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Agency

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Emergency and
Remedial Response

EPA/ROD/R04-89/055
September 1989

EPA

Superfund Record of Decision:

American Creosote Works, FL

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 18-acre American Creosote Works (Pensacola Plant) site, is in a dense moderately commercial and residential area of Pensacola, Florida, approximately 600 yards from Pensacola Bay and Bayou Chico. American Creosote Works, Inc. operated a wood preserving facility onsite from 1902 to 1981. During this time, process wastewater containing pentachlorophenol (PCP) was discharged into two 0.9-and 1.8-acre unlined, onsite surface impoundments. Prior to 1970, wastewater in these ponds was allowed to overflow through a spillway into the neighboring Bayou Chico and Pensacola Bay. After 1970, wastewater was periodically drawn from the ponds and discharged to designated onsite spillage areas. Additional discharges occurred during periods of heavy rainfall when the ponds overflowed. In March 1980, the city found considerable quantities of oily, asphaltic, creosotic material in the ground water near the site. Because of the threat posed to human health and the environment due to frequent overflows from the waste ponds, EPA and the State performed an emergency cleanup in 1983, which included dewatering the two ponds, treating the water via coagulation and filtration, and discharging treated water to the city sewer system. The sludge in the ponds was then solidified and capped. EPA signed a Record of Decision (ROD) in 1985 requiring all onsite and offsite contaminated solids, sludge, and sediment to be placed in an onsite RCRA-permitted landfill. Because the State did concur with the selected remedy, no remedial action was taken. Consequently, a post remedial investigation was conducted in (Continued on next page)

17. Document Analysis a. Descriptors

Record of Decision - American Creosote Works (Pensacola Plant), FL
First Remedial Action (Amendment)
Contaminated Medium: soil
Key Contaminants: organics (dioxin, PAHs, PCP)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

Availability Statement	19. Security Class (This Report) None	21. No. of Pages 52
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. Abstract (Continued)

American Creosote Works (Pensacola Plant), FL
EPA/ROD/R04-89/055

1988 to characterize the extent of contamination followed by a post feasibility study in 1989 to identify, develop, and evaluate alternatives. This ROD is the first of two planned operable units and addresses remediation of contaminated surface soil. A subsequent operable unit will address treatment of contaminated subsurface soil, sludge, and ground water. The primary contaminants of concern affecting the surface soil are organics including dioxins, carcinogenic PAHs, and PCP.

The selected remedial action for this site includes excavating and treating 23,000 cubic yards of PAH-contaminated soil using solid-phase bioremediation in an onsite land treatment area followed by onsite disposal of treated soil in the excavated areas or spreading the soil over the entire site; implementing temporary erosion control measures to preserve surface water quality; collecting leachate and drain water for spraying over the treatment area to moisten soil; monitoring dissolved oxygen, pH, nutrients, and soil moisture content; removing debris, repairing fences, sampling the cap and disposing of drums containing drilling mud; and implementing land and ground water use restrictions. The estimated present worth cost is $2,275,000 which includes an O&M cost of $319,000.

Record of Decision

Declaration

Surface Soil Contamination Operable Unit

Site Name and Location: American Creosote Works, Inc.
Pensacola, Escambia County, Florida

Statement of Basis and Purpose:

This decision document presents the selected remedial action for the American Creosote Works, Inc. Site in Pensacola, Florida, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for the site.

The State of Florida has concurred on the selected remedy. The information supporting this remedial action decision is contained in the administrative record for this site.

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 Record of Decision (ROD), may present an unacceptable risk to public health, welfare, or the environment.

Description of the Selected Remedy:

The remedy selected by EPA will be conducted in two separate operable units. This operable unit is the first of two operable units for the site. This initial operable unit addresses treatment of the contaminated surface soil and is fully consistent with all planned future site activities. Future site activities include treatment of the contaminated ground water and previously solidified sludges and underlying subsurface soil.

The major components of the selected remedy for this first operable unit are as follows:

- Excavating, screening, and stockpiling the contaminated surface soil
- Treatment of this contaminated soil by bioremediation
- On-site disposal of the treated soil in the excavated areas
- Support activities: remove debris, repair fence, sample drums containing drilling muds and properly dispose of contents, and repair existing clay cap.

Declaration:

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. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Lee A. DeHihns III, for — 9-28-89

Greer C. Tidwell
EPA Regional Administrator

Date

RECORD OF DECISION

The Decision Summary

American Creosote Works, Inc.

Pensacola, Escambia County, Florida

Prepared by:
U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia

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American Creosote Works, Inc. Site

Pensacola, Escambia County, Florida

1.0 Introduction

The American Creosote Works, Inc. (ACW) Site was proposed for inclusion on the National Priorities List (NPL) in October 1981 and became final on the NPL in September 1983. In September 1985, EPA signed a Record of Decision (ROD) for remediation of all on-site and off-site contaminated solids, sludges, and sediments. Ground water contamination was not specifically discussed. The State of Florida was not in agreement with the ROD as developed at that time. Consequently, a Post Remedial Investigation (RI) was conducted in June 1988 by EPA to provide further information on the extent of contamination. A follow-up Risk Assessment was done utilizing the results of the Post RI. In August 1989, a Post Feasibility Study (FS) was completed to identify, develop, and evaluate alternatives for remediation at the site. Also in August 1989, the Proposed Plan, which outlines these alternatives, was released to the public.

1.1 Scope and Role of Operable Unit

As with many Superfund sites, the problems at the ACW site are complex. As a result, EPA has organized the remedial work into two smaller units or phases, referred to as operable units. The first operable unit, which is addressed in this Record of Decision (ROD), will eliminate the potential for direct exposure to the contaminated surface soil. The proposed action is consistent with plans for future work to be conducted at the site. The second operable unit is undergoing additional study to further define the applicability of remediation technologies to the contaminated ground water and the solidified sludges and underlying subsurface soil.

This ROD has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative for the first operable unit.

2.0 Site Name, Location, and Description:

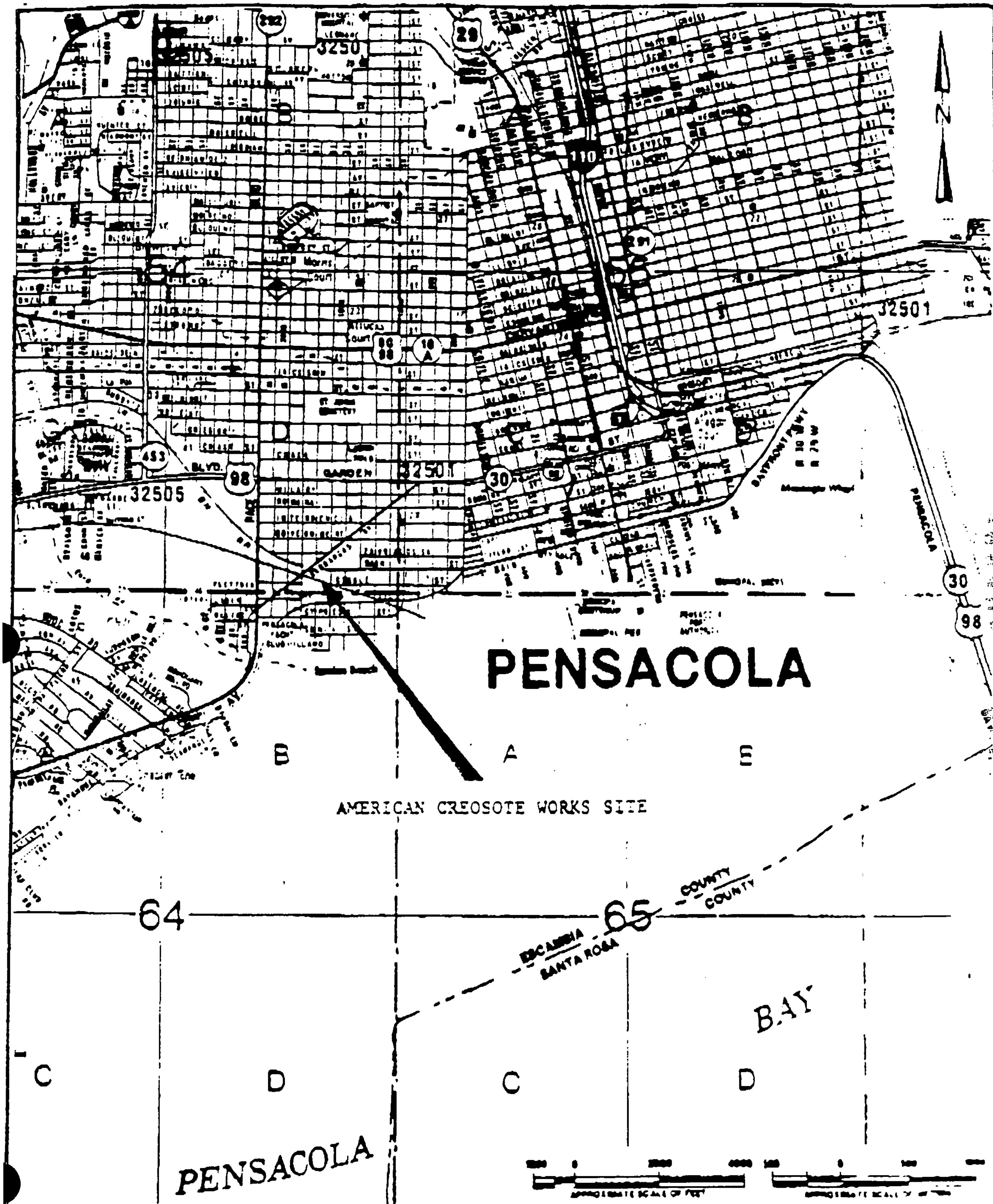
The ACW site occupies 18 acres in a moderately dense, commercial and residential district of Pensacola, Florida. See Figure 2.1. The site is located about one mile southwest of the intersection of Garden and Palafox Streets in downtown Pensacola and is approximately 600 yards north of Pensacola Bay and Bayou Chico. Immediately north of the site is a lumber company, an auto body shop, an appliance sales and repair shop, and a wide storage area. Residential neighborhoods are immediately adjacent to the site on the east and south, and a yacht sales shop is southwest of the site. The residential population within a one mile radius was approximately 5,000 people in 1970. The approximate population in the area of the site was 1,056 in 1970. A total of 404 dwelling units were present in this same area in 1970.

The more pertinent features of the site are shown on Figure 2.2. The site is about 2,100 feet long, east to west, and an average of 390 feet wide, north to south. Primary access to the site is off Pine Street at its intersection with J Street. Originally, a railroad spur line of the Burlington Northern Railroad traversed the site to the west and east. The majority of site buildings, process tanks, and equipment were situated near the center of the site in an area designated as the main plant area. A few small work sheds, miscellaneous equipment, and debris lay about the remainder of the site. At the present, only two small buildings remain standing on the site.

Four surface impoundments were located in the western portion of the site. The main pond and the overflow pond, located adjacent to L Street, were used for disposal of process wastes and are 1.8 and 0.9 acres in size, respectively. During former plant operations, liquid wastes periodically overflowed and were drawn off from the two larger impoundments. The liquid wastes accumulated in the smaller 0.3 acre railroad impoundment and 0.1 acre holding pond or were spread on the ground in spillage areas.

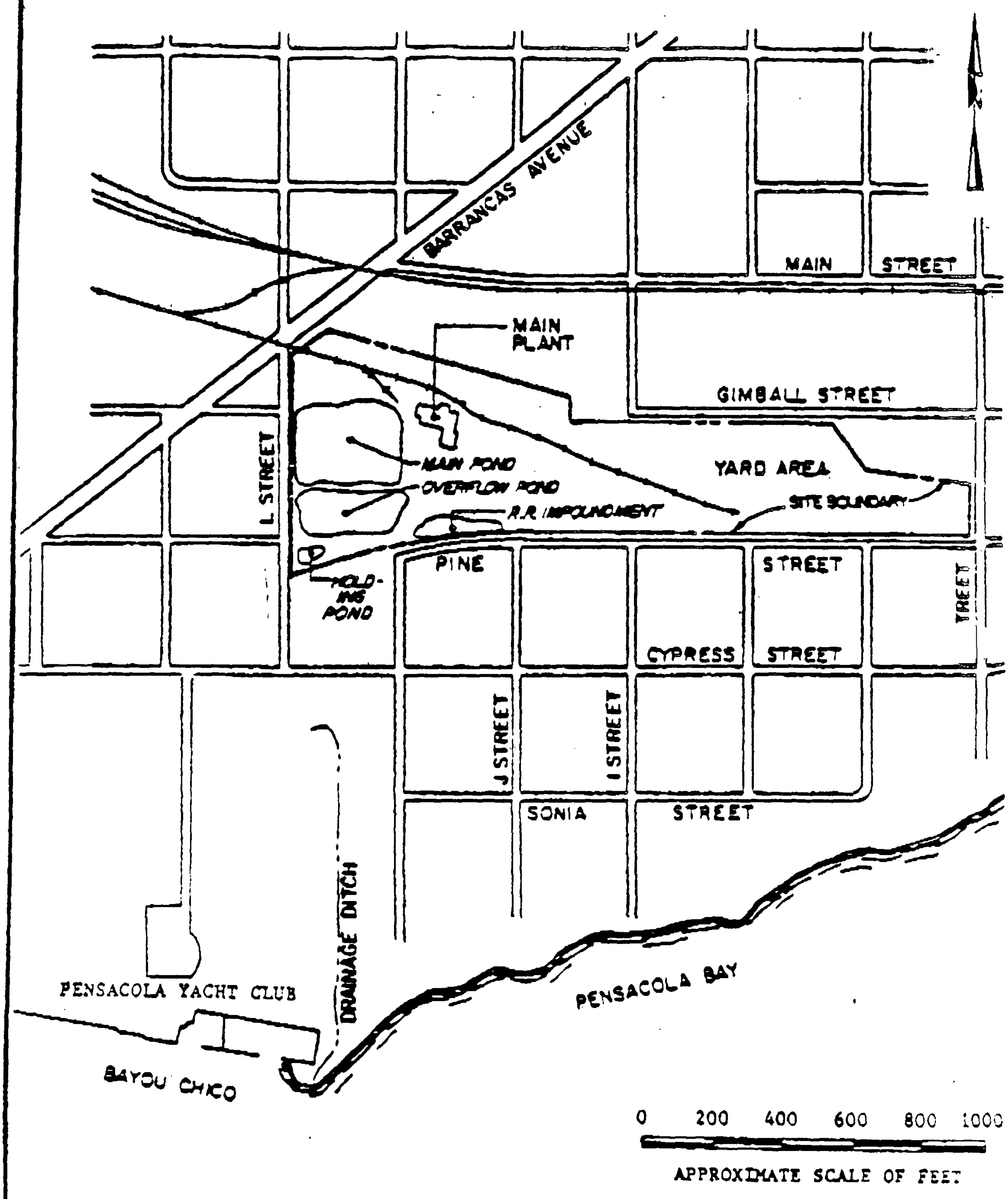
3.0 Site History

Wood-preserving operations were carried out at the ACW site from 1902 until December 1981. Prior to 1950, creosote exclusively was used to treat poles. Use of pentachlorophenol (PCP) started in 1950 and steadily increased in the later years of the ACW operations. During its years of operations, liquid process wastes were discharged into two unlined, on-site surface impoundments. Prior to 1970, wastewaters in these ponds were allowed to overflow through a spillway and follow a drainage course into Bayou Chico and Pensacola Bay.



SITE LOCATION
AMERICAN CREOSOTE WORKS SITE
PENSACOLA, FLORIDA

EBASCO
EBASCO SERVICES INCORPORATED



SITE LAYOUT
AMERICAN CREOSOTE WORKS SITE
PENSACOLA, FLORIDA

EBASCO
EBASCO SERVICES INCORPORATED

FIGURE 2.2

In subsequent years, wastewater was periodically drawn off the ponds and discharged to designated, on-site spillage areas. Additional discharges occurred during periods of heavy rainfall when the ponds overflowed the containment dikes.

In March 1980, considerable quantities of "oily/asphaltic/ creosotic material" were found by the City of Pensacola in the ground water near the intersection of L Street and Cypress Street. In July 1981, the U.S. Geological Survey (USGS) installed nine ground water monitoring wells in the vicinity of the ACW site. Samples taken from the wells revealed that a contaminant plume was moving in a southerly direction toward Pensacola Bay.

In February 1983, the EPA Site Screening Section conducted a Superfund investigation. The investigation included sampling and analyses of on-site soil, wastewater sludges, sediment from the area drainage ditches, and existing on-site and off-site monitoring wells. Concurrent with this investigation, the USGS initiated a site and laboratory research study.

Because of the threat posed to human health and the environment by frequent overflows from the waste ponds, the EPA Emergency Response and Control Section performed an immediate cleanup during September and October 1983. The immediate cleanup work included dewatering the two large lagoons (main and overflow ponds), treating the water via coagulation, settling, and filtration with subsequent discharge of the treated water to the City of Pensacola sewer system. The sludge in the lagoons was then solidified with lime and fly ash. A temporary clay cap was placed over the solidified material. The Florida Department of Environmental Regulation (FDER) also assisted during the cleanup.

A Remedial Investigation/Feasibility Study (RI/FS) under CERCLA was completed in 1985 by EPA. In September 1985, EPA signed a Record of Decision (ROD) which specified that all on-site and off-site contaminated solids, sludges, and sediments would be placed in a RCRA (Resource Conservation and Recovery Act) landfill to be constructed on-site. The remediation activity described would have involved excavation of significant amounts of soil from residential areas adjacent to the ACW site. Ground water contamination was not specifically discussed. The State of Florida was not in agreement with the ROD as developed at that time.

Consequently, a Post Remedial Investigation (RI) was conducted in June 1988 by the EPA Environmental Services Division (ESD) to provide further information on the extent of contamination. EPA performed a follow-up Risk Assessment utilizing the results of the Post RI. In August 1989, a Post Feasibility Study (FS) was completed to identify, develop, and evaluate alternatives for remediation at the site. Using the results of the Post FS, EPA completed the Proposed Plan in August 1989, which outlined the alternatives under consideration as well as the preferred alternative.

3.1 Enforcement Activities

The earliest documented incident of a release of any type from the ACW site occurred in the summer of 1978 when a spill of liquids flowed onto a nearby street and then onto the property of a yacht sales company. A flood in March 1979 resulted in a similar spill. This incident resulted in increased regulatory attention to ACW by the FDER. In January 1981, the FDER completed a responsible party search, a title search, and a financial assessment for the site. In May 1982, the company, American Creosote Works, Inc., filed for reorganization in the bankruptcy court. In 1984, the bankruptcy court presented a final court stipulation for the approval of the litigants. The ACW site would be sold after cleanup and the proceeds would be divided among FDER, EPA, and the financial organizations holding the corporation's assets. The stipulation was entered into in 1988.

In March 1985, the Burlington Northern Railroad was sent a notice letter informing them of their potential liability and requesting that they perform certain tasks at the site. Specifically, they were to remove railroad spur lines utilizing an EPA-approved work plan. The railroad spur lines, the equipment, and most of the buildings have been removed. At the present, only two small out-buildings remain standing on the site. EPA is investigating to determine whether any other PRPs exist.

4.0 Community Relations

The Draft Final Post Feasibility Study and the Proposed Plan were released to the public for comment in August 1989. These two documents were made available to the public in both the administrative record and information repository maintained at the EPA Records Center in Region IV and at the West Florida Regional Library. The notice of availability for these two documents was published in the Pensacola News Journal on Monday, August 28, 1989. A public comment period on the documents was held from September 6, 1989 through September 27, 1989. In addition, a public meeting was held on September 6, 1989. At this meeting, representatives from EPA and FDER answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

This decision document presents the selected remedial action for the contaminated surface soil at the ACW site in Pensacola, Florida, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the NCP. The decision for this site is based on the administrative record.

5.0 Summary of Site Characteristics

5.1 Geomorphology

The ACW site is located in the Gulf Coastal Lowlands of western Florida. The site is nearly flat with elevations ranging from 12 to 14 feet above sea level. The land slopes gently southward at about 25 feet per mile toward Pensacola Bay.

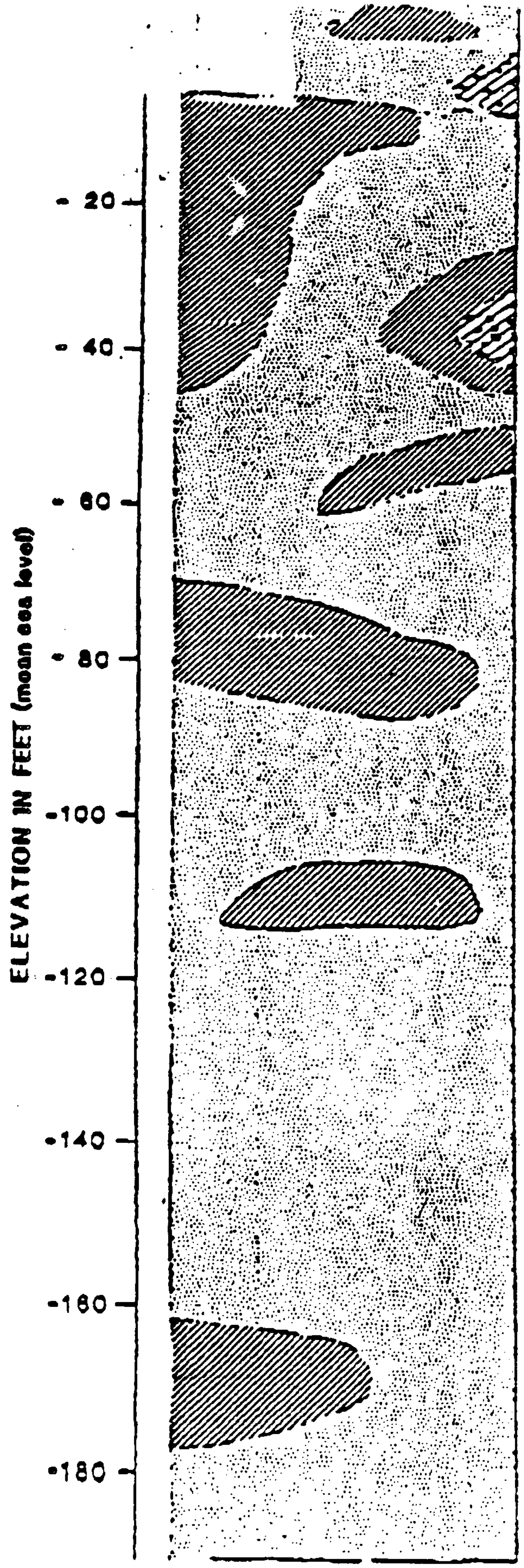
The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) indicates boundaries and elevations of the 100-year floodplain. Based on the FIRM, the 100-year floodplain is not located within the ACW site area and will not be affected by remedial actions at the site.

5.2 Local Geology

The water-bearing zone underlying the ACW site area is composed primarily of sand with many interbedded layers and lenses of clay and sandy clay. Figure 5.1 shows a generalized stratigraphic column for the site. These clay layers and lenses range from less than an inch to approximately 38 feet in thickness. Based on characteristics of the sands in these areas, the water-bearing zone can be divided into two distinct strata. The sand in the first 25 feet below land surface (BLS) of sediment varies in grain size from fine to coarse and in consistency from loose to dense. These variations in grain size and consistency are important since they are a factor in the seepage rate of water through the sediment.

The sand at depths ranging from 25 feet BLS to about 200 feet BLS is predominantly a very dense sand which is usually fine to medium grained with variable amounts of silt. Discontinuous clay and sandy clay nodules and lenses occur throughout the deep sand. No stratigraphic correlations were found between clay lenses in borings in and around the immediate site area. The results of a ground penetrating radar survey have shown many channel deposits in the area.

There are two massive clay layers in the water-bearing zone in the area of investigation. One clay layer is directly under the ACW ponds. This clay layer at a depth of 100 feet BLS appears to be continuous under the pond area although it does pinch out south of the site. South of the site, a second massive clay layer underlies the Pensacola Yacht Club property at a depth of about 20 feet BLS and extends south to Pensacola Bay. This second clay layer pinches out to the north before reaching the ACW site.



LEGEND

SAND (SP-SM) - white to dark brown, loose to very dense, moist to saturated, with trace to some silt

CLAYEY SAND (SC) - dark gray to light brown (some red and purple), loose, dry to saturated, some silty sand

CLAY (CH) - white to blue-gray (same red, brown and purple), medium stiff to hard, dry to moist

Figure 5.1

GENERALIZED STRATIGRAPHIC COLUMN

American Creosote Works
Pensacola, Florida

5.3 Surface Water

The dominant body of water in the ACW site area is Pensacola Bay. During rainfall events, most runoff from the site passes through the streets and storm drains and discharges to the bay. There is a small drainage ditch on the Pensacola Yacht Club property directly south of the ACW surface impoundments. The drainage ditch begins approximately 200 feet south of Cypress Street and extends to Pensacola Bay. Although the drainage ditch is fed by some land surface runoff during rain, most recharge of the ditch is from the ground water. The bottom of the ditch is below the top of the ground water table.

Pensacola Bay exerts a tidal effect on the drainage ditch. During high tides, water flows north from the bay into the ditch. When the tide recedes, water flows south from the ditch to the bay.

5.4 Surface Water Drainage

Storm water drainage at the site is not well-developed. Most drainage in the area is by overland sheet flow through the streets and into storm drains. Drainage also occurs by way of the drainage ditch on the Pensacola Yacht Club property. Storm water runoff eventually ends up in Pensacola Bay.

5.5 Hydrogeology

In southern Escambia County, practically all the fresh ground water is obtained from the sand-and-gravel aquifer. The aquifer is recharged by local rainfall. Because of the sandy nature of the aquifer and overlying soil, infiltration rates are relatively high. Annual recharge is from zero to ten inches per year.

There are three recognizable geologic subunits within the sand-and-gravel aquifer in the study area. The uppermost unit includes terrace sands with shallow wells to approximately 25 BLS feet deep. This unit provides relatively small yields of less than 50 gallons per minute (gpm). The middle subunit includes the Citronelle Formation where water supply wells extend 50 to 150 feet BLS in depth and have yields ranging from 50 to several hundred gpm. The lowest subunit includes the Miocene Coarse Clastics and the lower portion of the Citronelle Formation where wells are over 200 feet BLS deep and have yields ranging from 1,000 to 2,000 gpm.

Water level measurements from wells installed north of the 20-feet deep clay layer extend to depths of less than 100 feet and indicate that the ground water within the upper 100 feet is under water table conditions. Water levels from the 20-feet and 60-feet deep wells indicate similar ground water elevations. Similar ground water elevations are expected since recharge to this area is directly from the infiltration of surface water coming from the overlying ground water. South of the site, where the 20-feet deep clay layer is present, water levels show ground water elevations 0.5 to 3 feet higher than ground water elevations in the sand overlying this clay layer. This difference in hydraulic head indicates that ground water below the 20-feet clay layer is confined. This water level difference also indicates that an upward gradient exists. The ultimate fate of ground water below the 20-feet clay layer is upward migration to the overlying sand with discharge to Pensacola Bay and Bayou Chico.

The ground water below the 100-feet clay layer is also under water table conditions with little difference between wells above and below this clay layer. This deeper clay contains profuse layers and lenses of clayey sand which allow hydrologic communication between the two sand units.

The direction of ground water flow is to the south with discharge to Pensacola Bay. There are no public water supply wells in the immediate vicinity of the ACW site; however, there is an active well at the Crystal Ice Company plant approximately 1/4 mile northeast of the site. The closest well field belongs to the City of Pensacola and is located approximately one mile northeast of the site. The cones of influence of these wells do not reach the ACW site and are not affected by the contamination from the ACW site.

Based on data from monitoring wells installed to a depth of 20 feet BLS, the hydraulic gradient in the unconfined water-bearing zone above 20 feet is 0.0031. Based on wells installed to a depth of 100 feet BLS, the vertical gradient in the confined zone below the 20-feet clay layer is 0.0016. This variation is attributed to the confining function of the clay layer.

5.6 Ecology

The ACW site is located in the Pensacola urbanized area. Vegetation around the site consists mostly of cultivated grasses, trees, and shrubs. Trees in the surrounding area are largely oaks, however, no mature trees are present on the site. Vegetation on the site is a mixture of grasses and other shrubs.

Wildlife in the area is typically urban with rodents, squirrels, raccoons, opossums, and urban bird species. Some shore birds from adjacent marine and freshwater habitats frequent the site. Pensacola Bay and Bayou Chico represent critical environmental systems downgradient of the ACW site. The ecosystem in these water bodies has been stressed in the past due to pollution of these waters caused by industrial, municipal, and storm water discharges.

5.7 Soil

The most recent soil sampling was conducted in July 1988. Soil samples were collected from nineteen grids. Each grid had a total land area of 200 square feet. See Figure 5.2. Samples were collected from the approximate center of each area, except around the landfill, at depths of 4 to 12 inches BLS, 18 to 24 inches BLS, and from above the vadose zone for a total of three samples at each location. Four additional 4 to 12 inch BLS aliquots of soil were collected from each grid area at locations approximately 65 feet from the grid center at angles of 45, 135, 225, and 315 degrees from north. The additional aliquots of soil were composited with the 4 to 12 inch BLS soil samples collected from the center of the area to generate one composite sample. Polynuclear aromatic hydrocarbons (PAHs) were detected in most of the soil samples. PAHs are a diverse class of compounds consisting of two or more fused aromatic rings. They are formed during the incomplete combustion of materials containing carbon and hydrogen and are ubiquitous in the environment. PAHs are commonly found as constituents of coal tar, soots, vehicular exhausts, cigarette smoke, certain petroleum products, road tar, mineral oils, creosote, and many cooked foods.

Concentrations of carcinogenic PAHs in the upper 12 inches range from below detection limits to 498.0 milligrams per kilogram (mg/kg). The highest concentration detected in soil samples collected from 18 to 24 inches BLS was 1078.0 mg/kg. This sample was taken downgradient of the old waste impoundment area. Table 5.1 contains the list of carcinogenic PAHs. Pentachlorophenol was detected in eight grid areas across the site. The concentrations ranged from below detection limits to 110 mg/kg. Three dioxin compounds including hexa-, hepta-, and octa-chloro-dibenzodioxin and three dibenzofuran compounds including hexa-, hepta-, and octa-chlorodibenzofuran were detected in samples analyzed for these compounds. The extremely toxic compounds 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and 2,3,7,8-tetrachlorodibenzofuran were not detected in any of the samples. Appendix A contains site data obtained during the Post Remedial Investigation.

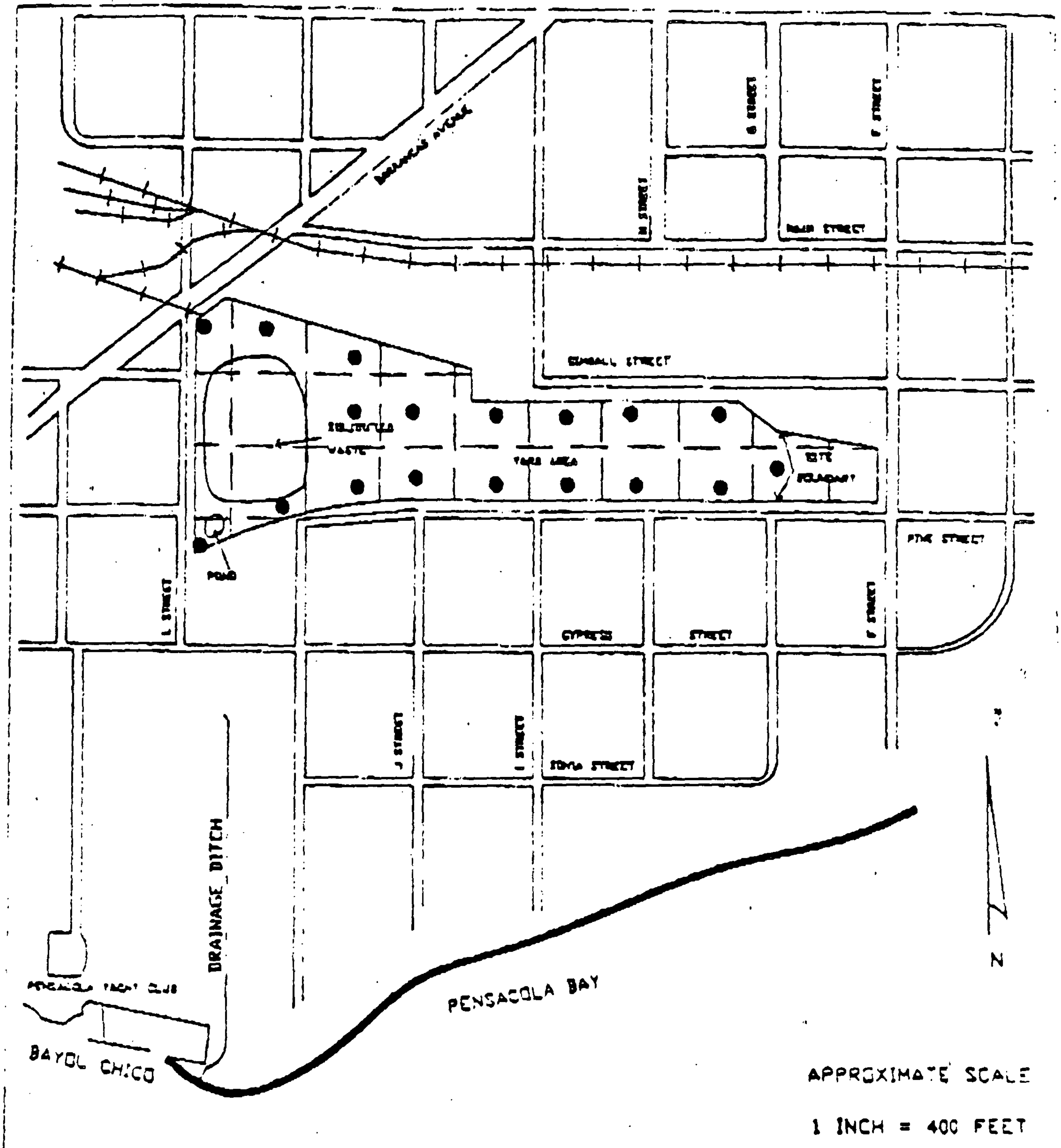


FIGURE 5.2

ON-SITE SOIL SAMPLING LOCATIONS
AMERICAN CREOSOTE WORKS SITE
PENSACOLA, FLORIDA

EPA

Table 5.1

CARCINOGENICITY OF PAHs

Chemicals for which there is sufficient evidence that they are carcinogenic in animals:

Benzo(a)anthracene	7H-Dibenzo(c,g)carbazole
Benzo(b)fluoranthene	Dibenzo(a,e)pyrene
Benzo(j)fluoranthene	Dibenzo(a,h)pyrene
Benzo(k)fluoranthene	Dibenzo(a,i)pyrene
Benzo(a)pyrene	Dibenzo(a,l)pyrene
Dibenzo(a,h)acridine	Indeno(1,2,3-c,d)pyrene
Dibenzo(a,j)acridine	5-Methylcrysene
Dibenzo(a,h)anthracene	

Chenicals for which there is limited evidence that they are carcinogenic in animals:

Anthanthrene	Dibenzo(a,c)anthracene
Benzo(c)acridine	Dibenzo(a,j)anthracene
Carbazole	Dibenzo(a,e)fluoranthene
Chrysene	2-, 3-, 4-, and 6-Methylchrysene
Cyclopenta(c,d)pyrene	2- and 3-Methylfluoranthene

Chemicals for which the evidence is inadequate to assess their carcinogenicity:

Benzo(a)acridine	Coronene
Benzo(g,h,i)fluoranthene	1,4-Dimethylphenanthrene
Benzo(a)fluorene	Fluorene
Benzo(b)fluorene	1-Methylchrysene
Benzo(c)fluorene	1-Methylphenanthrene
Benzo(g,h,i)perylene	Perylene
Benzo(c)phenanthrene	Phenanthrene
Benzo(e)pyrene	Triphenylene

Chenicals for which the available data provide no evidence that they are carcinogenic:

Anthracene	Pyrene
Fluoranthene	

Source: IARC 1983, 1984

5.8 Sediment and Surface Water

An examination of the ditch and bay data revealed the presence of sediment transport of PAH compounds down the ditch and into the bay. The sediment at the mouth of the ditch is contaminated with PAH compounds at a total level of 4,000 ug/kg while no PAH compounds were found in a sample of bay sediment 400 feet east of the mouth along the shoreline. The data from the June 1988 sampling of the shallow (<20 feet) aquifer was compared to the USGS data and the NUS RI data on the shallow aquifer. These comparisons suggest that the shallow ground water contamination is declining. This fact plus the slow movement (low hydraulic potential) of shallow water to the bay suggests that the shallow ground water will not adversely affect the bay water quality. However, sediment transport of contaminated soil particulates from the site to the ditch via rainwater runoff is a distinct possibility, particularly if on-site vegetation is not maintained. There is an apparent transport of contaminated soil particles down the ditch which are being deposited into the delta of the ditch mouth. Additional bay sediments and biota sampling will be needed to assess the impact on biota living in the bay sediment.

6.0 Summary of Site Risks

6.1 Identification of the Contaminants of Concern (Indicator Chemicals)

Over 100 different compounds were identified in the analyses of the soil samples. To bring meaning to this large database, compounds were grouped according to chemical and toxicological characteristics. The following is a listing of the classes of compounds found on site and selected as indicator compounds. The indicator compounds were selected on the basis of their frequency of occurrence at the site and their toxicologic properties. The groups selected to be carried through the analysis were:

1. Carcinogenic PAHs
2. Non-carcinogenic PAHs
3. Phthalates
4. Phenols
5. Pentachlorophenol
6. Chlorinated dioxins-dibenzofurans

Other classes of compounds were found, but only sporadically, at low concentrations.

6.2 Exposure Assessment Summary

The risk assessment for this site was developed using a mathematical modeling program designed to perform probabilistic risk analysis using a Monte Carlo technique.

In this program, risk-related parameters (such as body weights, absorption factors and exposure frequency) are input as ranges with probability distributions, and probability distribution of risk is the output.

The pathways considered for development of the cleanup goals for the contaminated surface soil were:

1. Oral and dermal exposure to surface soil in the following locations:

   a. American Creosote Works site
   b. Residential areas
   c. Drainage ditch area
   d. Condominium block

2. Inhalation exposure to airborne particulates from ACW site surface soil which may be experienced by individuals residing in nearby residential areas.

3. Ingestion of home grown crops in contaminated soil in residential areas.

6.3 Summary of the Toxicity Assessment of the Contaminants of Concern

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a 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 risk calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency 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.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans.) These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

To characterize the toxicologic properties of dioxins-dibenzofurans, the Toxicological Equivalent Factor (TEF) approach, as developed by EPA, was used to relate all dioxin/furan congeners to the more toxic 2,3,7,8-TCDD. Carcinogenic PAHs were all assigned the carcinogenic potency factor (CPF) developed with benzo(a)pyrene data by EPA. Phthalates were represented toxicologically using critical toxicity values for bis-(2-ethylhexyl)-phthalate and phenolic compounds by toxicologic parameters derived for 2,4-dimethylphenol. Compound-specific toxicologic data were used for pentachlorophenol. Risks for exposure to non-carcinogenic PAHs were characterized using toxicologic parameters for naphthalene.

6.4 Risk Characterization Summary

The receptor population was separated into four age groups. They are 1 to 6, 7 to 11, 12 to 18, and over 18 years old. Separate skin surface ranges, body weight ranges, exposure frequencies, and soil ingestion rates were used for each group. Non-carcinogenic risks were calculated for each age group. Lifetime cancer risks were calculated by summing the risks for each age group.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million 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.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ). The HQ is the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The total upperbound lifetime carcinogenic risks from dermal-ingestion exposure of both carcinogenic PAHs and dioxins in the various study areas are:

Area	Median	90th percentile estimate
On-site	2.6×10^{-4}	1.2×10^{-3}
Residential	1.6×10^{-6}	6.6×10^{-6}
Ditch	2.7×10^{-6}	1.2×10^{-4}
Condominium Block	7.4×10^{-5}	1.9×10^{-4}

The risk results also indicate the potential for non-carcinogenic health risks (in all cases due to exposure to dioxins-dibenzofurans) in Areas I and IV. Non-carcinogenic risks are not predicted to be a hazard for exposure to contaminated soil in Areas II and III. The median upperbound cancer risk estimate for exposure to airborne particulates derived from site soil was 6.1×10^{-7}. The 90th percentile risk estimate was 4.1×10^{-6}.

The vegetable pathway does not appear to be a pathway of concern based on analytical data collected during the vegetable garden study of 1985. However, to assess present conditions and to provide assurance of the protection of public health and the environment, limited sampling will be conducted during the Remedial Design.

6.5 Remediation Goals

Of the six substances selected as indicator compounds, only the total carcinogenic PAHs, dioxins, and PCP were present in concentrations requiring remediation considerations. Surface soil remediation goals for the total carcinogenic PAHs were developed based on the risk assessment and the following factors:

a. the cancer potency factor (CPF) for benzo(a)pyrene is very conservative and a reduction of this value is being considered by EPA;

b. the sum carcinogenic PAHs of the concentrations detected in site samples were comprised of only 5 to 10% benzo(a)pyrene with individual PAHs having a much lower carcinogenic potency comprising the major percentage;

c. natural degradation of PAH compounds occurs in soil, and using a standard 1.25 years of half-life assumption, the calculated decay rate indicates that soil concentration would decrease naturally by an order of magnitude about every five years.

Based on this evaluation, the surface soil remediation goal for the carcinogenic PAHs at the site was established to be 50 parts per million (ppm).

Surface soil remediation goals for dioxins were also determined. Applying the median exposure estimates, a soil level of 0.3 parts per billion (ppb) 2,3,7,8-TCDD toxicity equivalency concentration would yield an upper risk of 1×10^{-5}. The use of the median estimate and the 1×10^{-5} is considered to be appropriate for protection of human health. However, the CPF for 2,3,7,8-TCDD is very conservative and under consideration by the Agency for a tenfold (plus) decrease in its numerical value.

Also, ATSDR/CDC has indicated that 1 ppb 2,3,7,8-TCDD is a reasonable soil level to begin consideration of remedial action. Therefore, the soil cleanup level was established at 2.5 ppb for 2,3,7,8-TCDD toxicity equivalency for this site.

EPA's interoffice work group, Carcinogen Risk Assessment Verification Endeavor (CRAVE), and the Office of Research and Development have recently reclassified PCP from a "D" to a "B2" (probable) human carcinogen. A cancer potency factor has yet to be determined but ORD has indicated that the upper limit of the range of values being considered is 1.0. Applying this potency value of 1.0, median exposure values, and the 1 x 10^{-5} upper bound risk level determined for CPAHs and dioxin, the soil cleanup level for PCP is 30 ppm.

The analytical data was examined based on the cleanup levels for the carcinogenic PAHs, PCP, and the dioxin/furan. All sample results were below the 2,3,7,8-TCDD equivalents (1987 TEQs) cleanup level of 2.5 ppb. Figure 6.1 depicts the remediation areas based on PCP and the carcinogenic PAHs.

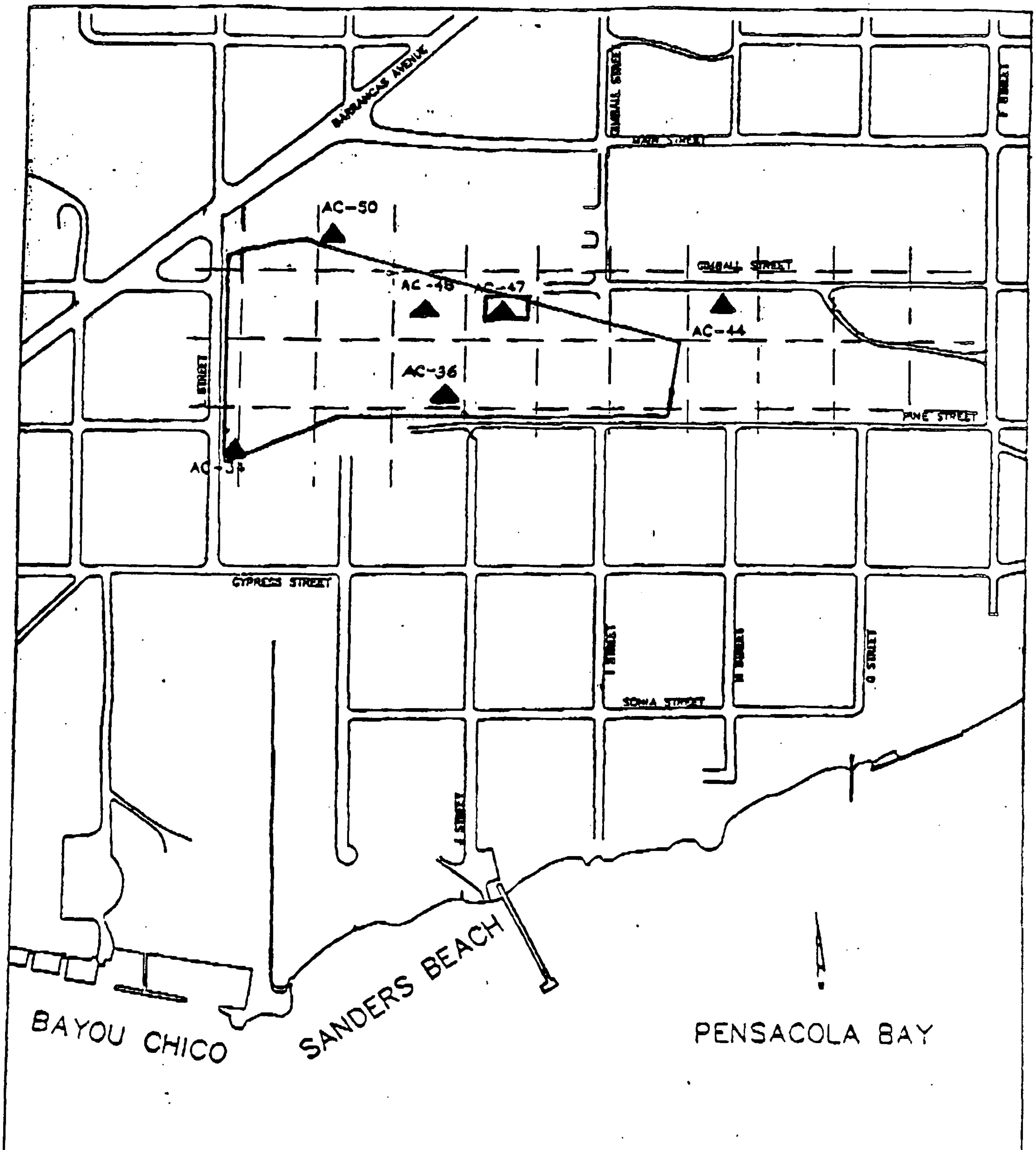
Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an unacceptable risk to public health, welfare, or the environment.

7.0 Description of Alternatives

The following alternatives for remediation were evaluated in the Post Feasibility Study report:

1) No Action
2) Capping/Landfilling
3) French Drain System
4) Ground Water Pump and Treat
5) Solidification/Fixation
6) On-site Incineration
7) Bioremediation: Slurry Phase
8) Bioremediation: Solid Phase
9) Bioremediation: In situ
10) Low Temperature Thermal Aeration

Alternatives 1, 3, 4, 7, 8, and 9 were developed to address the contaminated ground water and solidified soil at the site. Alternatives 1, 2, 5, 6, 7, 8, 9, and 10 were developed to address the surface soil contamination. Based on the cleanup levels developed for the American Creosote Works site, the estimated volume (worst case estimate) to be remediated is 23,000 cubic yards. Additional sampling will be conducted during the remedial design phase to further define the volume to be remediated.



LEGEND

FENCE

▲ CPAH > 50ppm

PCP > 30ppm and CPAH > 50ppm

FIGURE 6.1

REMEDIATION AREAS

AMERICAN CREOSOTE RI
PENSACOLA, FLORIDA
USEPA REGION IV

7.1 Alternative 1: No Action

The Superfund program requires that the no action alternative be considered at every site. Under the no action alternative, EPA would take no further action at the site to control the source of contamination. The no action alternative serves as a baseline with which other alternatives can be compared.

Potential health risks associated with current exposure paths would remain on site. This alternative exceeds the target risk range and does not attain applicable or relevant and appropriate requirements (ARARs). The no action alternative proposes leaving the site in its present condition without disturbing the contaminated surface soil. Associated with the no action alternative would be continued long-term monitoring of ground and surface water, construction of a perimeter fence, posting of warning signs on this fence, and ground water and land use restrictions. A public health assessment would be performed every five (5) years to evaluate potential changes in risk associated with no action.

The estimated present worth cost of this alternative is $408,000 which includes $330,000 for operation and maintenance.

7.2 Alternative 2: Capping/Landfilling

The capping/landfilling alternative would consist of placing the contaminated soil into a double-lined land vault with a permanent cap over the facility in accordance with the Resource Conservation and Recovery Act (RCRA) regulations. The landfill would occupy about five (5) acres of the site and would rise to about five (5) feet above the existing ground level, assuming the total volume of waste material disposed is 23,000 cubic yards. The landfill would be vegetated and would have a perimeter drainage ditch and a perimeter road. A new surface drainage system will be needed to control runon and runoff. A 24-inch thick clay capsule will be required. Other large volumes of clean fill and drainage material will have to be brought on to the site. Also, an additional fence would be built immediately surrounding the vault's perimeter road to preserve the landfill's integrity.

A semi-annual monitoring program to analyze for those ground water constituents of concern would be implemented for a period of five (5) years. A public health assessment would be conducted by EPA every five (5) years following remedial action completion. Following the first assessment, monitoring would continue annually for an additional twenty-five (25) years provided the public health assessment does not identify a need for further remedial action or monitoring.

This alternative would serve as an effective measure toward preventing exposure by ingestion of contaminated soil. The vault must be maintained in perpetuity and will be an eyesore near prime Florida water front properties. This alternative does not meet CERCLA/SARA's preference for treatment of contaminants but would significantly reduce their mobility.

The total present value cost for this alternative is estimated at $2,250,000 which includes $330,000 for operation and maintenance.

7.3 Alternative 3: French Drain System

Because this operable unit is only addressing remediation alternatives for the contaminated surface soil, the french drain alternative will not be discussed in this ROD since it addresses the existing ground water contamination.

7.4 Alternative 4: Ground Water Pump and Treat

Because this operable unit is only addressing remediation alternatives for the contaminated surface soil, the ground water pump and treat alternative will not be discussed in this ROD since it addresses the existing ground water contamination.

7.5 Alternative 5: Solidification/Fixation

A Portland cement based pozzolan solidification/fixation of contaminated surface soil would be accomplished by excavating the contaminated areas to depths determined by the latest (1988) sampling effort. The total estimated volume of contaminated soil to be solidified is 23,000 cubic yards. The solidified material would then be disposed of by backfilling into previously excavated areas of the site. Standard construction equipment would be utilized. When solidification is complete, a 12-inch thick vegetated cover would be placed over the solidified mass.

Treatability or bench-scale studies would be required to determine the proper waste pozzolan rating and the particular pozzolan constituents.

In the first five (5) years following completion of this alternative, semi-annual ground water monitoring would occur. At five (5) years, a public health assessment would be conducted by EPA. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

Ground water use restrictions would be imposed within a reasonable distance from the site. Land use restrictions would be imposed on the site to prevent disturbance of the solidified material. Support activities include removing debris, repairing the fence, clearing and grubbing the vegetation, and grading the site.

This alternative should effectively break the ingestion exposure pathway. Solidification/fixation, an established technology with improving techniques would immobilize contaminants, minimize potential leaching, and improve the handling characteristics of the contaminated media; however, it would increase the volume. The organic compounds would not interfere with the setting, curing, and performance of the solidified material.

Solidification/fixation processes are successful with soil containing up to 10,000 ppm PAHs; the bonding of contaminants to the stabilizing agent should not be impacted by long-term site-specific characteristics.

The total present value cost for this alternative is estimated to be $3,249,600 which includes $339,600 for operation and maintenance.

7.6 Alternative 6: On-site Incineration

Prior to incineration, all of the waste would be excavated and screened. Size reduction equipment such as shredders would be used to reduce solid particle size. During excavation, temporary erosion control devices would be required to prevent detrimental effects to the surface water quality south and southeast of the site. Specific incinerator unit availability is uncertain; however, it is probable that demand for units would dictate supply. A number of portable rotary kiln incinerators are available with capacities up to 500 tons per day. If this alternative is used, it would be necessary to conduct test burns. Pollution control equipment, such as cyclones and scrubbers, would be necessary to collect and treat exhaust gases and suspended particulates. The lack of fine particles (except for portions of the contaminated clay cap already in place) in soil feeds will not result in high particulate loading in flue gases. This excessive loading would occur with fine particles due to the turbulence in the rotary kiln (if a rotary kiln incinerator is utilized). Therefore, pollution control activities can be expected to be of average intensity at the site.

A semi-annual ground water monitoring program to analyze for those ground water constituents of concern would be implemented for a period of five (5) years after the completion of the incineration. At that time a public health assessment would be conducted by EPA.

Following this assessment, monitoring would be terminated, provided the public health assessment does not identify a need for further remedial action or monitoring. Ground water use restrictions would be imposed within a reasonable distance of the site in keeping with the establishment of ground water quality standards.

This alternative would permanently and effectively destroy the contamination present in the surface soil that exceed cleanup goals. All risk of exposure by ingestion of contaminated soil would be eliminated. Incineration is a proven technology at hazardous waste sites and reduces toxicity, mobility, and volume of hazardous materials. This alternative meets all ARARs.

The total present value cost for this alternative is estimated to be $9,990,000 which includes $330,000 for operation and maintenance.

7.7 Alternative 7: Bioremediation - Slurry Phase

This technology involves the treatment of contaminated surface soil in a large (mobile) bioreactor. This system maintains intimate mixing and contact of microorganisms with the hazardous compounds and creates the appropriate environmental conditions for optimizing microbial biodegradation of target contaminants. There may be air emissions from the bioreactor which may cause complaints from the community. The bioreactor would have to be enclosed and air pollution control equipment utilized to mitigate the air emissions from the bioreactor.

The total volume of contaminated surface soil is estimated at 23,000 cubic yards. The soil would have to be excavated and screened. Excavation of the contaminated soil would require erosion control measures to prevent impact to the surface water quality south and southeast of the site. The soil is then mixed with water to obtain the appropriate slurry density. The water source would likely be contaminated ground water. The typical soil slurry contains about fifty (50) percent solids by weight. The slurry is mechanically agitated in the reactor vessel to keep the solids suspended. Nutrients, oxygen, and pH control chemicals may be added to maintain optimum conditions. Microorganisms may be added to maintain the correct concentration of biomass. The volume of the bioreaction and the residence time for each batch will determine the amount of time necessary to biotreat the contaminated material. Once biodegradation of the contaminants is completed, the treated slurry is dewatered. The residual water may require further treatment prior to disposal. Fugitive air emissions of VOCs can be controlled by enclosing the bioreactor. Three or more companies have working slurry-phase bioreactors immediately available for scheduling.

A prerequisite for the use of the slurry-phase bioreactor may be th design and construction of a ground water extraction system so that ground water may be used for slurry water. Also, further water treatment may be necessary before ground water may be sent to a publicly owned treatment works (POTW) or disposed of in another fashion.

This alternative would permanently and effectively destroy the contamination in the surface soil. All risk of exposure by ingestion of contaminated soil would be eliminated. Slurry-phase biodegradation is a proven technology at hazardous waste sites and reduces the toxicity, mobility, and volume of hazardous contaminants in soil and ground water.

The decanted ground water resulting from the settling of the bioreactor sludge may be reused in the bioreactor or be tested and disposed by simply being sent to the local POTW.

A semi-annual monitoring program to analyze for those constituents of concern would be implemented for a period of five (5) years upon completion of the remedy. A public health assessment would be conducted by EPA at the end of the five (5) years. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring. This alternative meets all ARARs.

The total present value cost for this alternative is estimated to be $3,258,000 which includes $330,000 for operation and maintenance.

7.8 Alternative 8: Bioremediation - Solid Phase

With this technology, the contaminated surface soil (23,000 cubic yards) would be excavated, disaggregated, and screened as in the description of the slurry-phase bioremediation and stockpiled in a lined contaminant area on-site. Excavation of soil would require temporary erosion control measures to preserve surface water quality south and southwest of the site.

The on-site excavated areas to be used for a land treatment area would be filled and leveled with clean fill. The treatment area would have been graded to flow water and leachate to one corner of the area. The land treatment area would be lined with a high density polyethylene (HDPE) geomembrane liner with welded seams. Over the liner, flat perforated plastic pipe covered with filter fabric would form a drainage system to conduct water and leachate to a retention pond. The liner and drainage system would be covered with at least six (6) inches of clean sand to promote drainage. Contaminated soil, having been disaggregated, would be laid on the sand in six (6) inch lifts.

Local naturally-occurring bacteria would be used to seed the spread soil and nutrients, and moisture would be added to promote the growth of biomass. Leachate and drain water would be collected and sprayed over the treatment area when the soil moisture content fell too low. The soil would be tilled periodically to facilitate soil particle/bacteria contact. Some PAHs would be eliminated by photolysis and by volatilization due to the direct sunlight and hot weather. Air emissions may be a problem at certain times and may cause complaints from nearby residences.

The land treatment area and the stockpile area would occupy all of the site area. A fence already exists around the site, but may have to be re-set or added to. Treatment of 23,000 cubic yards of PAH-contaminated soil would probably take at least two (2) years. Treated soil could be left where they lay or spread over the entire site.

Continuous monitoring of the dissolved oxygen, pH, nutrients, soil moisture content, etc., would be required. A temperature range of 50-100°F. would be required. Air emissions from the treatment area due to volatilization would be significant just after the initial spreading of the soil when levels of soil contamination are still high.

Contaminated soil would be effectively treated and the ingestion exposure pathway broken. Given time, solid-phase bioremediation would satisfy most ARARs at the site.

A semi-annual monitoring program to analyze for those constituents of concern would be implemented for a period of five (5) years. A public health assessment would be conducted at that time. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring. Ground water use restrictions would be imposed within a reasonable distance from the site. Land use restrictions would be imposed to prevent use of the site for residential purposes.

Implementation time for this alternative is expected to be several years. However, the projected unit costs make this alternative competitive with other technologies. This alternative would be as effective towards the protection of public health and the environment as other treatment technologies. In addition, climatic conditions of the site are favorable for this type of treatment.

The total present value cost for this alternative is estimated to be $2,275,000 which includes $319,000 for operation and maintenance.

7.9 Alternative 9: Bioremediation - In Situ

In situ bioremediation would require the design of a ground water pumping and reinjection system both on-site and off-site. soil would not require excavation. The natural biodegradation process would be enhanced by injecting nutrients (i.e., phosphorus, nitrogen, etc.), oxygen (e.g., hydrogen peroxide), and even cultured bacterial strains. Adjustments to pH may also be made. The ground water pumping and reinjection would circulate nutrients and oxygen through a contaminated aquifer and the associated soil. Aerobic biodegradation generally proceeds more rapidly than anaerobic biodegradation.

In situ bioremediation would directly attack both soil and ground water contamination. Ground water use restrictions would be imposed within a reasonable distance from the site. Land use restrictions would not need to be imposed if both soil and ground water contamination were reduced to insignificant levels.

Continuous monitoring of the dissolved oxygen, pH, nutrients, etc. would be required. Temperatures in the subsurface soil and in ground water at various depths would have to be monitored. Odors may be forthcoming from the extraction/reinjection system and may cause complaints from the public. Odors may be emitted from the process area. Ground water would not be able to be used for drinking or irrigation by anyone in the site area because of the high bacterial counts and the intermediate breakdown products of the biodegradation. High bacterial count in the ground water during processing would prohibit the use of ground water even for irrigation.

ROD cleanup levels and additional alternate concentration levels (ACLs) may not be able to be completely met by this alternative in a short period of time. The original time for implementation may have to be extended.

A semi-annual monitoring program to analyze for those constituents of concern would be implemented for a period of five (5) years after the completion of the remedial action. A public health assessment would be conducted at that time. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

This alternative should be able to satisfy most ARARs over a period of time.

The total present value cost for this alternative is estimated to be $2,299,000 which includes $319,000 for operation and maintenance.

7.10 Alternative 10: Low Temperature Thermal Aeration

Twenty-three thousand (23,000) cubic yards of surface soil would be excavated, disaggregated, screened, and stockpiled. The prepared soil would then be introduced to the low temperature thermal aeration (LTTA) equipment (processing equipment which would operate at its maximum temperature of 800°F.) Process residuals would be processed soil, ash from the afterburner or spent carbon, and stack gases. A bench-scale or small pilot-scale test burn would be needed to evaluate the technical effectiveness and cost-effectiveness of the process at this site.

Presently, Weston Services, Inc. has a system available which can process up to 7.5 tons/hour. The process should produce removal efficiencies greater than 90 percent for 1, 2, and 3-ring PAHs. PAHs with four or more rings would need higher temperatures for volatilization. If necessary, other technologies could be used for these remaining PAHs. Stack gases would have to be continuously monitored to ensure that air pollution was not occurring.

A semi-annual monitoring program to analyze for those constituents of concern would be implemented for a period of five (5) years after the completion of the remedial action. A public health assessment would be conducted at that time. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

This alternative would probably permanently and effectively strip contaminated soil that exceed cleanup goals. All risk of exposure by ingestion of contaminated soil would be eliminated. Low temperature thermal aeration should reduce the toxicity, mobility, and volume of hazardous constituents in the soil. This alternative should satisfy most ARARs.

The total present value cost for this alternative is estimated to be $3,048,000 which includes $330,000 for operation and maintenance.

8.0 Summary of Comparative Analysis of Alternatives

This section provides the basis for determining which alternative provides the best balance of trade-offs with respect to the evaluation criteria. The major objective of the Post Feasibility Study (FS) was to develop, screen, and evaluate alternatives for remediating the American Creosote Works site. This decision document deals with the contaminated surface soil. Several remedial technologies were identified for the surface soil cleanup. These technologies were screened based on their feasibility given the contaminants present and the site characteristics.

Those which remained after the initial screening were evaluated in detail based on the nine criteria required by SARA. Cost was used to compare alternatives only when they provided similar degrees of protection and treatment. A summary of the relative performance of the alternatives with respect to each of the nine criteria is provided in this section. A glossary of the evaluation criteria is offered in Table 8.1.

Table 8.1

GLOSSARY OF EVALUATION CRITERIA

Overall Protection of Human Health and the Environment - addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs - addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provides grounds for invoking a waiver.

Long-term Effectiveness and Permanence - refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume - is the anticipated performance of the treatment technologies that may be employed in a remedy.

Short-term Effectiveness - refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

Implementability - is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Cost - includes capital and operation and maintenance costs.

State Acceptance - indicates whether the State concurs with, opposes, or has no comment on the preferred alternative.

Community Acceptance - will be assessed in the Responsiveness Summary in the appendix of the Record of Decision after reviewing the public comments received on the Post Feasibility Study and the Proposed Plan.

Overall Protection of Human Health and the Environment

All of the alternatives with the exception of the no action alternative would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls.

Because the no action alternative would not be protective of human health and the environment, it is not considered further in this analysis as an option for the site.

Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives would meet their respective applicable or relevant and appropriate requirements of Federal and State environmental laws; however, Alternative 2 - RCRA Landfilling, does not meet SARA's (Superfund Amendments and Reauthorization Act) preference for treatment.

Long-term Effectiveness and Permanence

Long-term effectiveness and permanence would be provided by all alternatives through elimination of risk posed by contaminants at the ACW site.

Reduction of Toxicity, Mobility, or Volume

Alternative 2 does not provide for a reduction of toxicity or volume of the contaminants but would reduce their mobility. Alternative 5 would reduce toxicity and mobility but not volume of the contaminants. Alternatives 6, 7, 8, 9, and 10 would reduce toxicity, mobility, and/or volume.

Short-term Effectiveness

The alternatives will require varying amounts of time to achieve cleanup of the site. All alternatives would have a degree of short-term effectiveness. Compared to the other alternatives, the in situ bioremediation alternative would not have as great a degree of short-term effectiveness due to the time required for bacterial culture growth. Any short-term risk to workers involved in construction of the remedy would be reduced through implementation of a health and safety plan.

Implementability

All alternatives are implementable, however, it is important to note that all alternatives would require various steps to reach full-scale implementation. These initial activities would include items such as treatability studies, bench-scale or pilot-scale studies, test burns, and culturing of bacterial strains.

Cost

The present estimated cost of EPA's selected remedy ranges from 2.3 million to 3.3 million dollars. The selected remedy provides overall effectiveness proportional to its costs such that the remedy represents a reasonable value for the money. When the relationship between cost and overall effectiveness of the selected remedy is viewed in light of the relationship between cost and overall effectiveness provided by other alternatives, the selected remedy appears to be cost-effective.

State Acceptance

The State of Florida as represented by the Florida Department of Environmental Regulation is in favor of the selected remedy for remediating the surface soil at the ACW site.

Community Acceptance

Based on comments made by citizens at the public meeting held on September 6, 1989, and those received during the public comment period, the community believes the selected remedy will effectively protect human health and the environment.

9.0 Selected Remedy

EPA selects biological treatment (bioremediation) as the most appropriate alternative technology to remediate the ACW site. Based on available data and analysis to date, solid phase bioremediation (Alternative 8) is expected to be the most appropriate solution for meeting the goals of the initial surface soil operable unit at the American Creosote Works site. However, treatability studies would be conducted during the pre-design phase to determine the most effective type of biological treatment (i.e. slurry phase, solid phase, or in situ phase). Solid phase bioremediation includes excavation and treatment of soil in an on-site land treatment area. At the present, EPA is successfully applying this technology at another Superfund site in Florida.

Based on current information, the selected provides the best balance among the nine criteria that EPA uses to evaluate alternatives. The rationale for choosing this alternative includes the following reasons:

- provides immediate protection to human health from the potential threats associated with direct contact with the contaminated surface soil;
- contributes to the implementation of a more permanent remedy at the site;
- is consistent with additional site actions and will be compatible with the final site remedy;

10.0 Statutory Determinations

The U.S. EPA and FDER have determined that this remedy will satisfy the statutory requirements of Section 121 of CERCLA by providing protection of human health and the environment, attaining ARARs, providing cost-effectiveness, and utilizing permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Sections 10.1 and 10.5 below are the statutory requirements for this site.

10.1 Protection of Human Health and the Environment

The selected remedy of solid phase bioremediation provides protection of human health and the environment by eliminating the direct threat through dermal contact with contaminated surface soil. The source of contamination, the surface soil, will be excavated and treated. For a short period following excavation, concentrations of contaminants might exceed ARARs but this concentration will decrease after time with treatment.

10.2 Attainment of the Applicable or Relevant and Appropriate Requirements (ARARs)

Remedial actions performed under CERCLA, as amended by SARA, must comply with all applicable or relevant and appropriate requirements (ARARs). All alternatives considered for the ACW site were evaluated on the basis of the degree to which they complied with these requirements. The recommended alternative was found to meet or exceed the ARARs.

When ARARs are not available for specific compounds or exposure media (such as soil), the cleanup goals are based on Agency reference doses (RfD) for noncarcinogens and 10^{-5} risk levels for carcinogens derived by use of Agency potency factors and site specific exposure assumptions.

No Federal or State contaminant-specific ARAR has been identified for PAH, PCP, or dioxin-contaminated soil.

Potential Federal location-specific ARARs for the ACW site include the following:

- Resource Conservation and Recovery Act (RCRA) location requirements - Mandates that hazardous waste treatment, storage, or disposal facilities located within a 100-year floodplain must be designed, constructed, operated, and maintained to avoid washout.

- Fish and Wildlife Coordination Act - Requires adequate protection of fish and wildlife if any stream or other body of water is modified.

- Endangered Species Act - Requires action to conserve endangered or threatened species for activities in critical habitats upon which these species depend.

- National Historical Preservation Act - Requires that action be taken to preserve or recover historical or archaeological data which might be destroyed as a result of site activities.

Federal regulations that contain potential action-specific ARARs for the site are listed below:

- 40 CFR Section 264.99 Compliance Monitoring Program - Establishes criteria for monitoring ground water quality when contaminants have been detected. This involves development of a ground water quality data base sufficient enough to characterize seasonal fluctuations in ground water quality at the site.

- Clean Water Act (CWA) - Provides criteria for ground water remediation and discharge into surface waters.

- Resource Conservation and Recovery Act (RCRA) - The provisions of RCRA pertinent to the ACW site have been promulgated under 40 CFR Parts 257, 260, 261, 262, 263, 264, 269, and 280. EPA has determined that the above regulations are applicable to RCRA characterized or listed hazardous wastes (40 CFR Part 260) which were either: 1) were disposed at a site after November 19, 1980; or 2) the CERCLA remedial action consists of treatment, storage, or disposal as defined by RCRA (40 CFR Part 264). In addition, the regulations are relevant and appropriate to RCRA hazardous wastes disposed at a site prior to November 19, 1980. Examples of RCRA requirements include minimum technology standards, monitoring requirements, and storage and disposal prohibitions.

- Clean Air Act (CAA) - The CAA requirements may be applicable in cases where on-site thermal destruction is considered.

- Land Disposal Restrictions - The LDRs are applicable to the waste on-site if the soil is excavated and removed or excavated and treated. In alternatives where the LDRs are applicable, the soil must be treated to the interim treatment levels prior to land disposal.

- Section 121(d) of the Superfund Amendments and Reauthorization Act (SARA) - SARA requires that the selected remedial action establish a level or standard of control which complies with all ARARs. At the ACW site, ground water discharges into Pensacola Bay and, therefore, beyond the boundaries of the site. Applicable statutory language concerning cleanup standards under CERCLA is found in Section 121(d)(2)(B)(ii) of SARA. SARA does not allow any increase in contaminants in off-site surface water. To relate health-based standards for contaminant concentrations to potential receptors, a current-use scenario was employed. Under an evaluation of the current-use scenario, there are no direct receptors of ground water at or downgradient of the site. Rather, the closest potential receptors are associated with surface water use where affected ground water discharges to Pensacola Bay.

10.3 Cost-Effectiveness

The present estimated cost of EPA's selected remedy ranges from $2.3 million to 3.3 million dollars. The selected remedy affords overall effectiveness proportional to its costs such that the remedy represents a reasonable value for the money. When the relationship between cost and overall effectiveness of the selected remedy is viewed in light of the relationship between cost and overall effectiveness afforded by other alternatives, the selected remedy appears to be cost effective.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The U.S. EPA believes this remedy is the most appropriate cleanup solution for initiating the first operable unit at the ACW site and provides the best balance among the evaluation criteria for the remedial alternatives considered. This remedy provides effective protection in both the short- and long-term to potential human and environmental receptors, is readily implemented, is cost-effective, and is consistent with future response actions to be undertaken at the site. Bioremediation of the contaminated surface soil represents a permanent solution (through treatment) which will effectively reduce and/or eliminate mobility of hazardous wastes and hazardous substances into the environment.

10.5 Preference for Treatment as a Principal Element

The statutory preference for treatment will be partially met because the selected remedy described herein only treats the contaminated surface soil. Future remedial actions to be performed at the site will treat the principal threat posed by the contaminated ground water and the solidified sludges and underlying subsurface soil.

APPENDIX A

SITE DATA

American Creosote Works, Inc. Site

Pensacola, Escambia County, Florida

TOTAL SELECT PAH CONCENTRATION ON-SITE
AMERICAN CREOSOTE WORKS
PENSACOLA, FLORIDA

SAMPLE LOCATION	TOTAL SELECT PAH CONCENTRATION (MG/KG) DEPTH BLS (INCHES) 4-12	18-24	VADOSE ZONE
1 (background)	----	----	----
34	57.00	1078.0	----
35	7.34	----	1.18
36	41.40	2.25	0.16
37	40.20	----	----
38	11.89	1.91	----
39	24.10	----	----
40	42.40	12.18	0.40
41	----	10.15	0.91
42	1.16	----	----
43	3.41	----	----
44	102.6	39.00	1.79
45	31.40	----	----
46	13.49	1.83	----
47	51.80	1.84	0.08
48	498.0	70.2	0.48
49	7.17	9.22	0.30
50	35.80	55.80	29.41
51	3.01	----	----
60	6.97	----	----

---- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

4-12 INCHES BLS REPRESENTS A SAMPLING DEPTH
18-24 INCHES BLS REPRESENTS B SAMPLING DEPTH
VADOSE ZONE REPRESENTS C SAMPLING DEPTH

DIOXIN/DIBENZOFURAN CONCENTRATIONS ON-SITE
AMERICAN CREOSOTE WORKS
PENSACOLA, FLORIDA

TOTAL DIOXIN/DIBENZOFURAN CONCENTRATION IN TEQs[1]
(UG/KG)
DEPTH BLS (INCHES)

SAMPLE LOCATION	4-12 TEQ	18-24 TEQ	VADOSE ZONE TEQ
1 (background)	----	----	----
36	1.03	----	----
38	0.66	0.75	.01
40	1.31	1.86	.01
46	0.07	.003	----
48	1.39	.01	----

---- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

4-12 INCHES BLS REPRESENTS A SAMPLING DEPTH
18-24 INCHES BLS REPRESENTS B SAMPLING DEPTH
VADOSE ZONE REPRESENTS C SAMPLING DEPTH

[1] NOTE: Specific dioxins/dibenzofurans are converted to 2,3,7,8-TCDD toxicity equivalents (1987 TEQs) using the toxicity factors from Table 3-3 in the risk assessment (June 1988), i.e.:

2,3,7,8 - Hexa CDDs ---- .04
2,3,7,8 - Hepta CDDs ---- .001
2,3,7,8 - Penta CDFs ---- .1
2,3,7,8 - Hexa CDFs ---- .01
2,3,7,8 - Hepta CDFs ---- .001

PENTACHLOROPHENOL CONCENTRATIONS ON-SITE
AMERICAN CREOSOTE WORKS
PENSACOLA, FLORIDA

SAMPLE LOCATION	PENTACHLOROPHENOL CONCENTRATION (MG/KG) DEPTH BLS (INCHES) 4-12	18-24	VADOSE ZONE
1 (background)	--	--	--
34	--	--	--
35	11.0	--	--
36	8.6	--	--
37	5.6	--	--
38	3.4	5.2	--
39	9.4	--	--
40	16.0	17.0	--
41	--	5.5	--
42	--	--	--
43	1.5	0.2	--
44	15.0	2.4	--
45	5.2	--	--
46	--	--	--
47	110.0	--	--
48	--	0.74	--
49	2.9	5.5	--
50	5.0	--	--
51	--	--	--
60	0.34	0.34	--

-- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

4-12 INCHES BLS REPRESENTS A SAMPLING DEPTH
18-24 INCHES BLS REPRESENTS B SAMPLING DEPTH
VADOSE ZONE REPRESENTS C SAMPLING DEPTH

RANGE AND FREQUENCY OF CHEMICAL CONTAMINANTS
IN VARIOUS MEDIA
AMERICAN CREOSOTE WORKS, INC., SITE
ALL CONCENTRATIONS IN mg/kg (SOILS) AND µg/l (WATER)

Contaminant	Soils Concentration Range and No. of Observations	Groundwater Concentration Range and No. of Observations	Sediment Concentration Range and No. of Observations
Polycyclic Aromatic Hydrocarbons (PAHs)			
benzo(a)anthracene	8.8-870 (16)		7,300 (1)
benzo(a)pyrene	6.7-140 (10)		
benzo(b)fluoranthene	9.2-480 (17)		8,300 (1)
benzo(k)fluoranthene	7.9-8.7 (2)		
chrysene	5.6-750 (19)		
anthracene	7.2-1,600 (17)	6,400-430,000*(2)	
benzo(ghi)perylene	5.4-20 (5)		
fluorene	7.1-1,800 (13)	50-140,000* (13)	5,700 (1)
phenanthrene	5.7-29,000 (21)	30-1,300 (10)	20,000 (1)
dibenzo(a,h)anthracene	7.8-91 (2)		
indeno(1,2,3-cd)pyrene	6.1-210 (5)		
pyrene	7.2-9,000 (29)	2,200 (1)	15,000 (1)
Other Acid and Base/Neutral Organics			
acenaphthene	7.3-6,900 (12)	40-140,000* (12)	
fluoranthene	8.1-10,000 (30)	60-2,700 (3)	18,000 (1)
naphthalene	74-1,100 (7)	35-580,000* (17)	
dibenzofuran	58-880 (8)	45-660 (6)	
2-methylnaphthalene	39-540 (7)	35-3,680 (8)	
pentachlorophenol	7.2-2,500 (10)		
Volatile Organics			
benzene	0.04-0.13 (3)	6-150 (15)	
ethylbenzene	0.03-0.26 (5)	15-110 (15)	
toluene	0.01-0.22 (7)	5-150 (15)	
acetone	0.08 (1)	400-2,700 (8)	
o-xylene	0.01-0.35 (10)	5-240 (16)	
Pesticides			
beta-BHC		*0.66-0.9 (5)	
endosulfan		**0.47 (2)	

* One reported concentration @ 230*
** Same sample as above, 12 µg/l
* May be in error owing to nonrepresentative data

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APPENDIX B

RESPONSIVENESS SUMMARY

American Creosote Works, Inc. Site

Pensacola, Escambia County, Florida

RESPONSIVENESS SUMMARY

The United States Environmental Protection Agency (EPA) and the Florida Department of Environmental Regulation (FDER) established a public comment period from September 6, 1989 through September 27, 1989 for interested parties to comment on EPA's and FDER's Proposed Remedial Action Plan (PRAP) for the first operable unit at the American Creosote Works, Inc. (ACW) site. The comment period followed a public meeting conducted by EPA held at the Escambia County Health Department Building in Pensacola, Florida. The meeting presented the studies undertaken and the preferred remedial alternative for the site.

A responsiveness summary is required by Superfund policy to provide a summary of citizen comments and concerns about the site, as raised during the public comment period, and the responses to those concerns. All comments summarized in this document have been factored into the final decision of the preferred alternative for cleanup of the ACW site.

This responsiveness summary for the ACW site is divided into the following sections:

I. Overview This section discusses the recommended alternative for remedial action and the public reaction to this alternative.

II. Background on Community Involvement and Concerns This section provides a brief history of community interest and concerns regarding the ACW site.

III. Summary of Major Questions Received During the Public Comment Period and EPA's or FDER's Responses This section presents both oral and written comments submitted during the public comment period, and provides responses to these comments.

IV. Remaining Concerns This section discusses community concerns that EPA should be aware of in design and implementation of the first operable unit and in planning for the second operable unit.

I. Overview:

The preferred remedial alternative was presented to the public in a public meeting held on September 6, 1989. The recommended alternative is an operable unit Record of Decision (ROD) which addresses the surface soil contamination. The major components of the recommended alternative for the surface soil include:

- Excavation, screening, and stockpiling of contaminated surface soil
- Treatment of the stockpiled soil by bioremediation
- On-site disposal of remediated soil.

The community, in general, favors the selection of the recommended alternative.

II. Background on Community Involvement and Concern:

The Pensacola community has been aware of the contamination problem at ACW site for several years. A public meeting was held at the Pensacola Yacht Club to inform the membership of the findings of the remedial investigation. A second public meeting was held on August 15, 1985 to present the draft feasibility study and allow for public comment.

EPA and FDER conducted the third public meeting on September 6, 1989. The purpose of this meeting was to explain the results of the site studies, to present the recommendations of EPA and FDER for the site cleanup, and to accept questions and comments from the public on the site or its cleanup. At this meeting, the key issues and concerns identified were:

Time: The public was concerned with the amount of time that it will take to cleanup the site.

Public Notice: The public wanted to be better informed of site activities.

III. Summary of Major Questions and Comments Received During the Public Comment Period and EPA's or FDER's Responses:

1.) One commenter inquired how would the public be notified.

EPA Response: EPA developed a community relations plan that outlined EPA's role in communicating with the public. As a part of the community relations plan, a mailing list was developed which included residents, the media, local, state, and federal officials. When EPA conducted the first public meeting, a sign-in sheet for interested individuals who wanted to be added to the mailing list was made available. The proposed plan fact sheet was mailed to all the [illegible] who were on the mailing list. In addition to the proposed plan, public notice was published in the legal section of the newspaper

2.) One commenter inquired about bioremediation studies and their effectiveness with the type of contaminants on site.

EPA Response: There are a number of bioremediation studies that apply to treatment of sites contaminated with creosote. The studies have indicated that bioremediation is effective as a cleanup method for creosote.

3.) One commenter inquired if the contaminated soils were being spread by the City or County when they graded the soils.

EPA Response: At this time there is no immediate concern, but we will be doing additional studies and will keep this in mind.

4.) One commenter inquired if all of the bioremediation would be done on the site.

EPA Response: Yes.

5.) One commenter expressed concerns about the Bay.

EPA Response: EPA will be working with experts to ensure that the Bay is not adversely affected. We have done some sampling of the Bay, and plan to conduct more sampling during the remedial design phase. With the currently available data, EPA has no indication that the Bay has been adversely affected.

6.) One commenter inquired if the capped areas on site would remain in their current state or if they would be treated.

EPA Response: The capped areas will be addressed in a second phase for this site. Additional studies are required before an appropriate decision can be made for the solidified materials, ground water, and the bay.

7.) One commenter inquired if the contaminated soils were going to be excavated and treated on the site.

EPA Response: Yes, the soils will be excavated and treated on-site.

8.) One commenter inquired if a lot of equipment would be brought to the site.

EPA Response: Yes, there will be some equipment. EPA wants to have another public meeting to provide the citizens with information about the type of equipment and how long the remedy is going to take.

9.) One commenter inquired if all of the soils would be excavated at the same time.

EPA Response: No, all of the soil will not be treated at the same time. The soils will be treated in layers; once a layer had reached the cleanup goal, another layer of contaminated soil would be excavated and treated.

10.) One commenter inquired how long would it take to clean up the site.

EPA Response: EPA will start remedial action on the site in September 1990. EPA has estimated that it will take two years to remediate the site. Once the remedial design has been completed, EPA will be able to define the actual amount of time necessary to clean up the site.

11.) One commenter inquired if EPA felt relatively comfortable that the site was contained right now.

EPA Response: Yes, EPA has alleviated the immediate threat at the site.

12.) Two commenters expressed the need for more public notice, and stated that some residents did not receive their Proposed Plan Fact Sheets.

EPA Response: EPA did mail a large number of residents the Proposed Plan Fact Sheet. In addition, EPA released a public notice in the newspaper to inform the citizens of the public meeting.

IV. Remaining Concerns:

The community's concerns surrounding the ACW site will be addressed in the following areas: community relations for the second operable unit, incorporation of comments/suggestions in the remedial design, and community relations support throughout the remedial design and the remedial action.

Community relations should consist of making available final documents (i.e., Remedial Design Work Plan, Remedial Design Reports, etc.), in a timely manner, to the local repository, and issuance of fact sheets to those on the mailing list to provide the community with project progress and a schedule of events. The community will be made aware of any principal design changes made during project design. At any time during remedial design or remedial action, if new information is revealed that could affect the implementation of the remedy, or, if the remedy fails to achieve the necessary design criteria, the Record of Decision may be revised to incorporate new technology that will attain the necessary performance criteria.

Community relations activities will remain an active aspect of the remedial design and the remedial action phases of this project.

APPENDIX C

STATE CONCURRENCE MEMORANDUM

American Creosote Works, Inc. Site

Pensacola, Escambia County, Florida

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

November 14, 1989

Mr. Greer Tidwell
Regional Administrator
U. S. Environmental Protection
Agency, Region IV
345 Courtland St., NE
Atlanta, Georgia 30365

Dear Mr. Tidwell:

The Florida Department of Environmental Regulation concurs with the selection of bioremediation as the remedial alternative for Operable Unit 1 of the American Creosote Works Superfund site in Pensacola, Florida, as described in Section 9.0 of the Record of Decision.

This alternative consists of the excavation and biological treatment of contaminated on-site surface soils. All soil having greater than 50 mg/kg of total carcinogenic indicator compounds or 30 mg/kg pentachlorophenol will be treated to attain these cleanup goals.

The remedy selected provides an effective and permanent means of eliminating the long-term threat to public health and the environment posed by contaminated soils at the site. Depending on the specific method of bioremediation chosen for the site, the cost of the selected remedy ranges from $2.3 to $3.3 million, including $319,000 to $330,000 for operation and maintenance. The state's share of these costs is $230,000 to $330,000.

The remedial alternative to be implemented for Operable Unit 2, which includes stabilized sludges, underlying soils and groundwater, will be addressed in a second Record of Decision. It is anticipated that this alternative will be selected within the next nine months.

We look forward to the successful completion of this remedial action.

Sincerely,

Dale Twachtmann
Secretary

DT:lc