 cubic yards of contaminated soil would have been consolidated within the CCU. The selected remedy will require that 112 soil grids that have TCDD concentrations at or above 5 ppb (approximately 18,319 cubic yards) be excavated and consolidated within the on-site landfill. This represents approximately 99 percent of all the dioxin present within site soils.

3) <u>TCDD-contaminated soils outside the fenced area will be excavated and landfilled on-site wherever the TCDD concentration exceeds 5 ppb.</u>

The May 1995 Proposed Plan did not make a distinction between the cleanup level for either the northern or southern portions of the site, and selected 5 ppm as the cleanup level for TCDD. The March 1996 Supplemental Proposed Plan set a 1 ppb TCDD cleanup level for the northern (unfenced) portion of the site, and proposed to cap the southern (fenced) portion of the site where TCDD levels ranged between 5 and 50 ppb. Areas having TCDD soil concentration levels above 50 ppb were to be excavated and consolidated within the CCU.

As discussed earlier in this ROD, data indicate that following the excavation of TCDD-contaminated soils, the average TCDD contamination levels will be less than 1 ppb. EPA data indicate that such an average dioxin concentration will result due to the excavation of grids containing dioxin concentrations above 5 ppb and due to the fact that there already exist grids that contain dioxin concentrations below 1 ppb. Therefore, by excavating soils where TCDD concentrations exceed 5 ppb over the entire site, the remedy selected results in the same overall cleanup goal as had been proposed in the original May 1995 Proposed Plan.

All other elements of the original proposed plan remain unchanged in the selected remedy.

The changes discussed above were fully evaluated as other remedial options considered in the OU2 FS and the original and supplemental proposed plan. EPA's selected remedy is a modification of Alternative S-2, which addressed landfilling of dioxin-contaminated media. The difference between the selected remedy and alternative S-2 is that EPA is requiring a more conservative dioxin action level to trigger excavation and landfilling (<u>i.e.</u>, 5 ppb rather than 50 ppb). In addition, the remedy selected in this ROD differs from EPA's preferred alternative selected in the March 1996 Supplemental Proposed Plan in that there no longer is a soils capping component to the remedy. This is in response to comments received during the public comment period. The remedy selected herein also allows the landfill height to be maintained at less than 25 feet, which likewise constitutes an accommodation to public preferences.

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ATTACHMENT A

FOREWORD

The comments received in response to EPA's initial May 1995 Proposed Plan for OU2 are addressed in the following document titled "Original Responsiveness Summary." EPA's initial proposal for remediation of soils called for the off-site incineration of dioxin contaminated hot spots and on-site landfilling of dioxin contaminated soils that exceeded a site-specific commercial/industrial exposure level. Under this scenario approximately two-thirds of the site would have potentially been available for future commercial reuse.

Following the release of the initial Proposed Plan in May 1995, EPA issued a series of administrative reforms for the Superfund Program. One purpose of the reforms was to control remedy costs and to promote cost effectiveness, and the reforms directed EPA to base site cleanup decisions on practical future land usage and reasonable contaminant exposure scenarios. As a result of those reform measures, Region 6 reconsidered and revised its Proposed Plan.

At an open house on March 5, 1996, EPA presented a Supplemental Proposed Plan for OU2 and the "Original Responsiveness Summary." The Supplemental Proposed Plan for OU2 eliminated the off-site incineration component of the original May 1995 Proposed Plan, included capping in-place soils having dioxin contamination between 5 to 50 ppb, and proposed on-site landfilling of soil contaminated with dioxin in excess of 50 ppb. Under this scenario none of the southern portion of the site would have been available for future development. The community strongly objected to the Supplemental Proposed Plan.

As a result of revisions to the initial Proposed Plan, some of the following responses take into account EPA's preferred alternative at that time. Therefore, some of the responses will indicate that capping dioxin contaminated soils in-place is appropriate. These comments reflect the EPA thinking at that time and are included as part of the administrative record. **Nonetheless, the remedy presented in this Record of Decision for the soils media is excavation of 5 ppb and above dioxin contaminated soils and on-site disposal in a RCRA Subtitle C Landfill, not capping.**

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ORIGINAL RESPONSIVENESS SUMMARY

This "Original Responsiveness Summary" has been prepared to provide written responses to comments received at the public meeting and during the public comment period for the Proposed Plan of Action for Operable Unit 2 media at the Vertac Superfund Site.

An informal open house was held in Jacksonville on May 25, 1995, to discuss EPA's proposed plan of action for remediating the contaminated soils at the Vertac site. A public meeting was held at the Jacksonville Civic Center on June 15, 1995 to further discuss the EPA's cleanup proposal and to formally accept comments on the plan. The transcript of this meeting is included in the Administrative Record. The comment period ran from May 26, 1995 to August 11, 1995.

Written comments on the proposed plan were submitted by the Arkansas Department of Pollution Control and Ecology (ADPC&E), Hercules, Incorporated, State Senator Bill Gwatney, the Concerned Citizens Coalition, the Environmental Compliance Coalition, the Jacksonville Chamber of Commerce, the Jacksonville Commerce Corporation, City of Jacksonville Office of Economic Development, the Jacksonville Serotoma Club, the Jacksonville Lions Club, the Arkansas Peace Center, Vietnam Veterans of America, the Environmental Health Association of Arkansas, Jacksonville Mothers and Children's Defense Fund, and numerous concerned citizens. ADPC&E also submitted additional comments on the draft ROD which can be found in Appendix C.

As will be explained in greater detail within the Supplemental Proposed Plan, which modifies the Proposed Plan upon which the comments below were submitted, since the May 26, 1995, issuance to the public of the initial Proposed Plan for OU 2, the EPA announced a series of administrative reforms to the Superfund Program on October 3, 1995, to be effective immediately. The October 3, 1995, administrative reforms that EPA followed in reevaluating the preferred remedy it had proposed for OU 2 were those intended to control remedy costs and to promote the cost-effectiveness of remedies for Superfund sites, and that directed EPA to base remedy decisions on practical future land usage and exposure pathways scenarios for a given Superfund site. In addition, EPA's reevaluation of the preferred remedy for OU 2 of the Vertac Site has been thoroughly reviewed and approved by EPA Headquarters Dioxin Review Board to ensure its consistency with EPA's decisions concerning dioxin-contaminated soils at industrial sites elsewhere in the county. Finally, EPA has requested that the Agency for Toxic Substances Disease Registry (ATSDR) with its revised approach for OU2, and ATSDR has informed EPA that this approach is protective of the human health and the environment.

Due to EPA's revision of its initial Proposed Plan for OU 2, the responses to some of the comments will take into account EPA's revised approach for the remediation of OU 2.

Arkansas Department of Pollution Control and Ecology Comments

1. **Comment:** For years an earthen central ditch had been the pathway for transportation/migration of off-specification materials. During 1984-1985 Vertac lined the bottom of the central ditch with concrete. In 1986 Vertac gunnited the slopes of the ditch.

The survey measurements and the persistent seepage of groundwater into the central ditch indicates that the base of the central ditch is below the adjacent ground water level. Thus, contaminated soil/sludge beneath the lined concrete is a major and continuous source of ground water contamination.

Any remedial action which leaves the highly contaminated soil/sludge beneath the lined concrete at the central ditch does not provide adequate protection of the environment. ADPC&E recommends inclusion of the soil/sludge beneath the central ditch as part of the soil remedy.

Response: EPA acknowledges that the central ditch at the Vertac site was used an unlined disposal conduit for many years. However, information presented during the remedial investigation at the site indicates that bedrock is very near the surface in this location and as such very little soil is thought to be present in that area. Contaminants in this area would most likely be present in fractures in the bedrock itself.

Under EPA's selected remedy for the Vertac site, the southern 100 acres (i.e., the area that contains the central ditch) will be fenced and access will be restricted to future site workers. Soils within the restricted area that have dioxin concentrations greater than 5 ppb and less than 50 ppb will be covered with 1 foot of clean soil to prevent direct exposure by site workers. Deed notices and appropriate restrictions will also be placed on this portion of the site to prevent unauthorized excavation into the soil cap.

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Ground water contamination at the site is being addressed by EPA in a separate Record of Decision.

2. **Comment:** Soils beneath some of the tank foundations are heavily contaminated. ADPC&E does not believe sealing foundations where persistent staining exists is a proper method of treatment. The contaminated soils beneath tank foundations, especially foundations that consist of pedestals, should be remediated.

Response: EPA agrees that soils below many of the old process tank foundations may be heavily contaminated. However, because EPA has determined that the southern 100 acres of site has little potential for commercial redevelopment, access to this area will be restricted for the foreseeable future. As such, site workers will be performing their daily activities (mainly ground water monitoring and treatment and site maintenance activities) under an authorized health and safety plan that will ensure their protection. Because building foundations, curbed areas, and other paved surfaces will remain in place, there is little potential for direct exposure to contaminants below these structures. Surface contamination on foundations will be removed through scarification and hydroblasting, and any areas that have persistent staining will be sealed.

3. **Comment:** EPA has indicated its desire to remediate the eastern half of the central process area for future commercial/industrial usage. However, under EPA's preferred remedy the foundations would be left intact. Beneath some of those foundations there could exist highly contaminated soil. So, if and when industrialization of this section of the site becomes a reality, construction activities could bring contaminated soil to the surface. Even with a comprehensive deed restriction, it would be difficult to monitor the integrity of every foundation. Therefore, the above concern should be addressed at this time.

Response: EPA now has determined that access for most of the southern 100 acres of the site will remained restricted. However, a 150 foot wide buffer zone along Marshall Road will be cleaned to commercial/industrial levels and as such could be developed for commercial/industrial purposes.

There are no building foundations within the buffer zone along Marshall Road that will require remediation. See Figure 13 in the ROD.

4. **Comment:** Since EPA's preferred remedy is not specifically listed in the feasibility study (FS), please explain the nature of remedial activities once excavation of the contaminated soil is completed (i.e., backfilling, grading, placement of topsoil, vegetative cover, etc.).

Response: EPA's selected remedy for site soils is Alternative S-2 in the FS with designated changes in action levels. Soils with dioxin concentrations exceeding the action level of 5 ppb, but less than 50 ppb will be capped in place. Capping will involve covering the contaminated surface soil with a 6 inch layer of compacted soil, topped by a 6 inch layer of topsoil, and revegetating the cap. Excavated areas would be backfilled and compacted with clean soil, including 6 inches of topsoil (to return areas to pre-excavation grade), and revegetated. Some surface drainage modifications may be used to control runon and runoff, thereby minimizing the potential for the deterioration of the soil cap.

Concerned Citizens Coalition Comments

The Concerned Citizens Coalition is the group of Jacksonville citizens that has undertaken the responsibility of administrating the Technical Assistance Grant (TAG) for the Vertac, Jacksonville, and Rogers Road landfill Superfund sites. As part of that responsibility, the group felt compelled to carefully evaluate the FS and EPA's Proposed Plan of action for the Vertac soil remediation, and as such, has developed several specific recommendations to EPA's proposal, which they designate as the "Jacksonville Plan." EPA received numerous letters in support of the "Jacksonville Plan," some of those included letters from such parties as the State Senator, the Jacksonville Chamber of Commerce, and the Jacksonville Serotoma Club.

The Major elements of the "Jacksonville Plan" are as follows:

5. **Comment:** The on-site landfill should be constructed on the extreme northwest section of the site. The base dimensions shall not exceed 500 feet by 500 feet, and the vertical height shall not exceed 25 feet. In order to maintain the proposed landfill

dimensions, the following should be considered: 1) Ship wood debris from the demolition activities, salt and ash, bagged soils from off-site residential areas, and other off-site soils to an off-site permitted facility for treatment and disposal; 2) decontaminate and recycle all steel from non-product piping and vessels structural steel (I-beams), steel doors, sheet metal, etc.; 3) place product piping and vessels into the landfill, and; 4) place concrete, asphalt, bricks, and cinder blocks into the landfill (crush prior to placement to minimize long axis to 18 inches).

Response: Based on the current estimated volume of material to be placed into the on-site landfill, the dimensions should be very close to those presented by the Concerned Citizens Coalition. However, the exact dimensions will be established when the design is finalized over the next few months. The ROD for Operable Unit 1 (the old process plant) called for recycling of non-contaminated or lightly contaminated material when possible. Recycling, however, is not desirable when more waste is generated during decontamination activities than is generated from efficient disposal practices. Specific details on recycling of materials will be developed during the remedial design.

Compaction of demolition debris, concrete, metal, wood, etc, will be an integral component of the landfill construction. Void spaces within the landfill will be minimized to ensure the integrity of the structure.

Wood debris, bagged soils and other off-site soils must be remediated as specified in EPA Records of Decision for the site. These materials have been designated to be placed into the on-site landfill. At present, no decision has been made regarding the disposal of the incinerator salt and ash. EPA is concurrently issuing for comment an Engineering Evaluation Cost Analysis (EE/CA) that outlines EPA's disposal preference for these materials. That preference involves the on-site in the RCRA Subtitle C landfill of the incinerator ash, salts, and pallets on which the drummed ash and salts had been stored.

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6. **Comment:** The landfill leachate handling system should be protective of ground water and surface water and consist of a temporary holding tank coupled to a pump station with a direct pipeline to the on-site water treatment system.

Response: The final design for the on-site RCRA Subtitle C landfill has not been completed at this time. However, because most of the material that will be placed into the on-site landfill will be construction debris and soil, very little leachate is expected to be generated or collected from the disposal unit. Any leachate collected from the landfill would be processed through the existing on-site ground water treatment system.

7. **Comment:** Roads to the new landfill should be constructed of concrete or asphalt to minimize dust and sediment migration.

Response: EPA agrees that dust suppression will be an important aspect of soils remediation at the site. The specific engineering controls that will be used during soils remediation will be developed during the remedial design phase of the cleanup. It is likely that hard surface roads will be used to allow access to the landfill during varied weather conditions.

8. **Comment:** A large drainage swale or french drain should be placed inside the fenced site area to control surface water runoff.

Response: Surface runoff from the southern portion of the site is currently directed through the existing sump/water treatment system at the site, i.e., the "first flush," or surface water that passes over the site (which is typically the most contaminated) is collected in the on-site sump system and is processed through the on-site carbon treatment system prior to discharge. Additional drainage controls will be implemented as part of the OU2 ROD that will minimize surface water runon and runoff from areas that have been capped.

9. **Comment:** Establish a 75 foot unobstructed buffer zone outside the fenced portion of the site. Outside the buffer zone establish a 75 foot wide vegetative barrier that will serve to obscure the site from the community.

Response: The selected remedy will require that a 150 foot buffer zone be established for the southern portion of the site along Marshall Road. A visual barrier will also be established so as to obscure as effectively as possible the site from the surrounding community to the east and south.

10. **Comment:** The site fence line for the southern portion of the site should be approximately 225 feet east of Rocky Branch Creek, extending in a north-northeast direction to the juncture of the two existing site fences running east-west.

Response: EPA now believes that the future landuse scenario for the southern 100 acres of the site should involve long-term restricted access, rather than extensive potential future commercial/industrial redevelopment.

In the proposed plan, EPA had origionally envisioned that approximately 50 percent of the southern 100 acres of the site would eventually be returned to commercial/industrial use. However, after re-evaluating the long-term operational and maintenance requirements for this area of the site (i.e., maintaining the caps on the existing site burial areas, the RCRA Subtitle-C landfill, and operation and maintenance of the ground water treatment system), EPA believes that these operations will substantially reduce the chance for extensive future redevelopment opportunities on the southern 100 acres. Thus, the site fence along the eastern border of the site will be located approximately 150 feet west or Marshall Road generally running in a north-south direction.

11. **Comment:** All buildings and structures, including concrete and asphalt pavements, within the existing Hercules security area should be demolished and disposed of properly.

Response: The ROD for Operable Unit 1 requires that all above ground structures at the southern portion of the site, including buildings and plant equipment, be demolished as a part of site remediation. In addition, most of the above ground structures in the northern portion of the site will also be removed except for the old munitions bunkers, which were never a part of herbicide operations at the site, and possibly the EPA-constructed pole barns. Some interest has been expressed that these structures may be useful for future commercial operations. EPA will ensure that these structures were decontaminated and clean if left in place.

Because access to the southern portion of the site will remain restricted, building foundations, curbed areas, and roads will remain in place after cleaning.

12. **Comment:** Hercules should construct permanent office and equipment storage facilities, not temporary structures.

Response: Construction details involving office space, site maintenance facilities, and the waste water treatment plant will be addressed during the remedial design phase of the cleanup. These issues are generally not specified in a ROD.

13. **Comment:** Hercules should clean all soils to an acceptable action level of 5 ppb within the security perimeter. All areas outside the security perimeter shall be cleaned to 1 ppb 2,3,7,8-TCDD toxic equivalent quotients (TEQs).

Response: Since the May 26, 1995, issuance to the public of the initial Proposed Plan for OU 2, the EPA announced a series of administrative reforms to the Superfund Program on October 3, 1995, to be effective immediately. The October 3, 1995, administrative reforms that EPA followed in reevaluating the preferred remedy it had proposed for OU 2 were those intended to control remedy costs and to promote the cost-effectiveness of remedies for Superfund sites, and that directed EPA to base remedy decisions on practical future land usage and exposure pathways scenarios for a given Superfund site. In addition, EPA's reevaluation of the preferred remedy for OU 2 of the Vertac Site has been thoroughly reviewed and approved by EPA Headquarters Dioxin Review Board to ensure its consistency with EPA's decisions concerning dioxin-contaminated soils at industrial sites elsewhere in the county. Finally, EPA has requested that the Agency for Toxic Substances Disease Registry (ATSDR) with its revised approach for OU2, and ATSDR has informed EPA that this approach is protective of the human health and the environment.

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Therefore, EPA has concluded that capping in place soils with dioxin concentrations exceeding the action level of 5 ppb, but less than 50 ppb, will be protective of human health and the environment and cost effective. Capping will involve covering the contaminated surface soil with a 6 inch layer of compacted soil, topped by a 6 inch layer of topsoil, and revegetating the cap. Excavated areas would be backfilled and compacted with clean soil, including 6 inches of topsoil (to return areas to pre-excavation grade), and revegetated. Some surface drainage modifications may be used to control runon and runoff, thereby minimizing the potential for the deterioration of the soil cap. Soils with dioxin concentrations in excess of 50 ppb will be excavated and consolidated within the on-site RCRA Subtitle C landfill.

14. **Comment:** All areas east of the Hercules security perimeter shall be reclaimed to original grade with a slope not to exceed 2 feet per 100 feet.

Response: Details involving the extent and location of excavation, capping, and grading will be developed during the remedial design phase of the cleanup.

15. **Comment:** No contaminated soils shall be used as filler for restoring excavated areas to grade.

Response: EPA agrees. Only clean soil will be used for backfilling purposes.

Citizens' Comments

The citizens of Jacksonville showed a decided interest in EPAs proposal to remediate soils at the Vertac site. Over 300 citizens responded either individually or by signing various petitions stating their cleanup preferences for the site. Similar questions have been grouped together in order to more fully respond to all the issues raised by the Jacksonville community.

16. **Comment:** Locate the landfill to the NW adjacent to or on the other side of the present landfills.

Response: Over the past several months EPA has been working with ADPC&E and Hercules to develop an alternate location for the on-site RCRA Subtitle C landfill. In order to be responsive to the community interest on this issue, the proposed location for the new landfill will be on the west side of Rocky

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Branch Creek, roughly at the midpoint from north to south. EPA, however, is still working out a potential conflict situation with the U.S. Air Force that is currently planning on upgrading their sanitary sewer line which crosses the Vertac property near the proposed landfill location. Currently, it appears that the two projects can proceed as planned if closely coordinated.

17. Comment: Reduce the height of the landfill, transport the maximum amount of waste from the site, and landfill only what cannot be transported. The maximum height of the landfill should not exceed 25 feet.

Response: There are two primary alternatives that can be implemented in order to reduce the height of the RCRA Subtitle C landfill that will be constructed at the site: 1) Make the footprint of the landfill larger, thereby lowering the height of the structure, or; 2), put less material into the landfill. Because of the overwhelming response by the community to locate the landfill at the back portion of the site, the ability to increase the size of the landfill footprint is limited. So, to minimize the height of the landfill, EPA agrees that less material should be placed into the unit. However, off-site transportation and treatment of soils from the Vertac site is a cost prohibitive operation. Estimates from the OU2 FS show the cost to excavate site soils and transport them to an off-site incineration facility to be approximately $6,000 per ton. Off-site treatment of dioxin-contaminated soils above the 50 ppb action level would exceed $25,000,000. EPA will now require that most of the contaminated soils at the southern portion of the site to be capped in place. Access in this area will be restricted to on-site maintenance workers, and by capping all dioxin-contaminated soils below 50 ppb, workers will not be required to wear protective clothing to conduct their daily site maintenance activities. EPA will, however, require the most contaminated areas of the site to be excavated and landfilled. This is a change from landfilling approximately 17,000 cubic yards to about 4,200 cubic yards. Capping is a cost effective means of minimizing any potential threat to human health or the environment, while reducing the size of the on-site landfill. EPA normally does not include actual specifications for remedial alternatives in a ROD. Those issues will be addressed during remedial design.

18. **Comment:** Restore the original buffer zone between the residences and the plant site, move the fence and gates to the original location, clean the soil on the south and east side to 1 ppb.

Response: It will be impossible to move the fence location at the southern side of the site to its original location, because of the existence of the French drain leachate collection system which is a part of the long term remediation effort of the site. The French drain was installed in 1986, under a court-ordered remedy, to intercept ground water contamination that could potentially pass beyond the site boundary. Pursuant to the 1986 Court-orderd remedy, Hercules is required to maintain the French drain system for a minimum of 20 additional years. Under this remedy EPA will require trees to be planted along the perimeter of the site where access will be restricted so as to provide a visual buffer to residents that live along the southern and eastern margins of the site. In addition, EPA will require that the southern gate be closed and new fencing be installed that will prevent future access to site from that area.

In response to the requested 1 ppb action level, as discussed in Response Number 15, EPA has established a 1 ppb action level for dioxin for all areas of the Vertac site that will be outside of the restricted access portion of the site. This will include a strip along Marshall Road and the northern 100 acres of the site which is slated to be returned to a commercial/industrial development. The area of the site along the southern fence is currently at or below the 1 ppb action level for dioxins. All areas within the restricted access southern portion of the site will be cleaned to a 5 ppb dioxin action level.

19. **Comment:** The heart of the plant site should be cleaned so that all grids with more than 5 ppb dioxin will be excavated and cleaned.

Response: See response to Comments 15, 18 and 19.

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20. **Comment:** Place warning signs at inside perimeter of buffer zone.

Response: Appropriate signage will be required as part of this remedy. Areas of the site that will have restricted access will be so designated.

21. **Comment:** Dress up green area and maintain in a well-groomed condition.

Response: Hercules will be required to maintain all restricted access portions of the site. This will include such activities as landscaping and mowing so as not to present a public nuisance.

The following nine comments are of a similar theme and are listed separately but responded to as a whole.

22. **Comment:** I want to see you give us a generous buffer zone between the homes and the plant site. I would ultimately like to see the whole thing taken away and a park put on it.

23. **Comment:** Move it and move it all. This is a horrible situation for Jacksonville and unsafe. This should be EPA's job to see that this is all cleaned up. Please don't leave us with this mess and the problems that go with it.

24. **Comment:** I would like to express my hope that the Vertac site be returned to its original use as an industrial site. The end use of this property, including along Marshall Road is of the utmost importance to Jacksonville. I support an effective, expeditious cleanup, such as recommended by EPA.

25. **Comment:** I feel that the site should be cleaned up totally so that it would be safe for children to be on the grounds.

26. **Comment:** Return the site to the very best condition possible.

27. **Comment:** Clean the northern portion of the site to commercial standards or for use as a city park. The southern portion of the site should be cleaned to industrial standards.

28. **Comment:** All necessary action should be taken to ensure that the Vertac site is cleaned up to the point

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that the site can be used for commercial development, city park, or residential development.

29. **Comment:** We have lived under the stigma of Vertac for so long that regardless of how long it takes, we want the site cleaned up totally. This location should be suitable for a park for children when cleanup is completed.

30. **Comment:** We encourage the restoration of the site to its original condition prior to development by Hercules Chemical Company and its predecessors. That would include: A) Removal of all structures; B) removal of all buried wastes; C) removal of all contaminated soils, and D); restoration of ground water to background standards. We would like to see in the future a site that could be used for any activity including development and use as parks, residences, commercial establishments or industrial facilities.

Response: EPA agrees that cleanup of the Vertac site is necessary. Under the proposed remedy for the Vertac site soils, approximately 50 percent of the property will be available for commercial/industrial redevelopment. This is due to the facts that the southern portion of the site currently contains landfills and will contain the RCRA Subtitle C landfill, which will be constructed to contain site equipment, debris and soils. In addition, that portion of the site contains ground water monitoring and treatment facilities, which will remain in place due to the necessity for conducting long term ground water remediation and monitoring. Therefore, most of the southern portion of the site will remain under restricted access. However, a north-south strip of land along Marshall Road (approximately 150 feet wide) will be cleaned so as to allow for commercial development in that area.

As previously stated in response to Comment 11, a buffer zone will be in place for the southern and eastern portions of the site. These areas are or will be cleaned up to 1 ppb for dioxin, and visual vegetative barriers will be installed. Because of the extensive contamination present at the old process plant area of the site, cleanup to a level that would permit the development of a park would be cost- prohibitive. EPA, when developing

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appropriate remedies for a site, must also consider the past use of that property. The Vertac property has been in commercial use for over 60 years, and as such, EPA's remedy for the site must be consistent with its past use. Finally, EPA's mandate under the Superfund law is to provide long term solutions to hazardous substance contamination problems by abating conditions that pose imminent and substantial endangerments to the human health and the environment. However, under the Superfund law, EPA is prohibited from substantially improving a property beyond its pre-contamination condition. Because the proposed remedy for OU 2 will be protective of the human health and environment and will allow a substantial portion of the site to return to industrial usage, EPA will meet its mandate while not improving the property beyond its existing industrial usage, which would be the case were it to accomplish a cleanup goal that would permit residential uses of the property.

31. **Comment:** I believe it is in the best long term interest of the EPA, the City of Jacksonville, and the State of Arkansas to not bury any more wastes at the site. There are sufficient off-site landfills available able to receive these wastes.

Response: One of the issues that EPA had to consider when evaluating disposal options for dioxin contaminated soils at Vertac was the "dioxin rule" which states that if dioxin wastes are taken off-site then they must be treated via the Best Demonstrated Available Technology (BDAT) prior to disposal. BDAT requires that a treated F-02X waste (dioxin-containing waste) be reduced to less than 1 ppb TCDD as determined by the toxicity characteristic leaching procedure (TCLP) found at 40 CFR Part 261, Appendix II, prior to land disposal in a RCRA permitted landfill. Therefore, any soil that is transported off-site would first have to be incinerated (at a cost of approximately $4,000 per ton) and then the residuals would have to be land disposed in a RCRA Subtitle C landfill per RCRA regulations. Thus, the cost for off-site disposal of dioxin wastes is extremely high. On the other hand, on-site disposal of dioxin-contaminated soils may be land disposed in a RCRA Subtitle C landfill without triggering the 1 ppb land ban requirement if done within a contiguous "area of contamination" (AOC). According to EPA guidance (OSWER Directive 9347.3 05FS), "for the land disposal restrictions (LDRs) to be applicable to a CERCLA response, the act must first constitute placement of a restricted hazardous waste." Therefore, it must first be determined whether consolidation activities considered or contemplated at the site constitute placement, and if a RCRA hazardous waste is involved. To assist in defining when placement does and does not occur for CERCLA actions involving on-site disposal of wastes, EPA uses the concept of areas of contamination (AOCs) which are equivalent to RCRA units, for the purpose determining the applicability of RCRA's land disposal restrictions found at 40 CFR Part 268. An AOC is delineated by the areal extent of contiguous contamination. Placement does not occur when wastes are left in place, or moved within an AOC. Specifically, "placement does not occur when the wastes are consolidated within the AOC." See preamble to the National Contingency Plan (NCP), 55 Federal Register 8759 - 8760, March 8, 1990.

In addition, minimum technology requirements are also not required within the AOC but may be relevant and appropriate requirements for such a CERCLA action. If materials are treated on-site within the AOC and then redeposited within the AOC such as within a landfill, then placement has occurred and land disposal restrictions would apply. However, as noted above, because the proposed on-site landfilling of dioxin-contaminated soil and debris will occur entirely within the Vertac AOC, but without prior treatment, placement will not occur for purposes of applicability of the RCRA land disposal restrictions.

32. **Comment:** It is in the best long term interest to exhume the existing wastes. I realize there are existing court decisions and RODs that must be overcome in order for this to occur. I believe that it can be done, and shorten the overall site cleanup, including that for groundwater.

Response: In 1984 EPA challenged the court-ordered plan for disposal of waste materials in the on-site burial areas at Vertac with no success. See Order of the U.S. District Court for the Eastern District of Arkansas, Western Division, in U.S. v. Vertac Chemical Corporation and Hercules, Inc., No. LR-C-

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80-109, July 18, 1984. Because that Order is now unappealable, EPA will continue to evaluate the effectiveness of the Court-ordered remedy, and will respond as appropriate.

33. **Comment:** I believe the dioxin cleanup standard should be 1-10 ppb. I do not object to the on-site treatment via incineration or tilling of soil for exposure to sunlight.

Response: EPA has established that 5 ppb dioxin cleanup standard is appropriate for a commercial/industrial future use exposure scenario for the Vertac site. EPA no longer favors additional treatment of dioxin-contaminated soils at the Vertac site for the following reasons: When looking at the Vertac site and each of the six operable units as a whole, it can be seen that a substantial amount of treatment, both on-site and off-site, have been employed to address principal threats at the site. Examples of on-site treatment include the incineration of approximately 29,000 drums (10,000 tons) of dioxin-containing organic liquids. The dioxin concentration in these drums was one to several orders of magnitude greater than that generally found in the Vertac site soils. In addition, the contents of the abandoned tanks at the site, oily leachate from the french drain system, and contaminated carbon from ground water treatment operation will also be treated by incineration at an off-site facility and will exceed approximately 5,000 additional tons of material. As such, a significant amount of the dioxin at the site has or will be treated during site remediation efforts.

34. **Comment:** I object to siting the landfill on clean soil near the railroad. I believe that this area should be kept clean for future development.

Response: EPA received overwhelming response from Jacksonville citizens that if an above ground on-site landfill was necessary at the Vertac site, that it be placed as far back on the Vertac property as possible and that its height be restricted to 25 feet or less if possible. The current proposed location for the on-site landfill is responsive to those concerns. As far as future development in the proposed landfill area, it is true that this area is clean. However, because of

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the location of Rocky Branch Creek to the east and the railroad to the west, access to this area is extremely limited.

35. **Comment:** EPA's proposals do not take into account exposure of children, who are at higher risk and when factored in make risks unacceptable.

Response: The future land use for the Vertac site was assumed to be a commercial/industrial scenario, and is based on the most probable use of the land and current land use zoning requirements. For a commercial/industrial type scenario exposure to adults is evaluated rather than to children.

36. **Comment:** Alternative disposal methods should be employed, not incineration, either off-site or on-site.

Response: In the proposed remedy for Vertac soils, off-site incineration is no longer a component of the cleanup. Instead, EPA has proposed employing on-site landfilling and on-site capping as alternative disposal methods.

37. **Comment:** Health monitoring, health surveys and a disease and hazardous waste exposure registry should be a priority for the Vertac site.

Response: A health and exposure study was initiated by the Arkansas Department of Public Health (ADPH) in conjunction with the Agency for Toxic Substances Disease Registry (ATSDR) and the Centers for Disease Control (CDC) over four years ago, and is ongoing. Preliminary results of these studies have been presented to the public during a number of public meetings over the past several years. The commenter is referred to the Arkansas Department of Public Health for information concerning the results from those studies.

38. **Comment:** Opening up any part of the site that does not have less than 1 ppb TEQs is irresponsible and contrary to EPA's mandate to safeguard health and safety.

Response: Under the proposed remedy for on-site soils, all portions of the site that will be available for commercial/industrial development will be remediated to an action level of 1 ppb for dioxin. Areas that will remain fenced where access will be restricted to on-site workers will be remediated to 5 ppb for dioxin.

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39. **Comment:** Landfilling is at best a temporary solution. The existing landfills have breached the French drain and there is some evidence that the ground water at the site is contaminated.

Response: EPA currently has no data from Vertac ground water monitoring program that would suggest that the French drain leachate collection system is not functioning as designed. EPA does, however, acknowledge that the ground water under the Vertac site is heavily contaminated with site compounds. The results of the ground water investigation at Vertac can be found in the OU2 Phase 1 and Phase 2 Remedial Investigation Reports. Ground water remediation will be addressed as part of the Record of Decision for Operable Unit 3. EPA expects to release a Proposed Plan to discuss potential ground water remediation options within the next several months.

40. **Comment:** Construction of a landfill will allow more airborne particulates and fugitive emissions.

Response: The construction of the on-site landfill is required as a part of the Record of Decision for Operable Unit 1, where all building debris and equipment from the demolition of the plant will be disposed in the on-site landfill. Appropriate dust suppression measures will be employed and monitoring will be conducted to ensure the safety of workers and residents living near the site. As a part of the proposed remedy for Operable Unit 2 (Soils), EPA is now requiring a much reduced volume of soil to be placed into the on-site landfill which should substantially reduce any issues concerning fugitive emissions from soil excavation operations.

41. **Comment:** Establish a laboratory, testing and research facility on the Vertac site for the future evaluation of non-thermal dioxin destruction technologies.

Response: Many lawsuits have been filed over the past several years concerning the potential for emissions from on-site remedial operations to impact the local community. EPA is curious why the commenter would be interested in EPA setting up an experimental testing facility to work on dioxins near a residential community. Little is known about the potential emissions from many of

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the new and untested technologies. Such a testing facility would most likely have to be in place for many years to determine the effectiveness of new treatment technologies. EPA does not favor such a proposition for this site.

Arkansas Peace Center, Vietnam Veterans of America, Environmental Health Association of Arkansas, Jacksonville Mothers and Children's Defense Fund, and the Environmental Compliance Organization Comments

42. **Comment:** The failure to characterize all dioxin and furan congeners, and to include analyses-supported toxic equivalency quotients (TEQs) into the generation of remedial goals (RGs) is seriously problematic, as is the failure of the risk assessment to provide calculations for all possible exposure scenarios. Therefore, selection of remedial alternatives should be deferred until adequate analytical data in regard to dioxins and furans are available.

Response: EPA agrees that it is important to evaluate all dioxin and furan congeners when addressing the risk from exposure to site soils. Because these data were not available for most of the sampling that was conducted for the site during the remedial investigation, EPA is requiring that all soil remediation be conducted with respect to dioxin and furans as 2,3,7,8-TCDD toxicity equivalents (TEQs). That is to say, for each soil grid remediated at the site, the average dioxin/furan concentration shall not exceed the action level as for TCDD and TCDFs as TEQs.

43. **Comment:** There is a concern regarding the absence in all data obtained for review of an attempt to calculate soil remedial goals that would be protective of the extremely aggressive ground water Maximum Contaminant Limit (MCLs) of 30 parts per trillion (TEQ) for dioxin established by EPA and the even lower TEQ thought to be protective of surface water.

Response: Remediation of ground water at the Vertac site will be addressed as part of the Operable Unit 3 ROD. In general, the ground water situation at the Vertac site is extremely complex, due to the presence of dense nonaqueous phase liquids (DNAPLs) and questions as to how they move within a tilted, fractured bedrock environment. These dense phase liquids typically migrate down along dipping rock strata and are trapped in fractures where current remediation technologies have a very limited potential of capturing them. As such, these DNAPLs will provide a long term source for dissolved phase contamination at the site. A ground water technical impracticability waiver will most likely be sought for the central process plant portion of the site, and thus attainment of MCLs will not be required. One positive point is that ground water (even though highly contaminated) does not move quickly under the Vertac site. With over 40 years of on-site operations, current data suggest that the ground water plume has not migrated beyond the boundaries of the site. Various forms of ground water containment will be necessary, however, to ensure that migration of site contaminants is controlled over the long term.

44. Comment: There are concerns that the favored plan of action to include off-site disposal and on-site landfilling appears to be less than fully protective of human health and the environment, as required by the National Contingency Plan (NCP), and does not provide mandated treatment to reduce the toxicity, mobility, and/or volume of the waste.

Response: EPA disagrees. Soils within the restricted access portion of the site that are highly contaminated will be excavated and consolidated into an on-site RCRA Subtitle C landfill. Soils that contain lower levels of contaminants will be capped in place. Both excavation and consolidation into a RCRA landfill, and capping in place, will substantially reduce the mobility of site contaminants and will prevent direct exposure through dermal contact, inhalation or ingestion by future site workers maintaining the restricted access area. Therefore, the proposed remedy is fully protective of human health and environment.

When evaluating the Vertac site and each of the six operable units, it can be seen that a substantial amount of treatment, both on-site and off-site, have been employed to address principal threats at the site (i.e., the most toxic and mobile materials). Over 15,000 tons of dioxin-containing organic liquids and sludges have been

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treated through both on-site and off-site incineration.

45. Comment: We find no discussion of the RCRA land ban restrictions on the type of waste contemplated for land disposal in this instance as Applicable, Relevant and Appropriate Requirements (ARARs).

Response: Page 44 of the Proposed Plan for OU2, and page 12 of the OU2 Fact Sheet both discuss compliance with ARARs and specifically address land ban issues.

A complete discussion of potential ARARs for each disposal option is presented in Sections 2.2, 2.3 and 2.4 of the OU2 feasibility study. Pages 2-12 through 2-16 deal with RCRA disposal and specifically with TSD facility requirements, land ban, and consolidation issues. See also response to Comment 32.

46. Comment: There is concern that there has been limited chemical and physical characterization of the condition of the existing disposal areas on the site. We can find no documentation of a comprehensive ground water monitoring plan, no effort to delineate the wetlands that appear to encroach the northwest disposal area..., no discussion or investigation into the status of closed disposal areas which do not appear to sustain grass or other vegetative cover.

Response: The north burial area, the south burial area, the Reasor Hill burial area, above ground vault (Mt. Vertac), and the cooling water pond were all remediated between 1984 and 1986 as part of a Court-ordered remedy. The remedy generally involved closing the Vertac plant cooling water pond and the equalization basin and consolidation of the sediments from these units into an excavated area where earlier operators had buried drums of waste. The burial areas were capped and a French drain and leachate collection system was installed around them. Ground water monitoring wells were also installed and a ground water monitoring program was initiated.

EPA generally disapproved of the remedial approach, but its legal objections were overturned. As such, these remedies are considered to be final, and further action by EPA on this areas is limited unless documentation of

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remedy failure is found. See also response to Comment 33.

47. Comment: Page 3, Paragraph 4 of the Proposed Plan states that soil concentration levels are based on what "will be protective for persons reasonably expected to be in contact with these soils." This statement fails to note that EPA health-based cleanup standards are to be conservative, not reasonably protective. Additionally, this rationale fails to embrace the twin mandate of CERCLA to protect both human health and the environment... No demonstration has been presented that the proposed soils remediation goals will provide adequate protection of ground water resources and aquatic environments. The concluding sentence of this paragraph notes primarily that the preferred alternative is cost effective. However, under existing EPA guidance cost is not to be considered in preference to technical considerations, except where the difference in cost between to alternatives represents a magnitude of order discrepancy.

Response: EPA believes that a remediation goal for dioxin of 5 ppb TEQ is protective of human health and the environment assuming a commercial/industrial exposure scenario. See EPA's risk assessment dated April 11, 1995, which is part of this Administrative Record. This action level is being applied to that portion of the site (southern 100 acres) where access will remain restricted to future site workers and is considered to be conservative for that exposure scenario. A 1 ppb dioxin action level will be required for all other area of the site that will have unrestricted commercial access. While ground water issues are not being addressed in this ROD, they will, however, be addressed in the ROD for Operable Unit 3. See also response to Comment 44.

48. Comment: There exists a potential conflict of interest involved with allowing a responsible party to perform a risk assessment that will subsequently determine remedial goals, given the negative economic implications of more extensive, and more protective, remedial work.

Response: EPA allowed Hercules to conduct the baseline risk assessment and Monte Carlo risk modelling for the Vertac site. After review of these documents and many discussions with Hercules and its contractors on various assumptions used in the risk assessments, EPA decided to conduct its own risk assessment. Remediation goals for Vertac were established from the EPA site-specific risk assessment for Vertac, and not on Hercules' product.

49. Comment: EPA's justification for choosing 261 ppb and below as the cutoff for off-site remediation appears to be cost efficiency. We do not believe that cost is a proper, or controlling, factor in determining remedial goals which are per statute intended to be health-based.

Response: The 261 ppb cleanup number presented in the Proposed Plan for OU2 media should not be confused with a remedial action goal for the site. It is simply a number where EPA made a determination of cost effectiveness for applying two different treatment technologies. The health-based remedial action goal for site soils was set a 5 ppb TEQ for dioxin.

50. Comment: Page 6, Paragraph 2 of the Proposed Plan gives the impression that on-site landfilling, a non-permanent, non-destructive alternative that does not immobilize, detoxify, or reduce waste volume is preferable to on-site treatment, despite the SARA-mandated preference for treatments.

Response: <u>See</u> response to Comment 34.

51. Comment: We request that EPA provide documentation of the compliance and regulatory history of the APTUS facility. Full explanation of any permit suspensions, administrative orders, or notices of deficiencies is also requested.

Response: EPA is no longer proposing to send contaminated soil to the APTUS facility for treatment under this Record of Decision. EPA has reevaluated the necessity to treat dioxin-contaminated soil at the Vertac site and since it is not considered to be a principal threat at the site, other disposal options have been selected in place of incineration. See also response to Comment 34.

52. Comment: We are uncomfortable with the assumption that since unsampled areas of the site are downgradient from areas of relatively low contamination, that no contamination is probable in those areas. More and comprehensive characterization is required and is a prerequisite to critical remedial determinations.

Response: EPA disagrees. When examining the soil contaminant data that were collected from over 460 different collection grids at the Vertac site, patterns of contaminant distribution become readily apparent. Site contamination is related to specific process operations at specific site locations and is also related to past site disposal activities.

53. **Comment:** Page 15, Bullet 3 of the Proposed Plan identifies porous bedding media as a potential problem, but does not elaborate on potential contaminant migration, corrective action, or sampling effort to fully characterize the concern.

Response: EPA has no data that show whether porous bedding media was actually used at the site around underground conduits, i.e., no plans or drawings are available from early construction activities. However, EPA has conservatively assumed that porous bedding media may be present, and as such, the proposed remedy will require that cuttoff barriers be installed at specific locations along these conduits to prevent any potential shallow ground water flow along these lines.

54. **Comment:** At page 17, Bullets 1 and 3 of the Proposed Plan, EPA notes its goal to minimize cancer risks to within the statutory mandate between 1/10,000 and 1/1,000,000. This is, however, a very broad range of values, and requests an explicit statement of the specific level of acceptable risk that EPA has adopted for OU2 and the site in general.

Response: EPA's risk modelling for the Vertac site shows that a commercial/industrial worker exposed to site soils remediated to 5 ppb dioxin or less will be exposed on average to 0.67 ppb dioxin. The risk estimated from the Reasonable Maximum Exposure (RME) method is $1X10^{-4}$. Monte Carlo modelling predicts the risk at the upper 95 percentile level for a 5 ppb cleanup to be $4X10^{-5}$. Both are within EPA's acceptable exposure risk range. See also in the Administrative Record EPA's site specific risk assessment entitled "Evaluation of Surface Soil Cleanup level

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contaminated with 2,3,7,8-TCDD TEQs at the Vertac, Inc. Superfund Site," dated April 11, 1995.

55. **Comment:** The proposed fish flesh monitoring program should be modified to provide better information responsive to on-site conditions. Specifically, sampling should be scheduled for one event prior to excavation activities, at the midpoint of remedial activities, and a 30 days post-remedial confirmation sampling.

Response: EPA was not proposing to conduct a new fish-monitoring program. Rather, EPA was explaining the results of the existing monitoring program that is a requirement of the Off-site ROD issued in September 1990. The existing program is considered to be adequate for monitoring contaminant concentrations in aquatic organisms in Rocky Branch Creek and Bayou Meto.

56. **Comment:** At page 22, Paragraph 2 of the Proposed Plan EPA takes the position that because public water is available on and around the site, ground water is not a potential pathway for human exposure. This is not necessarily the case in that it is well documented that ground water normally discharges into proximate surface features. Therefore, contaminated ground water from the site is likely to discharge into Rocky Branch Creek which is a potential human exposure route through both direct contact and the food chain.

Response: EPA agrees that potential exposure pathways from ground water sources may exist for the Vertac site through dermal exposure and incidental ingestion exposures from primarily surface water features. EPA's statement in the Proposed Plan was that the ground water ingestion pathway (drinking well water) was unlikely since Jacksonville is on a public water supply.

Ground water exposure issues are not being addressed in the Operable Unit Record of Decision. They will, however, be addressed in the ROD for Operable Unit 3.

57. **Comment:** The additional characterization data for all congeners for dioxin and furan needs to be reflected in recalculated risk assessment values. It is absolutely necessary that EPA show the actual calculations related to the 20 percent

elevation in risk when all dioxins and furans are considered.

Response: See response to Comment 43.

58. Comment: Page 24, paragraph 2 of the Proposed Plan states that 2,4-D contributed materially to an unacceptable hazard index of 4 (1.0 is the threshold). However, no soil remedial goals for 2,4-D are proposed.

Response: The commenter is correct. However, EPA need not establish remediation goals for all contaminants of concern at the site if such contaminants are reduced to below levels of concern during the remediation of another contaminant. Such is the case for 2,4-D. When dioxin is remediated in surface soils at the site below the specified action level, 2,4-D concentrations will also be well below a health based exposure levels.

Hercules Incorporated Comments

59. Comment: Although the plan acknowledges the existence of the two areas, it fails to recognize unique area-specific conditions when proposing surface soil cleanup criteria, i.e., the plan provides for a 5 ppb dioxin (TEV) cleanup criterion for surface soil for both the restricted and unrestricted portions of the site.

Response: EPA disagrees. EPA made a conscious decision to establish a soil cleanup level for the southern restricted access portion of the site that would be protective of a site worker, such that protective clothing would not be required during the conduct of daily activities. Several reasons for this include: 1) The long term ground water remediation efforts and site maintenance efforts will be required, and thus individual site workers will likely be required to be at the site a normal work period; 2) it is difficult to enforce/monitor how well health and safety requirements (i.e, personal protective clothing requirements are being maintained) over a long term operation, and 3); the Jacksonville Community felt that a "no moon suits" requirement should be established for the southern part of the site because of the nearness to residential neighborhoods and the fact that this site will be a part of their community for the foreseeable future.

60. Comment: The 5 ppb dioxin surface soil cleanup criterion, however, is unnecessarily stringent and inconsistent with a past dioxin cleanup requirement of 20 ppb used at another commercial/industrial site in Arkansas, e.g., the site in Arkwood, Arkansas, and at other sites.

Response: EPA disagrees that a 5 ppb dioxin surface soil cleanup level is unnecessarily stringent. The commenter failed to note that EPA's risk assessment did not consider an exposure to dioxin at a concentration of 5 ppb. Rather, EPA more liberally looked at the average concentration of dioxin that would be present at the site after remediaion of dioxin at 5 ppb occurred, which is 0.67 ppb. EPA calculated the risk from exposure to future site workers based on this average concentration and found the risk to be $1X10^{-4}$, using EPA RME methodology. A cancer risk of $1X10^{-4}$ is the upper limit of the range ($1X10^{-4}$ to $1X10^{-6}$) that EPA considers to be acceptable. Monte Carlo modelling was also used by EPA to predict the risk to a future site worker from exposure to dioxin after remediaion at a 5 ppb action level, the future risk was estimated at $4X10^{-5}$.

A 20 ppb cleanup level for dioxin (which equates to a 2 ppb exposure concentration after remediation), based on site-specific conditions, would result in exposures that are outside of EPA's acceptable risk range for both RME ($2.7X10^{-4}$) and Monte Carlo modelling ($1.1X10^{-4}$).

EPA believes that it has appropriately established a cleanup level for dioxin at the site that is protective of human health.

61. Comment: The EPA risk assessor incorrectly used EPA default risk assessment guidance when selecting the amount of skin area exposed to soil for workers wearing the clothing described above. The risk assessor used 25 percent as the percent of the total body surface exposed every working day for twenty-five years. This skin area corresponds to hands, arms, face and lower legs being continually exposed. For normal work clothing, i.e., long sleeve shirt and pants, EPA risk assessment guidance for exposure to soil indicates that the skin exposure should be 10 percent (reference made to the "Dermal Exposure Assessment: Principals and Applications, Interim Report," U.S. EPA, 1992) which corresponds to exposure of hands and face. This factor alone will effectively reduce the estimate of potential risk to future workers by about 60 percent for any given soil cleanup criterion.

Response: EPA guidance referenced by the commenter, the "Dermal Exposure Assessment: Principles and Applications" states on pages 8-10 that "for soil contact scenarios dermal exposure was expected to occur at the hands, legs, arms, neck, and head (McKone and Layton, 1986) with approximately 26 percent and 30 percent of the total surface area exposed for adults and children, respectively. Less conservative scenarios have limited exposure to the arms, hands, and feet. The clothing scenario presented above suggests that roughly 10 percent to 25 percent of the skin area may be exposed to soil. Since some studies have suggested that exposure can occur under clothing, the upper end of this range was selected for deriving defaults. Thus, applying 25 percent to the total body surface area results in defaults for adults of 5,000 cm^2 and 5,800 cm^2. The defaults for children can be derived by multiplying the 50th and 95 percentiles by 0.25 for the ages of interest."

62. **Comment:** The risk assessor also assumed that future site workers would not conduct any of their activities in those portions of the containment area that have already been remediated. Under EPA oversight, 40 percent of the containment area has been remediated using clean off-site soil and is currently contaminant free. The EPA risk assessor ignores the fact that many of the site activities, e.g., inspection and maintenance, mowing of capped areas, measuring water levels in monitoring wells, etc., currently and in the future will occur in clean areas. Hercules believes that the risk assessment for the future worker should reflect this site information. If incorporated correctly, this factor would reduce the predicted risk to future workers by at least 40 percent because future site workers are expected a disproportionate share of time in clean areas.

Response: The worker exposure area as defined by Hercules includes about 100 acres of the southern portion of the site. This is considered to be an extremely large exposure area. The exposure for a site worker could be much less than the whole 100 acre site. It is currently not known what specific activities will be required of future site workers and the locations of the site that they will be required to conduct their daily activities. In EPA's risk assessment evaluation of the soil cleanup level for the southern portion of the site, the risk posed by exposure to site soils after remediation at a 5 ppb cleanup level was approximately $1X10^{-4}$ based on RME calculations and $4X10^{-5}$ using Monte Carlo risk estimates. These risk numbers are based on an average exposure of 0.67 ppb for dioxin, which is the average concentration of dioxin for all the southern portion of the site that gets remediated. That is not to say that some workers will not be exposed to higher concentrations and others to lower concentrations, depending upon the exact location where work is conducted at the site. For example, the cleanup scenario requires that any grid at the site (each is approximately 5,000 sq. ft. in size) with an average dioxin concentration greater than 5 ppb be covered with 1 foot of clean soil. Thus, the dioxin concentration at that location is now assumed to be half the detection limit or 0.15 ppb. Any grid that has an average dioxin concentration of less that 5 ppb, say 4.9 ppb, would be left undisturbed. For that particular case, the actual exposure point concentration for a worker at that location would be 4.9 ppb and not the average of 0.67 ppb for the entire site. This means that the risk associated with exposure to this one grid or several adjacent grids if the concentrations are similar, would be higher than the average or approximately $8X10^{-4}$ based on RME and $3X10^{-4}$ based on Monte Carlo, which are outside of EPA's acceptable risk range. EPA, however, considers it unreasonable to assume that site workers will be exposed only to these grids. Rather, EPA believes that site workers will be exposed to a range of dioxin concentrations across the site from 4.9 ppb to zero as they conduct their daily activities. Thus, EPA's risk assessment reasonably predicts the risks associated with future work conducted on the southern portion of the site after remediation is complete.

63. **Comment:** The EPA risk assessor also failed to consider that remedial plans for the site which, although not yet finalized, include relocation of most of the

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waste water treatment facilities into a clean building within the containment area. Collection and treatment of ground water will be the main future activity within the containment area. Therefore, future worker exposure to site soil will be further reduced from that assumed by the EPA risk assessor. Hercules has estimated that over one-half of each worker's time in the containment area will be spent on operating and maintenance activities which will occur within the clean building. This factor should also be included in the site risk assessment.

Response: Recent conversations between EPA and Hercules have indicated that the waste water treatment plant may not in fact be relocated to a "clean" portion of the site. EPA does not believe it appropriate to reevaluate site exposure scenarios based on unknowns. <u>See also</u> response to Comment 64.

64. Comment: Two other inappropriate assumptions or procedures were used by the risk assessor that resulted in an overly stringent cleanup standard. One inappropriate procedure was the use of a site-specific bioavailability factor of 10 percent that was higher than any of the individual results determined by the Rutgers University bioavailability study for 2,3,7,8-TCDD conducted with soils samples from the Vertac site. The individual results ranged from less than 1 percent to less than 9 percent. An average of the site-specific results which had a geometric mean 2.3 percent more accurately describes the bioavailability of dioxin for Vertac site soil. In addition, the risk assessor used a slope factor of 156,000 kg-day/mg for 2,3,7,8-TCDD that is substantially greater than the slope factor of 100,000 kg-day/mg which corresponds to the risk-specific dose of dioxin (0.01 grams TEV per kilogram of body weight results in one additional cancer in one million) stated in the plan (page 22).

Response: a) The bioavailability study of 2,3,7,8-TCDD conducted by Hercules for Vertac site soils was reviewed by EPA and discussed with Hercules personnel, Hercules contractors, and the author of the report on several different occasions as the study progressed and at the conclusion of the study. EPA found the study results to be inconclusive concerning whether the low measurements of bioavailability were attributable to Vertac soils or to experimental error. The study failed to show proper expected responses in the positive control animals. It was not apparent from the authors of the study that the experiment was designed or implemented to determine a reliable, reproducible bioavailability "factor" to be used quantitatively in the manner proposed by Hercules. Rather, their study seemed to be directed more toward establishing whether dioxin in Vertac soils is bioavailable as determined by liver enzyme responses and other bioassay techniques, rather than producing specific percentages of bioavailability to apply to human risk calculations. In short, Gallow and Meeker (authors of the study) seem to attribute qualitative significance to their study, but not the quantitative significance which Hercules does. Site-specific soil studies done at other Superfund sites showed a wide degree of variation in bioavailability. For example, Gallow and Meeker discussed a Times Beach soils study that showed approximately 30 percent bioavailability. There was no indication that an attempt was made to characterize the soils (i.e., sand versus clay or absorption capacity) to help correlate or explain differences within Vertac soils or between Vertac soils and Times Beach or other site soils. EPA does not believe that the Hercules bioavailability study for Vertac site soils was conclusive for the reasons mentioned above. However, EPA gave Hercules credit for conducting the study and acknowledges that dioxin absorption from soil is expected to be less that absorption from corn oil (55 percent is often used as the default bioavailability for dioxin), thus an absorption factor of 10 percent (the upper range of the individual results obtained in the Hercules study) was accepted by EPA and was used in EPA risk assessment calculations for the site.

b) The statement by Hercules that "... 0.01 grams TEV per kilogram of body weight results in one additional cancer in a million" was improperly cited from EPA's proposed plan. What EPA stated was that 0.01 picograms TEV per kilogram of body weight per day results in the incidence of one additional cancer case in one million people. According to the Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part A), pages 7-15, the toxicity values in the

Integrated Risk Information System (IRIS) database should be used in EPA risk assessments. If information is not available in IRIS, then the toxicity values in the Health Effects Summary Tables (HEAST) may be used. A toxicity value for 2,3,7,8-TCDD is not available on IRIS as of August 1995, but an oral and inhalation slope factor of 1.5E+5 (150,000) mg/kg-day is presented in the HEAST database. The toxicity value of 156,000 mg/kg-day which was used in the Vertac risk assessment was based on the Rat toxicity study done by Kociba et al. in 1978. The study by Kociba et al. was referenced in the HEAST and has been used historically to evaluate risk from exposure to dioxin and furans. Current information from the EPA's dioxin reassessment also does not change the slope factor for dioxin.

65. Comment: Hercules supports EPA's conclusion that dioxin-contaminated soils can be safely disposed of in an on-site hazardous waste landfill. Hercules does not agree, however, that application of that remediation technology should be limited to soil containing less than 260 ppb dioxin. None of the site soil is a principal threat, especially when compared to the thousands of tons of concentrated wastes which have been, or will be, destroyed by incineration. Based on both the technical effectiveness of landfilling dioxin-contaminated soil and the very low cost effectiveness of incinerating such soil, Hercules believes that all excavated dioxin-contaminated surface soil should be placed into the on-site hazardous waste landfill that will be constructed as part of Operable Unit 1 remediation. Landfilling will eliminate the need to transport the soil over public highways to an off-site incinerator, shorten the remediation time, and eliminate short term risks by not having to pre-process the soils (removal of coarse rock fraction) prior to shipment.

Response: EPA agrees.

66. Comment: The Feasibility Study evaluated capping of contaminated soil in place and found the technology to be both technically and economically appropriate for areas of low contamination concentrations. The very low potential for dioxin to migrate through soil, as supported by the low bioavailability, is supportive of covering

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contaminated soil in place with a layer of clean soil. Therefore, Hercules recommends that capping for some areas of low contaminant concentrations ... in the containment area with clean soil be selected as an optional remediation technology. Capping some areas of low contaminant concentration would have the additional benefit of minimizing the size of the landfill. Hercules is aware that the Jacksonville community would like the landfill size to be minimized.

Response: EPA agrees. When EPA re-evaluated the future landuse potential for the southern portion of the Vertac site, i.e., the southern 100 acres, EPA concluded that because of the existing on-site burial areas and landfills, the construction of a new landfill as part of Operable Unit 1 remediation, and likelihood of long term on-site ground water monitoring and treatment, these operations would substantially reduce commercial redevelopment opportunities at this part of the site.

Because the southern portion of the site will not be used for commercial/industrial development, other remedial options presented in the OU2 FS and in the supplemental proposed plan, such as capping, present a more cost effective means of cleanup that is fully protective of human health and the environment. The cap for Operable Unit 2 soils would involve covering the contaminated surface soil with a 6 inch layer of compacted soil, and a 6 inch layer of topsoil, and re-vegetation. Drainage controls would be implemented to prevent runon and runoff from capped areas. The function of the cap is principally twofold: 1) To prevent direct exposure through dermal contact, inhalation, or ingestion by future site workers maintaining the restricted access portion of the site, and 2); to prevent potential off-site exposure to human and environmental receptors from the migration of contaminated soils via various sediment transport mechanisms.

Migration of dioxin-contaminated soils is adequately addressed by the 1 foot soil cap because:

- Dioxin has an extremely low solubility in water and does not leach readily;

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- Site-specific studies have shown that dioxin adheres strongly to fine grain particles and soils with organic content of 3 percent or greater, thereby further reducing its leachability;

- The soil cap is not designed to protect ground water at the site. Ground water is heavily contaminated with high concentrations of dissolved phase contaminants and non-aqueous-phase liquids (NAPLs), and as such a technical impracticability (TI) waiver will be sought for this area of the site. Ground water remediation will most likely entail hydraulic containment of the plume;

- The construction of an impervious infiltration barrier over a major portion of the site could substantially complicate ground water flow and contaminant migration prediction, as well as affect the collection of both dissolved phase contaminants and NAPL recovery efforts in the existing French drain system. Several years have been invested in developing a good conceptual ground water flow model for the site (which has been confirmed through long term site testing and monitoring), and as such few benefits can be found for installing an impermeable cap, and;

- An increase in the thickness of the soil cap would not add additional protection from exposure for on-site workers. They will be conducting maintenance activities under an approved health and safety plan that will dictate the appropriate level of protection should the need arise to breach any capped areas. Increasing the thickness of the cap also has certain negative aspects in that it could increase the possibility of erosion in areas graded from the cap surface to the ground surface because the slope in these areas would be greater.

67. Comment: The assessment of potential risk to human health from exposure to contaminated soil in the tetrachlorobenzene (TCB) spill area indicated that 500 ppm of TCB in soil provided an acceptable risk if exposure of workers is limited. The FS evaluated only two remedial technologies, thermal desorption and incineration, for TCB-contaminated soil. Although evaluation of other technologies was focused on dioxin-contaminated soil, Hercules believes these evaluations apply to TCB contaminated soil as well. Specifically, Hercules believes soil which contains up to ten times the no-action level of 500 ppm TCB should be placed into the on-site landfill for permanent containment. Soil containing more than 5,000 ppm TCB and any crystalline TCB should be sent off-site for treatment in a RCRA facility. Although incineration is the most likely treatment for these materials, the ROD for these materials should allow for other permitted treatments or recovery options to be evaluated and selected during the remedial design period.

Response: EPA currently cannot comment on the appropriateness of the Hercules proposal to landfill TCB-contaminated soils with concentrations between 500 ppm and 5,000 ppm because it was not an option considered by EPA in the Feasibility Study. In addition, EPA believes that this cleanup option could not have reasonably been anticipated by the public, and as such, must be presented to the public for consideration or comment prior to further action by EPA.

Public Meeting Comments

68. **Comment:** Why hasn't a comprehensive health study, morbidity study, or a census on adverse health effects been conducted for the residents in Jacksonville.

Response: See response to Comment 38.

69. **Comment:** The Vertac site should be used as a dioxin research facility where alternative treatment and disposal technologies are developed and tested.

Response: See response to Comment 42.

70. **Comment:** EPA needs to hold a public referendum on all possible alternatives for soils remediation, including chemical dechlorination.

Response: Under the Superfund process each citizen has the opportunity to review and comment on cleanup alternatives proposed for each site. This information is formally presented to the public in the Feasibility study and Proposed Plan of Action, and comments received are evaluated by EPA prior

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to drafting a Record of Decision for the site. Chemical dechlorination was one of the technologies evaluated in the Vertac Operable Unit 2 Feasibility Study and was presented as one of the options in the May 1995 Proposed Plan for on-site soils. In addition, EPA discussed in length many of the pros and cons associated with the use of chemical dechlorination for dioxin-contaminated soils at the public meeting held in Jacksonville on June 15, 1995. EPA received over 300 written responses or signatures concerning the proposed cleanup for soils at the Vertac site, and only three comments concerned chemical dechlorination. EPA believes that the public has had an opportunity to provide EPA input on the use of chemical dechlorination at Vertac.

71. **Comment:** EPA needs to develop a study to evaluate the potential migration of contaminated ground water off-site.

Response: EPA has been evaluating the condition of contaminated ground water at the Vertac site over the past several years and is currently in the process of developing a Proposed Plan that will present various cleanup alternatives and EPA's preferred alternative for ground water remediation at the Vertac site. See also response to Comment 44.

72. **Comment:** EPA needs to guarantee that there will be no further on-site incineration.

Response: EPA cannot guarantee that if additional remediation efforts are needed at the site that they would not include on-site incineration. EPA can, however, state that on-site incineration is not a part of any current remediation efforts slated for the site and that the on-site incinerator used in the remedy for OU 1 has been dismantled to the point that it would be cost-prohibitive to reassemble it and return it to operating condition.

73. **Comment:** There are concerns about fugitive emissions in the moving of the dirt, including dust, salt, and ash, and the salt soils, and salt spills around the incinerator site. Have they been sampled, or are they included in the sampling process?

Response: See response to Comment 41 on dust suppression. As a part of the cleanup operation for the northern portion of the Vertac site, soil sampling will be employed to ensure that dioxins and furans are below the 1 ppb action levels set for this area of the site.

74. **Comment:** EPA should consider using the local abandoned missile silos as permanent waste storage facilities.

Response: This option was not considered by EPA in the FS, and EPA is very doubtful that it poses a very realistic disposal alternative for dioxin-contaminated wastes. EPA fails to see the advantages is disposing of dioxin wastes in missile silos over that of a hazardous waste containment unit that was designed to hold hazardous wastes.

75. **Comment:** EPA should declare this a contaminated area, permanently restrict access, and buy out nearby homes and business properties.

Response: EPA disagrees. EPA believes that approximately 50 percent or 100 acres of the Vertac site can be returned to commercial/industrial reuse after site cleanup efforts are complete. Access to the remaining 100 acres of the site, i.e., the old process plant area, will be restricted and engineering controls such as landfilling and capping will be employed to ensure that contaminants are controlled so that they will not pose an unacceptable risk to nearby residents, future site workers, or the environment. Residential areas that were found to have site contaminants above health-based levels were remediated as part of a removal action back in 1987.

76. **Comment:** Explain in terms of risk the difference between the 20 ppb dioxin cleanup standard that Hercules is proposing and EPA's 5 ppb dioxin cleanup level.

Response: First, the distinction between a cleanup standard and an exposure concentration must be made. When soils are cleaned up to a certain concentration, say 5 ppb, the resulting concentration of contaminants in the soil after remediation will range from 4.9 ppb at their maximum for some areas down to zero for others. So, a 5 ppb cleanup level will result in an exposure concentration that will be the average of all the remediated area.

Specifically for Vertac, if the site is cleaned to 20 ppb for dioxin, then the resulting average dioxin concentration for the remediated areas will be 1.8 ppb. The risk associated with being exposed to 1.8 ppb of dioxin under a commercial scenario ranges from $3X10^{-4}$ based on RME estimates to $1X10^{-4}$ for Monte Carlo estimates. These are both outside EPA's acceptable risk range. A 5 ppb dioxin cleanup, however, will result in an average exposure concentration of approximately 0.67 ppb dioxin. The risk associated with exposure at this concentration for a commercial scenario is $1x10^{-4}$ for RME and $4X10^{-5}$ for Monte Carlo. Both are within EPA's acceptable risk range.

77. **Comment:** Will the portion of the site that is cleaned up and tested to be below 5 ppb have unrestricted commercial access, public access, or public use?

Response: Access to southern portion of the site (fenced area) will be restricted to site maintenance workers. The Receiver for Vertac Corporation, which holds title to the property, has indicated to EPA a willingness to impose deed restrictions on the property that will prevent the property from being redeveloped.

The northern portion of the site will be cleaned to a 1 ppb dioxin (TEQ) action level and will have unrestricted commercial/industrial use. Generally, municipal zoning restrictions are used to control the type of development that occurs on a particular piece of property. When EPA determines future site risks, guidance requires that EPA evaluate the past use of the property, and in most instances, future use of a piece of property follows its past or historical use. EPA generally is prohibited from restoring a site to a future use that is above its historical use. <u>See</u> response to Comment 31.

78. **Comment:** Does EPA's risk assessment address potential exposure to children who may have access to this site (the area that will have commercial redevelopment) after the remediation is complete?

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Response: No. The portions of the site that will be returned to productive use (i.e., the northern 100 acres) will have administrative controls such as deed restrictions that will prevent future development other than commercial and light industrial. However, as a part of EPA's proposed remedy, EPA will require that the northern portion of the site be cleaned to a 1 ppb dioxin TEQ action level. This action level has been used by EPA as the cleanup standard for residential properties adjacent to the Vertac property and floodplain soils along residential stretches of Rocky Branch Creek, and as such, any incidental exposure from children accompanying a parent to work would not pose an unacceptable risk to the child.

79. **Comment:** Clean the area of the site that will be used for commercial/industrial reuse to 1 ppb (dioxin) and the fenced portion of the site to 5 ppb (dioxin).

Response: See response to Comment 14.

80. **Comment:** We encourage the restoration of the site to its original condition prior to development by Hercules and its predecessors. This includes, removal of all structures, removal of all buried waste, removal of all contaminated soils, and restoration of ground water to background standards. Partial restoration of the site is not in the best interest of the community or its future residents. The future use of the site should be able to support any activity, including parks, residences, commercial establishments, or industrial facilities.

Response: See response to Comment 31.

81. **Comment:** The average person in Jacksonville would like to see the site cleaned up to conditions that existed prior to Hercules' operation, including the excavation and off-site disposal of the existing on-site landfills.

Response: See response to Comment 31.

82. **Comment:** It appears that some of the buildings at the site may remain. All the buildings should be removed.

Response: See response to Comment 12.

83. **Comment:** The EPA pole barn buildings at the northern portion of the site should be cleaned and left in place. These building could be used by the city as a new recycling center.

Response: The disposition of the existing pole barns on the site are not part of the proposed remedy for OU2. However, EPA is willing to clean and leave these structures in place if they are considered to be valuable. Agreement from the City and the Vertac Receiver will be sought should the City and the Receiver have such an interest.

84. **Comment:** Highly contaminated soils should be treated or taken off-site rather than placing all that soil into an on-site landfill.

Response: EPA has determined that off-site disposal of the highly contaminated soils is not cost-effective and affords only minimal additional protection over secure containment on-site in a RCRA Subtitle C landfill.

85. **Comment:** The salt and ash residuals from the completed incineration operation should not go into the on-site landfill.

Response: EPA is presenting information to the public in an Engineering Evaluation/Cost Analysis which will explain options being considered by the Agency for the disposal of approximately 40,000 drums of salt and ash generated during the on-site incineration of drummed herbicide wastes and approximately 1,000 tons of pallets used in the storage of these wastes. EPAs preferred alternative for salt, ash and pallets is containment in an on-site RCRA Subtitle C landfill. Citizens will have 30 days to comment on EPA's proposal when it is released.

86. **Comment:** The restricted access portion of the site should be much smaller than that proposed. Minimize the portion of the site that will remain fenced.

Response: <u>See</u> response to Comment 11.

87. **Comment:** We had origionally hoped that while the incinerator was operating out at the site that all the contaminated soil would have been processed, which would have allowed for a smaller landfill. If there are other technologies that could be used

at the site to remediate the soils and reduce the size of the landfill, they should be considered.

Response: Other technologies were evaluated in the Feasibility Study for treating on-site soils, but were not adopted by EPA as the preferred alternatives for OU 2.

88. Comment: The citizens of Jacksonville, the business community, the civic clubs, and the city officials all are saying the same thing, and that is, clean it, restore it, and give us back an area at least equivalent to what we started out with. If some waste must be left out there, make it as little as possible.

Response: See response to Comment 31.

89. Comment: EPA has stated that the total amount of dioxins and furans at the site are approximately 20 percent higher as toxicity equivalents than for 2,3,7,8-TCDD alone. The dioxin reassessment indicates that the ratio should be approximately 10 times greater than for 2,3,7,8-TCDD alone. How does EPA derive the 20 percent figure?

Response: The 20 percent number used by EPA was based on site-specific sampling conducted at Vertac. In 1994, five areas at the Vertac site were resampled using EPA Method 8280 to determine the dioxin and furan congener concentrations for those areas. The analytical results from each area was used to calculate a Toxic Equivalency (TEQ) concentration for the sample collected, and the ratio of 2,3,7,8-TCDD to TEQ was determined. The ratio of 2,3,7,8-TCDD to TEQ ranged between 0.73 and 1.00. This suggests that other dioxin and furan congeners are present at the site that would contribute to the overall dioxin toxicity calculated for site. As a result of the dioxin resampling effort, EPA is requiring that all soil grids at Vertac site be remediated for dioxin and furans expressed as 2,3,7,8-TCDD toxicity equivalents.

90. Comment: Has EPA evaluated the various isomers of tetrachlorobenzene (TCB) from the spill area to determine the appropriate cleanup level, or has it just considered a common potency for all. Some of the isomers are dioxin-like and this should be factored into the cleanup determination.

Response: EPA evaluated the toxicity of tetrachlorobenzene and some of its isomers from the data available in EPA's Integrated Risk Information System (IRIS) database. The studies used to develop the reference dose (RfD) for tetrachlorobenzene included the evaluation of 1,2,4,5-tetrachlorobenzene, 1,2,3,4-tetrachlorobenzene, and 1,2,3,5-tetrachlorobenzene isomers.

91. **Comment:** Has EPA evaluated other dioxin-like compounds at the site such as chlorinated biphenalenes? These compounds are as toxic as dioxins and are expected to be present and could radically change the risk assessment.

Response: During the remedial investigation of the site Hercules, Incorporated evaluated compounds in site soils based on raw materials used at the site, manufacturing intermediates, and finished products. These compounds included compounds such as toluene, chlorinated herbicides, chlorinated phenols and dioxin. Because the history of site operations was known, extensive screening for numerous other compounds was not conducted.

92. **Comment:** EPA should considered using other treatment technologies such as chemical dechlorination, base catalyzed decomposition, or bio-remediation to destroy the approximately 2,000 tons of soils slated for off-site incineration. Even if these technologies do not get the dioxin contamination down to the cleanup standard, it would have reduced the dioxin level to a degree that it could be dealt with in other ways.

Response: Both chemical dechlorination and biological treatment were evaluated in the Vertac Operable Unit 2 FS. Biological treatment using "white rot fungus" was found to be in the developmental stage, and limited bench scale tests have been run on contaminated media containing 2,3,7,8-TCDD. Currently no venders offer this remediation service commercially.

Chemical dechlorination along with base catalyzed decomposition (BCD) were also evaluated and found to be successful in treating dioxin-contaminated media. Most tests conducted to date have been either bench scale tests or field trial tests and considerable additional testing would most likely be necessary to confirm the efficiency of this technology for Vertac soils. One of the major concerns that has been raised during on-site incineration was the health effects associated with emissions from the incinerator. The Region also considered those concerns when it evaluated whether to pursue chemical dechlorination or BCD for soil remediation at Vertac. Information available from a test conducted at the Koppers Superfund site showed that dioxin and furan emissions had to be addressed with additional engineering controls before the full scale operation could proceed. Therefore, EPA did not prefer this option for the small amount of soil that would have required treatment at Vertac.

93. **Comment:** The dioxin data collected for the Vertac site soils was for 2,3,7,8-TCDD only and not toxicity equivalents. Why were equivalents used in the risk assessment?

Response: See response to Comment 43.

94. **Comment:** In the risk assessment a gastrointestinal absorption of 0.55 was assumed for TCDD equivalents and was derived from the U.S. EPA's 1989 Human Health risk guidance. Is that document still valid after the dioxin reassessment.

Response: Yes.

95. **Comment:** What criteria did EPA use to define the 260 ppb cutoff for dioxin soil treatment and landfilling, i.e., your determination between high concentrations and low concentrations? It looks as though it could have been entirely economic.

Response: The 260 ppb treatment level for dioxin-contaminated surface soils was based primarily on a cost/benefit balance. The balance that EPA weighed was the high cost associated with off-site incineration and the reduction of toxicity or mobility of soil contaminants through treatment. EPA looked at the reduction in the total amount of dioxin that would be achieved by incrementally incinerating the most highly contaminated grid at the site down to the least contaminated, and the resulting cost for that incineration. What was found was that by incinerating the 8 most highly contaminated grids at the site approximately 70 percent of all the dioxin in site soils was destroyed. However, by incinerating the ninth grid, only an additional 0.5 percent was destroyed at a cost of an additional $1 million. After treatment of the 8th grid, it became apparent that treatment of additional grids yielded little additional benefit.

96. Comment: Who developed Monte Carlo Modelling? My indication is that industry actually developed Monte Carlo in order to raise the cleanup levels at various sites.

Response: Monte Carlo probabilistic modelling is a statistical application that has been used in a wide variety of fields to evaluate population-type data. This modelling technique is widely used by researchers in universities, industry, and the government. This modelling technique is unique in that it looks at data as a distribution for a given input parameter, rather than as a fixed point. Application of Monte Carlo modelling does not result in laxer cleanup standards for a given contaminant.

97. Comment: Is the landfill that is to be constructed under the ROD for Operable Unit 1 going to be built to RCRA hazardous waste specifications?

Response: Yes. The on-site landfill will be constructed to RCRA Subtitle-C standards.

98. Comment: EPA should consider reducing the toxicity of the soil through treatment prior to putting it into the on-site landfill, even if requires that several different alternatives be used.

Response: From a cost/benefit perspective, there is very little benefit from pretreating dioxin-contaminated soils to reduce toxicity prior to disposal into a secure RCRA Subtitle C landfill. The Subtitle C landfill will be designed and maintained to strict standards, and therefore exposure to waste materials placed in the landfill would be considered a very remote possibility.

99. Comment: Is EPA considering capping any of the dioxin-contaminated soil at the site as Hercules is proposing?

Response: Yes. In the proposed plan, EPA had origionally envisioned that approximately 50 percent of the southern 100 acres of the site would eventually be

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returned to commercial/industrial use. However, after reevaluating the long term operational and maintenance requirements for this area of the site (i.e., maintaining the caps on the existing site burial areas and the RCRA Subtitle C landfill, and operation and maintenance of the ground water treatment system), EPA believes that these operations will substantially reduce the chance for extensive future redevelopment opportunities on the southern 100 acres. Because access to this area of the site will remain restricted (except for site maintenance workers), other remedial options presented in the OU 2 FS and set out in the OU 2 Proposed Plan, such as capping, present a more cost effective means of cleanup that is fully protective of human health and the environment.

ATTACHMENT B

SUPPLEMENTAL RESPONSIVENESS SUMMARY

The Environmental Protection Agency (EPA) has prepared this Supplemental Responsiveness Summary in response to comments received at the open house held in Jacksonville, Arkansas, on March 5, 1996, and during the public comment period that ran from March 6, 1996, to April 29, 1996, regarding the Supplemental Proposed Plan of Action for Operable Unit #2 (OU2) media at the Vertac Superfund Site.

This Responsiveness Summary addresses comments received upon the Supplemental Proposed Plan for OU2, and does not address those comments EPA received on the original Proposed Plan for OU2 dated May 23, 1995. EPA provided the public with its response to those comments on March 5, 1996, and those responses are attached to this ROD as Attachment A.

Written comments on the May 1995 Supplemental Proposed Plan were submitted by the Arkansas Department of Pollution Control and Ecology (ADPC&E), Hercules, Incorporated (Hercules), State Senator Bill Gwatney, the Concerned Citizens Coalition, the Environmental Compliance Coalition, the Jacksonville Chamber of Commerce, the Jacksonville Commerce Corporation, City of Jacksonville Office of Economic Development, the Jacksonville Serotoma Club, the Jacksonville Lions Club, the Arkansas Peace Center, Vietnam Veterans of America, the Environmental Health Association of Arkansas, Jacksonville Mothers and Children's Defense Fund, and numerous concerned citizens.

As was explained in detail within the Supplemental Proposed Plan issued on February 26, 1996, EPA Administrator Carol M. Browner issued a series of administrative reforms for the Superfund Program on October 3, 1995. One purpose of those reforms was to control remedy costs and to promote cost effectiveness, and the reforms directed EPA to base site cleanup decisions on reasonably anticipated future land usage and reasonable contaminant exposure scenarios based on the future land usage.

As a result of those reform measures, and due to the ongoing deadlock over the Federal budget occurring at the time, Region 6 revised the proposed plan of action for OU2 and developed the Supplemental Proposed Plan issued on February 26, 1996. That supplemental plan eliminated the off-site incineration component of the original proposed plan, included capping of soils having dioxin concentrations between 5 - 50 parts per billion (ppb), and proposed on-site landfilling of soil contaminated with dioxin concentrations in excess of 50 ppb.

The following are the comments received by EPA Region 6 during the 45-day comment period between March 6, 1996, and April 29, 1996, and the responses from the EPA are included below each comment.

1) **Comment:** The commenter is opposed to constructing the on-site landfill on the west side of the Rocky Branch Creek and stated that it would be more desirable to site the landfill within the French drain system since the land on the west side is considered "clean." Also, this commenter expressed some concern with respect to the continued integrity of the ground water monitoring wells.

Response: The siting of the landfill is considered appropriate since it is on-site and within the general area of contamination at the Vertac site. Based on numerous comments during meetings with the community, the most desirable location was west of Rocky Branch Creek where the new landfill could be "out of site - out of mind." See response to comment #34 in the Original Responsiveness Summary in Attachment A.

The Hercules, Inc., a potentially responsible party (PRP), will be conducting continuous groundwater monitoring at the site. More information on ground water will be included in the ROD for the Groundwater Operable Unit (OU3), which EPA plans to issue concurrently with the ROD for OU2.

2) **Comment:** The commenter (Hercules, Inc.) provided two letters stating that the trichlorobenze (TCB) and TCB-contaminated soil having TCB concentrations between 500 ppm and 5,000 ppm should be landfilled on-site, but agreed with EPA that the TCB above 5,000 ppm should be incinerated off-site.

Response: The on-site landfilling of TCB-contaminated soils above 500 ppm was not an option considered by EPA in the Feasibility Study, and therefore was not presented to the public for comment. In addition, in the ROD for OU2, EPA has chosen to consolidate within the on-site RCRA Subtitle C hazardous waste landfill low level threat material having the similar characteristic of dioxin contamination. However, the TCB-contaminated soils with concentrations between 500 and 5,000 ppm TCB do not share that common characteristic. In addition, because Hercules' proposal has not been held out for public comment, EPA cannot include that proposal within its remedy decision for OU2.

3) **Comment:** The commenter stated that the existing fenced areas at the site were unacceptable since the fence along the south side of the site is considered a detriment to

property values in the area. The commenter further stated that the site should be completely remediated so that the site could be "useful" in the future.

Response: One of the EPA's goals with respect to the remedy selected for OU2 is to allow the greatest amount of the site to be unrestricted by such structures as fencing to permit the commercial redevelopment of the greatest amount of the site. However, EPA will not know the extent of the fencing that will be necessary for areas around the eastern and southern portions of the site until the remedial design/remedial action phase of the OU2 remediation. Nonetheless, the northern and western fenced areas are around the existing landfills, and the French Drain must remain in place due to the fact that those areas were delineated by a 1984 order of the U.S. District Court for the Eastern District of Arkansas. In addition, it will be necessary to maintain some fencing around areas where ground water extraction and monitoring wells currently are located or will be placed upon the execution of the ground water operable unit ROD (OU3) to protect those wells and to prevent trespassers from interfering with them. Finally, fencing will also have to be maintained around the existing wastewater treatment plant since that facility will continue to be operated during the extended periods of operation and maintenance (O & M) for various of the site's operable units.

With respect to the comment regarding a complete remediation of the site, EPA believes that the remedy selected in this ROD for OU2 allows the greatest amount of the site's future useful reuse in a manner that is consistent with the new direction of the Superfund program and that meets the public's general approval.

4) **Comment:** The commenter provided voluminous petitions from local citizens, and numerous other letters from individuals, endorsing and reiterating the preference for the Jacksonville Plan.

Response: While EPA acknowledges the merits of the Jacksonville Plan, it is not cost effective when evaluated along with the other eight criteria set out in the Superfund statute for evaluating Superfund remedies. The remedy selected in the ROD for OU2 results in a cost effective remedy that is protective of the human health and the environment, recognizes the reasonably anticipated future land use for the site, which allows for a substantial amount of the site to be redeveloped for commercial/industrial uses, is supported by the State of Arkansas, and is consistent with the Agency's strategy for dealing with low level threat wastes.

5) **Comment:** The commenter expressed concern about reduced property values of real estate in areas adjacent to the site to the west and requested that all material that might constitute a hazardous waste be removed from the site immediately. The commenter also requested that a public statement be made when any and all of the hazardous wastes have been removed from the site so that it would be suitable for industrial use. Finally, the commenter stated that if the requests could not be performed then adjacent landowners should be compensated for the true loss of value to the property.

Response: As discussed earlier in this Responsiveness Summary, a 1984 Court Order resulted in the permanent location of several unlined landfills and the French drain system on-site. In addition, as discussed in the OU2 ROD, EPA considers the material to be consolidated within the on-site RCRA Subtitle C hazardous waste landfill to constitute low level threat media. The Agency has stated in the National Contingency Plan (NCP), 40 CFR Part 300, that the preferred method of addressing such low level threat media is containment, and that the use of the technologies employed in constructing, operating, and maintaining such a hazardous waste landfill have been proven. Therefore, the on-site containment of low level threat media within the on-site RCRA Subtitle C landfill is appropriate in light of the above comments and when considering that the 1984 Court-ordered remedy resulted in the on-site burial of principal threat materials in unlined landfills that do not meet the technological standards of the RCRA Subtitle C unit currently being constructed.

Nonetheless, the remedy selected in this ROD will result in a substantial amount of the site being available for commercial/industrial redevelopment. Upon completion of the OU2 remedy, the public will be made aware of the fact that those portions will be available for such redevelopment.

Finally, the conditions at the site are not due to the actions of the Federal government, and therefore, any loss of property value is not compensable by the United States or any of its agencies.

6) **Comment:** The commenter offered financial management services and stated that a local bank could provide direct deposit and electronic transfer capabilities. Also, the commenter further stated that the EPA was spending more money on the cleanup than necessary.

Response: There is no known need for electronic transfer capabilities to fund this project. In addition, EPA believes that the remedy selected for OU2 is cost effective and fully protective of the human health and the environment. Therefore, EPA disagrees that it is spending more money at the site than is necessary. Furthermore, it is the intent of EPA to order Hercules, Inc., to perform the OU2 remedy.

7) **Comment:** The commenters stated that there has been economic damage to the City of Jacksonville because of the publicity surrounding the Vertac site. Before Vertac, Jacksonville was one of the fastest growing communities in the area, and as a result of the Vertac situation, adjacent communities such as Cabot and Sherwood have experienced economic and population booms. The City of Jacksonville Chamber of Commerce has formed an organization to purchase industrial property to enhance recruitment opportunities for potential industry and associated jobs. The Commenter has urged the EPA to clean the northern portion of the site to 1 ppb and is eager for the EPA to donate this property to the City of Jacksonville so that this land can be included in industrial marketing efforts. The commenter further requested that careful consideration should be given to the strip of property along Marshall Road for long term future development as it relates to cleanup levels.

Response: The EPA recognizes that the City of Jacksonville has suffered a continued economic loss as a result of the Vertac site. However, the cleanup standards included in this ROD will allow future use of the northern portion of the site and will result in an average dioxin concentration of 1 ppb or less. Property along Marshall Road will be cleaned to a dioxin concentration of 5 ppb thereby providing for future redevelopment. Due to the long term operation and maintenance (O & M) activities necessary with respect to the wastewater treatment plant, ground water extraction and monitoring wells, and the existing landfills within the southern portion of the site, future land use exists for only a portion of the southern property. The risk assessments performed for OU2 have established that soil concentrations of up to 5 ppb dioxin are fully protective for future commercial/industrial land use.

Finally, while the Vertac site belongs to the Vertac Receiver, and is not the property of the EPA, EPA has and will continue to encourage the future redevelopment of all available remediated portions of the site.

8) **Comment:** The commenter (the Department of the Interior (DOI)) has stated that based on numerous previous studies, unacceptable levels of TCDD (dioxin) in sediments already

exist in Rocky Branch Creek and Bayou Meto; and that if the source of contamination is not controlled, even more dioxins will be loaded into this system which would pose an unacceptable risk to fish, mammals and birds. Further, the commenter indicated that the proposed capping of the southern portion of the site does not provide a permanent remedy since dioxin contamination can be uncovered during flood events, resulting in continued loading of dioxin into the system.

Response: There is no doubt that dioxin has been released to Rocky Branch Creek and subsequently into Bayou Meto. However, the remedy selected in this ROD does not include a capping component, as was recommended in the Supplemental Proposed Plan for OU2. Instead, the remedy selected in this ROD will result in the excavation and consolidation within a RCRA Subtitle C hazardous waste landfill of dioxin contaminated soils at concentrations of 5 ppm and above for the entire site. EPA data indicate that the average post-remediation soil levels will be at or below 1 ppb. The excavation and on-site consolidation of soils with dioxin concentrations of 5 ppb and above will provide for commercial/industrial remedial actions. Therefore, the implementation of the remedy selected in this ROD will eliminate dioxin concentrations in site soils, excepting the areas subject to the 1984 Court Order, in excess of 5 ppb, which will effectively eliminate those soils as a source of off-site contamination. Finally, because storm water run-on/run-off measures will be implemented in connection with the remedy selected in this ROD, site soils or surface run-off waters will be prevented from leaving the site, and most storm waters will be captured and treated in the on-site wastewater treatment facility.

9) **Comment:** This comment was provided by the City of Jacksonville by Resolution #47 (#2-96) which opposed the modification of the original proposed plan issued May 1995, and reiterated support of the Jacksonville Plan.

Response: With the exception of the off-site incineration of up to eight highly-contaminated grids, the remedy selected in this ROD is substantially similar to the remedy proposed in EPA's original May 1995 Proposed Plan for OU2. As discussed above, the Jacksonville Plan, while having some merit, is not a cost effective remedy that takes fully into account the reasonably anticipated future land use for the site or acknowledges that the OU2 media constitute low level threat media, as opposed to principal threat media.

10) **Comment:** This comment is a summary of numerous letters and petitions from various members of the Jacksonville community

expressing concern with EPA's proposal to "reduce the scope" of the cleanup of the Vertac site. Also, included in the letters and petitions is a statement supporting the "Jacksonville Plan."

Response: As discussed in the response to Comments 5 and 10, EPA believes that the remedy selected in this ROD is fully protective of the human health and the environment, is cost effective, and meets with general public approval.

ATTACHMENT C

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 682-0833
FAX: (501) 682-0880

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September 16, 1996

Jane Saginaw
Regional Administrator
U.S. Environmental Protection Agency
1445 Ross Avenue
Suite 1200
Dallas, Texas 75202

Dear Ms. Saginaw:

This letter is to inform you that the Arkansas Department of Pollution Control and Ecology (ADPC&E) formally concurs with the Operable Unit 2 Record of Decision (ROD) and the amended 1990 Off Site ROD for the Vertac Superfund Site.

ADPC&E also concurs with the ROD for Operable Unit 3 provided that any changes to the ground water plume containment trigger levels will be more stringent than those which are currently contained in the ROD. In addition, ADPC&E must be involved in the decision making process should changes to the trigger levels become necessary.

I commend your staff in their efforts in achieving this goal.

Sincerely,

Randall Mathis

Randall Mathis
Director