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RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

ESCAMBIA WOOD TREATING COMPANY SUPERFUND SITE

OPERABLE UNIT 01 (SOIL)

PENSACOLA, ESCAMBIA COUNTY, FLORIDA

PREPARED BY:

**U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA**

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LIST OF ACRONYMS and ABBREVIATIONS

AOC	Area of Contamination
amsl	above mean sea level
ARAR	Applicable, or Relevant and Appropriate, Requirement
BaP EQ	benzo(a)pyrene toxicity equivalents
BCD	base catalyzed dechlorination
bls	below land surface
CAMU	Corrective Action Management Unit
CDD	chlorinated dibenzo-p-dioxins
CDF	chlorinated dibenzofurans
CERCLA	Comprehensive Environmental Response Compensation Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
cPAH	carcinogenic polyaromatic hydrocarbons
cy	cubic yards
DoJ	U.S. Department of Justice
EPA	U.S. Environmental Protection Agency
ERT	EPA Emergency Response Team
ESD	EPA Environmental Services Division
ETC	Escambia Wood Treating Company
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FS	Feasibility Study
F.S.	Florida Statute
ft^3/day	cubic feet per day
GRA	general response action
HEAST	health effects assessment summary tables
HI	Hazard Index
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments
IRIS	Integrated Risk Information System
LDR	Land Disposal Restriction
LMJA	Larry M. Jacobs & Associates
LOAEL	lowest observed advers effect level
MCL	Maximum Contaminant Level
mg/kg-day	milligram per kilogram per day
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
MTTD	medium-temperature thermal desorber
M/T/V	mobility/toxicity/volume
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan

LIST OF ACRONYMS
(Continued)

NOAEL	no observed adverse effect level
NOV	Notice of Violation
NPL	National Priorities List
O&M	Operation and Maintenance
OSC	On Scene Coordinator
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	polyaromatic hydrocarbon
PCP	pentachlorophenol
PCE	Tetrachloroethylene or Perchloroethene
ppm	part per million
psi	pounds per square inch
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	Reference Dose
RGO	Remedial Goal Option
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record Of Decision
SARA	Superfund Amendments and Reauthorization Act
"Site"	Escambia Wood Treating Company Superfund Site
S/S	solidification/stabilization
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	toxicity equivalents
TOP	Temporary Operating Permit
TPH	total petroleum hydrocarbons
yd^3	cubic yards

PART 1: THE DECLARATION

1.1 Site Name and Location

This Record of Decision (ROD) is for the Escambia Wood Treating Company Superfund Site, Operable Unit 01 (Soil) that is located at 3910 North Palafox Street in the City of Pensacola, Escambia County, Florida. The EPA Site Identification Number is FLD008168346.

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for the Escambia Wood Treating Company (ETC) Superfund Site (the "Site"), Operable Unit (OU) 01 (Soil) that 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 Contingency Plan (NCP). This decision is based on the Administrative Record for the Site. The State of Florida concurs with the Selected Remedy.

1.3 Assessment of Site

The response action selected in this Record of Decision is necessary to protect the public health or welfare and the environment from actual or threatened releases of hazardous substances to the environment.

1.4 Description of Selected Remedy

The overall cleanup strategy for the OU-1 final remedy is to treat principal threat wastes through solidification/stabilization and to permanently isolate surface and subsurface soil contaminated above the selected cleanup levels in an on-site containment system in order to protect both human and ecological receptors. The selected remedy addresses the source materials constituting principal threats at the site. The major components for the Selected Remedy include:

- Excavation of contaminated soil both on- and off-site, including permanent relocation of residents in the Clarinda triangle neighborhood;
- Containment of the contaminated soil in lined cell(s) followed by installation of a multi-layer cap over the containment area compatible, to the extent possible, with the intended future commercial use of the property;
- Solidification/stabilization of identified principal threat waste to form a sub-cap (3 to 4-ft in thickness) beneath the multi-layer cap;
- Operation & maintenance of the cap and containment system;
- Long-term monitoring of the containment system;
- Institutional controls to restrict future use of the Site to commercial uses compatible with the remedy; and
- Five-year reviews of the remedy to ensure protectiveness is maintained.

1.5 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 (unless justified by a waiver), and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for OU-1 and satisfies the statutory preference for remedies that employ treatment to reduce toxicity, mobility, or volume as a principal element. The remedy eliminates human and ecological exposure to contaminated soil, permanently controls the mobility of the contaminants, and is protective of ground water resources.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy remains protective of human health and the environment.

1.6 Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision (Part 2). Additional information can be found in the Administrative Record file for this Site.

- ❑ Chemicals of concern and their respective concentrations (pages 21 to 40)
- ❑ Baseline risk represented by the chemicals of concern (pages 42 to 46)
- ❑ Cleanup levels established for chemicals of concern and the basis for these levels (pages 46 to 48)
- ❑ How source materials constituting principal threats are addressed (page 76)
- ❑ Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the Baseline Risk Assessment and ROD (page 40)
- ❑ Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (pages 82 to 84)
- ❑ Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (pages 82 to 84)
- ❑ Key factor(s) that led to selecting the remedy (i.e. describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (pages 76 to 77)

1.7 Authorizing Signatures

Beverly H. Banister (signature) — 2/13/06

Beverly H. Banister, Acting Director
Waste Management Division

Date

PART 2: THE DECISION SUMMARY

2.1 Site Name, Location, and Brief Description

This Record of Decision (ROD) is for the Escambia Wood Treating Company (ETC) Superfund Site (the "Site"), Operable Unit (OU) 01 (Soil), that is located at 3910 North Palafox Street in the City of Pensacola, Escambia County, Florida. A Site location map is shown on Figure 1. The United States Environmental Protection Agency's (EPA) is the lead agency for this Site, and the EPA Site Identification Number is FLD008168346. Site remediation is planned to be conducted and financed through Superfund with the Florida Department of Environmental Protection (FDEP) administering a State Cost Share of ten percent of the remedial action costs.

The ETC Site encompasses light industrial, commercial and residential properties surrounding and down gradient of the former Escambia Wood Treating Company property. Residential properties located both north and south of the Site have been the subject of a National Relocation Pilot Project that served as an interim action for the remediation of ETC OU-1. This remedial action provides a final remedy for OU-1 that will address contaminated soils both on-site and on surrounding off-site properties consistent with the planned future use of those properties.

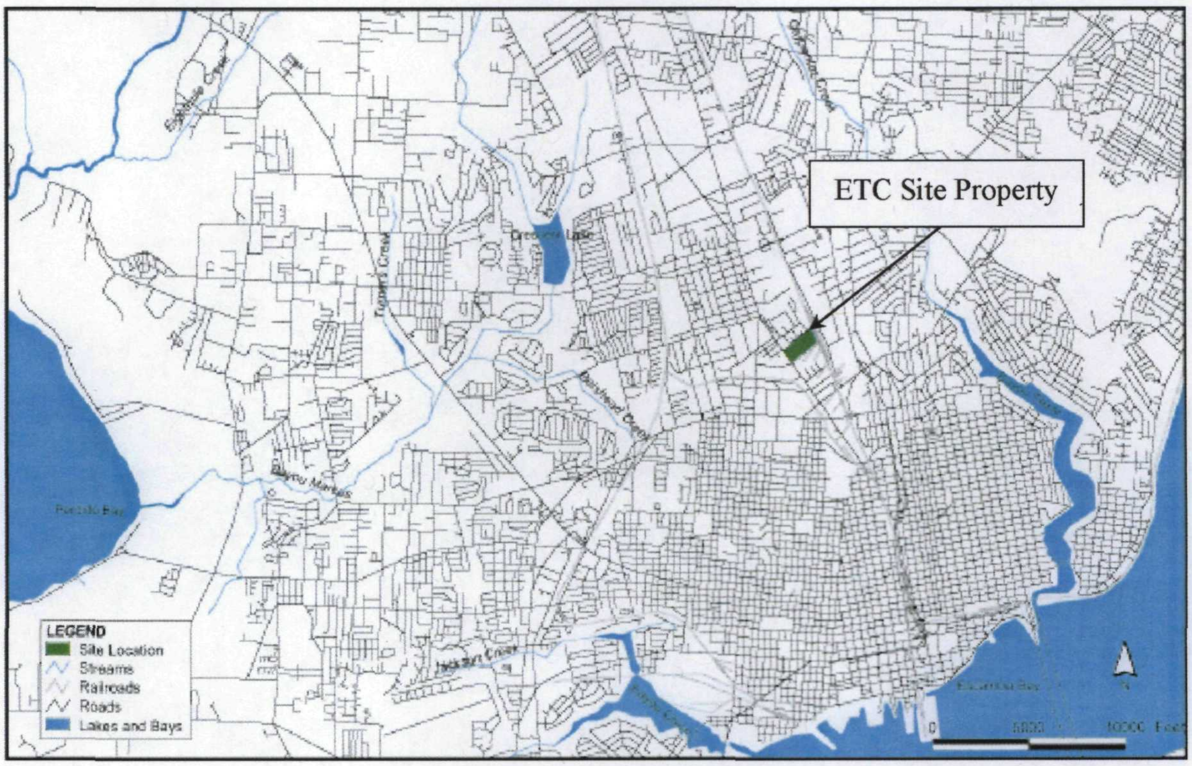

Figure 1. ETC Site Location Map

The ETC Site is an abandoned wood preserving facility that operated from 1942 until its closing in 1982. The Site is located at approximately 30° 27' 19" north latitude and 87° 13' west longitude, and the ETC property occupies approximately 26-acres. The Site is bordered on the north by residential neighborhoods, on the west by Palafox Street, on the east by the CSX Railroad Switchyard, and on the south by an abandoned concrete plant and small industrial park. During its operational period, the facility treated utility poles, foundation pilings, and lumber with creosote and pentachlorophenol.

Prior to the National Relocation Pilot Project (see Section 2.5.2) interim action, the nearest residences were directly adjacent to the northeastern boundary of the Site. This residential area nearest the Site included Rosewood Terrace, Oak Park, and the Escambia Arms apartment complex. The Palafox Industrial Park is south of the Site, and abuts another relocated neighborhood encompassing Herman Avenue and Pearl Street to the south. A mixed commercial and residential area west of Palafox Street, known as the Clarinda triangle, also has been impacted by the Site, and was not a subject of the interim action. Prior to relocation, the population surrounding the Site was distributed as follows: 0-.25 miles (180); 0.25 - 0.5 miles (540); 0.5 - 1 mile (8,909); 1.0-2.0 miles (24,094). Three schools with an enrollment of approximately 2700 students are located from 0.5 to 1 mile from the Site. Figure 2 illustrates the neighborhoods around the ETC Site.

Figure 2. Neighborhoods around the ETC Site (Relocated Neighborhoods are Highlighted)

Ground water beneath and down gradient of the Site has been impacted by releases from the Site. The ground water contamination will be addressed by OU-2, which is undergoing Remedial Investigation/Feasibility Study (RI/FS). The prior EPA soil removal action has been effective at reducing or eliminating ongoing impacts to ground water. No drinking water wells are known to be present within the contaminated aquifer. There are no surface water bodies in the immediate vicinity of the ETC Site. Bayou Texar is located 1.5 miles east of the Site, and is the discharge point for ground water beneath the Site. Bayou Texar flows to Pensacola Bay which is 3.5 miles south of the ETC Site.

2.2 Site History and Enforcement Activities

2.2.1 Operational History

The ETC site was first developed in 1942 as a manufacturing facility of wood products treated with creosote. Before the start of operations in 1942, the land was used for farming (Weston, 1993d). ETC's Pensacola facility was involved in the pressure-treating of wood products, primarily utility poles and foundation pilings. Southern Yellow Pine was debarked, formed, dried, impregnated with preservatives, and stored at the facility until delivered to customers. From 1944 to approximately 1970, coal-tar creosote was used as the primary wood preservative. PCP dissolved in No. 6 diesel fuel was used at the facility as a preservative from 1963, and was the sole preservative in use from 1970 to 1982 (A.T. Kearney 1990).

Creosote is a mixture of more than 200 organic compounds that are distilled from coal tar at temperatures between 200°C and 400°C. PCP is prepared by the chlorination of phenol in the presence of a catalyst, and is commonly acquired in bulk crystalline form and dissolved in hot diesel fuel because PCP is a solid at ambient temperatures.

Before pressure impregnation of preservative into the debarked and "framed," or formed, wood products, naturally-occurring moisture and resin were removed from the Southern Yellow Pine using a steam/vacuum process. In this process, the wood was placed in treater cylinders and heated using steam from the facility's wood-fired boiler. Condensate formed in the cylinders during the heating cycle was continuously drained to a condenser hot well, then to a primary oil/water separator via a process drain system. At the end of the heating cycle, the cylinders were vented, and a vacuum was applied. Liquids in the wood, which were either vaporized and removed by the vacuum system or removed from the wood by internally-generated steam, settled to the bottom of the cylinders. These liquids then were pumped to the primary oil/water separator at the conclusion of the vacuum cycle. The vacuum system at ETC was a steam ejector jet attached to an elevated, direct-contact, barometric condenser. Vapors from the treater cylinders condensed, mixed with the condenser cooling water, and were gravity-fed from the condenser 35 feet in the air to the condenser hot well, and then to the oil/water separator (A. T. Kearney, 1990).

Following the heating/vacuum cycle, the wood preservative was impregnated into the wood under pressure. After the impregnation cycle, the pressure was reduced in the treating cylinders, and the wood products were removed from the cylinders on trams used to transport the wood stock.

Following pressure reduction, excess wood preservative was allowed to drain from the treated products along drip tracks before on-site storage in the nine treated-wood-storage areas.

Contaminated wastewater and runoff from the former treatment area were the primary wastes managed at the facility. In the early years of operation, all wastewater was sent to an unlined impoundment located in the northeastern part of the site. This natural earthen unit was used from the mid-1940s through the mid-1950s. After the mid-1950s, process wastewater and contaminated runoff were managed by two separate systems. Process wastewater was initially managed by an oil/water separator to recover treating chemicals and process water for reuse in the wood-treating process. The system consisted of two concrete and treated wood impoundments. The former "hot" and "cold" ponds, each used from 1955 to 1982, and with a holding area of 6250 cubic feet, operated in series. The "hot" pond received wastewater laden with PCP and creosote before its discharge via shower heads into the "cold" pond. The shower heads cooled the water, volatilizing some of the organic constituents. Water from this unit was discharged to the Pensacola sanitary sewer system or pumped back into the process vacuum line.

The contaminated runoff from the treatment area was directed into a runoff collection/separation system. This system consisted of a concrete collection pad and a series of separation basins, which removed waste-treating solutions from the runoff water. Runoff was then pumped via a storm-drain system to an impoundment located in the southern section of the facility. The impoundment, which was constructed of sectionally poured concrete, had a holding capacity of 225,000 gallons. Wastewater in the impoundment, also known as the "swimming pool", was allowed to evaporate, and the remaining content was discharged to the Pensacola sanitary sewer system (A. T. Kearney 1990).

2.2.2 Regulatory and Enforcement History

The ETC site has a lengthy regulatory history that begins with the submittal of the Notification of Hazardous Waste Activity Form (CERCLA 103C) to EPA on August 15, 1980. Before this submittal and the promulgation of the Resource Conservation and Recovery Act (RCRA), little available documentation was generated regarding compliance and non-compliance with federal, state, or county rules and regulations (A. T. Kearney 1990).

As required under the notification provision of RCRA, a Part A Permit Application was submitted by ETC on November 18, 1980, to the Florida Department of Environmental Regulation (FDER) for a permit to operate a hazardous waste storage facility engaged in the storage of K001 Wood Preservative waste. K001 Wood Preservative waste is defined as "bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol" under 40 CFR Part 261.32. Although ETC ceased operation in October 1982, three surface impoundments at the facility that contained K001 sludge and wastewater required permitting and closure.

ETC applied to the State of Florida for a Temporary Operating Permit (TOP) on April 11, 1983. Permit number HT17-68894 was issued on March 2, 1984, with an expiration date of January 1, 1987. The specific provision of the permit required ETC to submit a modified closure plan, groundwater monitoring plan, and statistical analysis of groundwater samples (A. T. Kearney 1990). As a result of these requirements, the facility submitted a revised closure plan for the surface impoundments in March 1985.

In May 1985, ETC submitted to the Hazardous Waste Management Section in Tallahassee, Florida, a request for waiver allowing the post-closure care period to continue for a minimum of 5 years, rather than be supplanted by the 30-year, post-closure period required under the RCRA regulations. On May 3, 1985, the waiver was denied and the facility was required to maintain a 30-year, post-closure period of operation (A. T. Kearney 1990).

On August 20, 1985, a Warning Letter was issued to ETC regarding violation of the RCRA financial requirements. The warning letter was followed by a Notice of Violation (NOV) on September 15, 1985, resulting from the facility's failure to respond to the warning letter. The major violations cited in the NOV dealt with the groundwater program and the failure to provide financial assurance (A. T. Kearney 1990).

During the month of September 1985, in accordance with the TOP, the facility removed sludges from the three surface impoundments and transported them off-site to a hazardous waste facility in Alabama (A. T. Kearney 1990). On October 2, 1985, a revised closure plan addressing the 30-year, post-closure requirements under the regulations was submitted to FDER. In addition, the facility was able to obtain a standby letter of credit for closure/post-closure costs as part of the RCRA financial assurance requirements.

In a letter dated November 13, 1985, the facility owners stated that issues in a previous NOV from the FDER had been addressed regarding financial assurance with the exception of the sudden and non-sudden insurance. The applicable insurance policy was canceled July 1, 1985, and ETC had been unable to obtain another policy. On December 14, 1985, ETC obtained liability insurance; however, the policy clearly stated that the general liability insurance coverage excluded pollution events.

On December 31, 1985, Consent Order No 85-0985 between the State of Florida and ETC was signed by both parties to establish a compliance schedule for ETC. This schedule for the installation of additional monitoring wells and the submittal of an acceptable groundwater monitoring program was reviewed by the state. The financial assurance issue was handled by the use of a "good-faith effort," which the State considered to be a temporary solution to liability coverage. This required ETC to show evidence, every 90 days, of contacts with known suppliers of pollution liability coverage.

Following the consent order, additional information concerning the closure permit was received from the facility on February 13, 1986; May 29, 1986; and June 24, 1986. On December 19, 1986, the State of Florida issued a notice of intent to issue a permit for closure of the ETC facility. The closure permit application submitted and modified by the facility contained additional permit conditions (closure) established by the state. These conditions addressed groundwater monitoring; location, number, and depths of wells; and sampling parameters during closure and post-closure, and were unacceptable to the facility. According to ETC personnel, they did not believe that an extensive groundwater monitoring program was necessary because 168 cubic yards of K001 sludge was removed from the three impoundments in September 1985.

In February 1987, ETC submitted a petition to request a hearing on FDER's intent to issue a permit. ETC objected to the requirements that additional groundwater monitoring wells be installed. ETC claimed that FDER had not sufficiently justified the need for additional wells. Furthermore, ETC representatives questioned FDER's authority regarding groundwater monitoring at the site and the proper closure of the surface impoundments. During April, 1987, a down gradient facility, Agrico Chemical, notified the state and EPA that its up gradient well was contaminated with PCP, and on April 15, 1987, EPA conducted a site visit at Agrico to sample the up gradient well.

In September 1987, EPA issued a complaint and compliance order regarding the installation of a groundwater monitoring system at the facility waste management areas which would fulfill the groundwater monitoring requirements of 40 CFR.265.91 (Tobin 1987). During May 1988, a Preliminary Reassessment was conducted at the ETC facility to confirm the findings of the initial preliminary assessment conducted by FDER on July 31, 1984. Reviews of data collected by the EPA Environmental Services Division (ESD) (Sampling Inspection of June 27, 1988), off-site reconnaissance and target survey findings, and reviews of existing EPA and FDER material concluded that the facility should be slated for further investigations.

In September 1988, EPA filed a complaint against ETC regarding violations at the Pensacola and other facilities. In April 1989, EPA conducted a compliance evaluation inspection at the ETC site, and noted several interim status standards violations of 40 CFR 265.

A preliminary review and visual site inspection were conducted during the RCRA Facility Assessment (RFA) to identify Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) in June of 1990 by EPA (A. T. Kearney 1990). The RFA was required pursuant to the Hazardous and Solid Waste Amendments (HSWA) of 1984, which expanded EPA's authority under RCRA to require corrective action for releases of hazardous waste or constituents from SWMUs for facilities such as ETC that sought a RCRA permit. The RCRA correction action process applies to all SWMUs and AOCs that have the potential to release hazardous constituents.

The RFA identified 31 SWMUs and 2 AOCs of which 16 SWMUs and 1 AOC were deemed to require further action (A. T. Kearney 1990).

The Escambia Wood Treating Company filed for bankruptcy and abandoned the Site in 1991. The company defaulted on its environmental liabilities, and the case was referred to the Department of Justice (DoJ) to pursue settlement with the owner. DoJ reached a final settlement with the owner in 2002.

2.2.3 Previous Investigations

The ETC site has been the subject of numerous previous investigations. These investigations are briefly summarized below:

- **1982 EPA Environmental Services Division (ESD) Investigation**

In November 1982, EPA ESD conducted a RCRA compliance monitoring non-site-specific, Superfund Investigation at the ETC Site. Ground water, soil cores, and waste samples were collected during this investigation. Ground water was collected from two existing supply wells, and no wood preserving or related compounds were detected. Soil core samples collected on site had elevated concentrations of metals and wood preserving related compounds. Samples of wastewaters and sludges had highly elevated concentrations of pentachlorophenol (PCP).

- **1984 Preliminary Assessment**

In July 1984, EPA conducted an on-site inspection and used the results of the 1982 ESD investigation and a 1983 FDER RCRA compliance report to complete a potential hazardous-waste-site preliminary assessment. The assessment reported that no damage to off-site property was observed, but that runoff produced at the site might contaminate nearby storm drains, detention ponds, and other facilities. The assessment concluded that although the extent of contamination was not known, it could extend off-site, and sampling would be necessary to determine if it did (EPA 1984a).

- **1984 Site Inspection**

In August 1984, National Water Well Association Research Facility personnel recorded monitoring-well data from the facility's four monitor wells as part of a Site Inspection. The Site Inspection was conducted under contract with USEPA.

- **1986 Geohydrological Investigation**

In July 1986, Larry M. Jacobs & Associates, Inc. (LMJA) conducted a geohydrological investigation of the ETC Site for the Escambia Wood Treating Company. The investigation consisted of three 150-foot-deep standard penetration test borings, laboratory tests on selected soil samples, a site visit, and inspection and analysis of samples. Unidentified odors were detected in the soil samples collected near the water table at a depth of 40 feet to 45 feet in one boring. Additional odors were detected from 85 feet to 118 feet below grade in a layer of white, slightly silty, fine sand soils. The FDER, reviewed the results of the geohydrologic investigation, and indicated that due to the local geology any contaminant discharged at the Site could reach the main production zone of the Sand and Gravel Aquifer (180 feet to 280 feet bls), given time, distance, and effect produced by public supply wells downgradient of the site (Kennedy 1986).

- **1987 FDER Site Investigation**

In August and September of 1987, FDER conducted an investigation at the ETC Site. The objective of the investigation was to determine if the old creosote pond (SWMU 10), located in the northeast corner of the abandoned facility, was a source of ground water contamination. Ground water monitoring and flow data generated in this study indicate that a significant contamination problem existed in the area of the pond and immediately down gradient. The contaminants identified included high concentrations of polynuclear aromatic hydrocarbons (PAHs) and PCP, all of which are associated with the wood treating process and directly associated with the creosote pond contents. These compounds also had been identified in an earlier set of ground water samples taken at the abandoned Agrico facility, which is located less than a mile to the south (downgradient from the pond). The FDER investigation concluded that to accurately assess the area of ground water that has been impacted by this source, a comprehensive investigation that includes multi-level monitoring would be necessary (FDER 1988).

- **1987 EPA ESD Compliance Sampling Inspection**

  A RCRA sampling inspection was conducted at the ETC site by EPA ESD during the week of December 7, 1987. Samples were collected from five monitoring wells, three waste containers, and three soil sites at the facility. The material in the tanks appeared to be waste sludge. Results from the metals analysis show that the metals concentrations in the groundwater samples and soil samples were generally at or near background levels. A number of organic compounds were detected at very high concentrations in many of the samples. Both volatile and semi-volatile organic compounds associated with wood treating were detected.

- **1988 Preliminary Reassessment**

  A preliminary reassessment conducted by NUS Corporation in May 1988 noted that the aquifer of concern beneath the ETC site is the unconfined Sand-and-Gravel aquifer, and that this system of interbedded, unconsolidated quartz, sand, and gravel supplies most of the agricultural, industrial, municipal, and domestic water needs of this portion of western Florida, including Escambia and Santa Rosa counties. The Preliminary Reassessment concluded that the site should be considered for further investigation.

- **1990 RCRA Facility Assessment**

  A preliminary review and visual site inspection were conducted during the 1990 RCRA Facility Assessment (RFA) to identify SWMUs and AOCs. The RFA identified 31 SWMUs and 2 AOCs. Sixteen SWMUs and 1 AOC were deemed to require further action (AT Kearney 1990). The RFA concluded that almost the entire facility should be considered an AOC. The area of greatest concern appeared to be the SWMU 10 area and the entire former treating area. The area of least concern appeared to be the northwest section of the facility which appeared to manage only wood stock awaiting treatment. An additional concern that was identified was the extent of possible creosote contamination in the uppermost aquifer. The RFA report concludes that potential dense non-aqueous phase liquid could have migrated southeastward, based on the structure of the lower confining zone, the Pensacola Clay. At the time of the RFA, none of the existing monitor wells had been drilled to the lower confining layer, so this could not be tested (A. T. Kearney 1990).

- **1991 Preliminary Assessment**

The EPA Emergency Response Team (ERT) was activated by the EPA Region IV On-Scene Coordinator (OSC) to perform a preliminary assessment at the ETC site in 1991 (Weston 1991). The preliminary assessment consisted of soil, groundwater, sludge, and air sampling, and conducting a bioassessment. The preliminary assessment presented the following conclusions:

- Soil in SWMU#10 was highly contaminated with creosote compounds.
- Soil in the process area was highly contaminated with PCP, dioxins/furans, and creosote compounds.
- Groundwater appeared to be moving in a southeasterly direction.
- Creosote compounds, PCP, and VOCs associated with their carriers have leached into the on-site groundwater.
- Sludge in SWMU#7 and SWMU#17 were highly contaminated and contained PCP, dioxins/furans, CCA (SWMU#7) and creosote compounds.
- Air sampling indicated that there was no immediate threat to the public through the migration of airborne contaminants.
- No areas of ecological concern exist on the Site that warrants further investigation or influence removal or remedial decisions.

- **1991 Air Monitoring and Air Sampling Investigation**

The EPA ERT performed air sampling and monitoring for excavation activities during the removal action at the ETC Site. The monitoring information gathered was used to make field decisions on health and safety concerns and to determine if there was off-site migration of contaminants occurred during the excavation and stockpiling activities (Weston 1991). The October and November, 1991 air sampling events coincided with excavation of the SWMU 10 area, while the December 1991 event was carried out in relation to excavation of the process area. Based on the air monitoring, dust suppression techniques were instituted in October 1991 as a result of readings from Location #2 (located along a path that dump trucks used to move excavated soil to the stockpile).

- **January 1992 Well Sampling, Treatability Sampling Volume Estimate Investigation**

The EPA ERT conducted an additional round of monitor well sampling and treatability study sampling. Overall, several contaminant levels from two wells associated with the SWMU 10 and Process Areas were significantly lower than the levels measured in 1991 (pre-removal action). Excavations and stockpiles on-site were surveyed to estimate the volume of contaminated soil excavated at the ETC Site (Weston 1992b).

- **1992 EPA ESD Field Investigation**

In July, 1992, EPA Region IV ESD conducted a sampling investigation at the ETC site to acquire additional data for site risk assessment (EPA 1992). Surface soil samples were collected from two locations on-site and from six residences located adjacent to and north of the site. In addition to analysis of volatile and semi-volatile compounds, dioxin/furan compounds were analyzed and detected in all samples collected. The background sample contained the lowest concentrations of dioxin/furan compounds, and the duplicate samples from the residence adjacent to the ETC site contained the highest concentrations.

- **1992 Extent of Contamination Study - Phase II**

The objective of this study was to identify the volume of soil to be removed for SWMUs 10 and 16 (based on contaminant concentration and depth) and to characterize the lithology of the material encountered during sampling activities at the ETC Site (Weston 1992d).The Phase II Contamination Study Report concluded that the two SWMUs were targeted correctly, and that excavation work had succeeded in removing the bulk of contaminated soil. The distribution of contaminant concentrations relative to depth indicates that contaminants have been transported laterally by groundwater movement; however, the direction of groundwater flow indicated by the contamination profile of some boreholes was not in agreement with previously identified groundwater flow directions, and further ground water characterization was warranted.

- **1992 Air Sampling Investigation**

The objective of this project was to conduct air sampling and monitoring at the ETC Site to characterize residential and on-site airborne concentrations of PCP, dioxins, PAHs, and VOCs during the excavation and stockpiling of PCP and creosote contaminated soils. Data collected were evaluated against community action limits of 59 ug/m^3 for PCP and 5.5 pg/m^3 for dioxin. The results from the sampling indicated that the levels established in the air sampling plan for dioxin, PCP, and/or PAHs were never exceeded. The highest detected levels always were at the station downwind and closest to the work activities.

- **1994 EPA ESD Field Investigation**

In July, 1994, EPA ESD conducted a sampling investigation to identify the presence and concentrations of any organic constituents in the drinking water supply that might be associated with wastes from the ETC Site. Water samples were collected from three fire hydrants located across the site, and from two of the city water supply wells that provide water to residents near the site. EPA concluded that all of the constituents sampled are below EPA's National Primary Drinking Water Regulations or any other health-based standards with the exception of one detection of tetrachloroethylene (PCE) in City Well #9 (raw water) at a concentration of 6.6 ug/l. EPA's MCL for PCE is 5 ug/l. However, when the well was sampled after treatment (filtering), the PCE concentration was below the detection limit, and EPA concluded that the use of this water supply well should not result in any adverse health effects.. PCE is not a chemical associated with the ETC Site.

- **Soil Removal Action - Related Sampling**

Removal activities at the ETC site began on October 14, 1991. Removal activities consisted in part of the excavation and stockpiling of contaminated material, proper off-site disposal of PCB transformers, proper overpacking and disposal of various containers from the former laboratory building and from around the site, and separation and proper disposal of asbestos material on-site (related to demolition of on-site buildings). During this removal action, extensive sampling activities were conducted to help define the extent of contamination in the SWMU 10, SWMU 16, and process areas, and as a preliminary means of determining if additional excavation was needed (Weston 1993d).

Test pits were dug in the north pond and process area excavation pits in an attempt to determine extent of contamination. Immunoassay kit results for PCP and total petroleum hydrocarbons (TPH) indicated that contamination was present in the north pond area at a depth of 50 feet and at a depth of 35 feet in the process area.

Excavation activities were completed in October 1992. An EPA Superfund Removal Update dated March 1994 indicated that the excavations went to a depth of 40 feet where groundwater was encountered. Contaminant concentrations remained above action levels (except dioxin levels) and a visible LNAPL was present on top of the water table. According to the Removal Update, the lateral extent of contamination appears to have been captured within the excavation area. Removal activities did not involve removal or treatment of contaminated groundwater. Figure 3 provides an aerial photograph of the removal soil stockpile and surrounding properties.

2.2.4 Remedial Investigations/Feasibility Studies

EPA proposed the ETC Site for inclusion on the National Priorities List (NPL) in August 1994. The site's listing on the NPL was finalized on December 16, 1994. Development of work plans for a combined RI/FS of the ETC Site was begun in 1994. During this RI/FS, it was determined that defining separate operable units for source soils and ground water would result in a more efficient cleanup approach. In 1998, the Remedial Investigation (RI) for OU-1 (Soil) was completed, and a Feasibility Study (FS) was issued in June, 1998. Discussions ensued among EPA and FDEP regarding selection of appropriate cleanup standards for soil, and EPA undertook additional sampling to define the extent of contamination using the more stringent FDEP cleanup standards. A revised FS incorporating the results of the additional sampling was issued in June 2005.

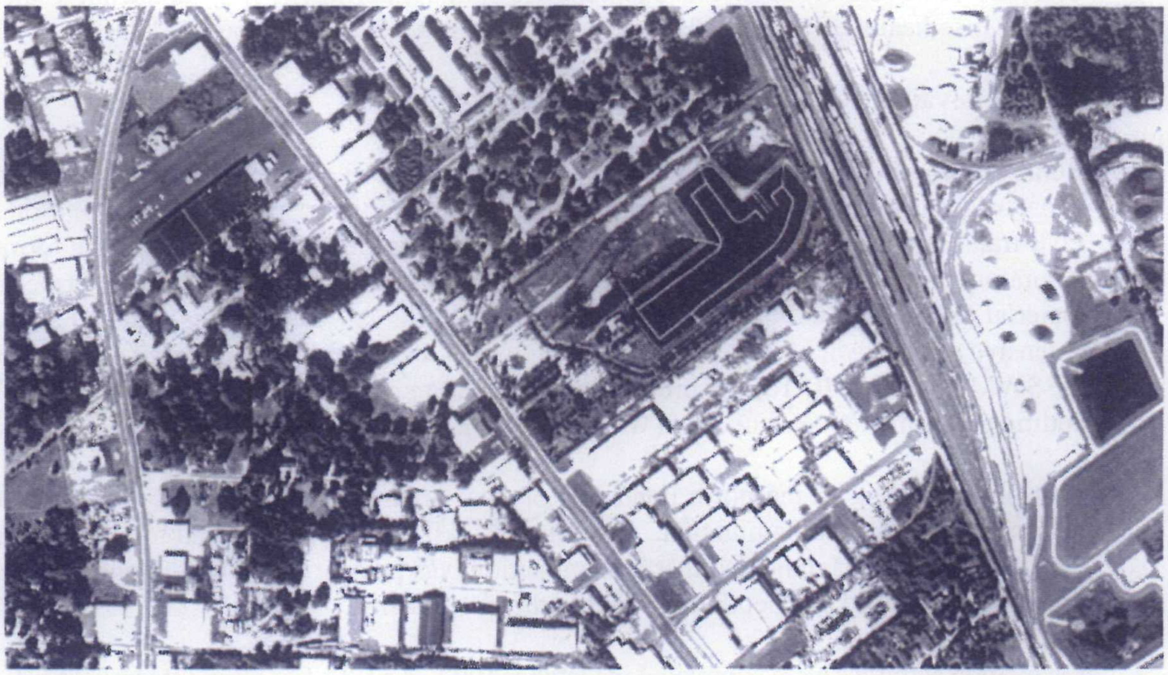

Figure 3. Aerial Photograph of the ETC Site Soil Stockpile and Surrounding Properties

- **1998 Remedial Investigation**

The field investigation for the ETC RI was developed as a two-phased comprehensive data collection program (CDM, 1998). The main objective of the Phase I field investigation was to characterize the nature of on-site soil and ground water contamination and the extent of potential contamination in the adjacent neighborhood which may be attributable to the ETC Site. For Phase II, the objective of the field investigation was to determine the vertical and horizontal extent of groundwater contamination attributable to the ETC Site. Due to the separation of the Site into two OUs, the RI Report was focused on the results of the soil investigation (OU-1).

The on-site soil sampling was subdivided into three areas. In the SWMU-10/Process Area Excavation area (prior removal action area), elevated concentrations of polyaromatic hydrocarbons (PAH), PCP, and dioxin were detected in surface and subsurface soils. Around the Stockpile Perimeter area, similar contamination was identified, but appeared to be associated with the prior operations of the facility. In the remainder of the ETC Site area relatively low levels of contaminants were widespread in surface soils, and three locations had notable contamination. In the off-site Rosewood Terrace/Oak Park/Escambia Arms neighborhoods, PAH and dioxin contamination was primarily located adjacent to the ETC Site and at the Escambia Arms apartment complex. Subsurface soil contamination appeared to be limited to the area adjacent to the ETC Site. In the Pearl Street and Hermann Avenue neighborhood PAH contamination was fairly widespread, and localized areas had elecated concentrations of metals and pesticides. Limited dioxin data was collected, but this contaminant was present in the area.

- **1998 Feasibility Study**

The primary objectives of this FS were to support the identification of remedial goal options (RGOs) for contaminated surface and subsurface soil; to determine the extent of contamination above the RGOs; to develop general response actions (GRAs); to identify, screen, and select remedial technologies and process options applicable to the contamination associated with the Site; and to develop and analyze possible remedial action alternatives for the site. Risk-based remedial goal options (RGOs) were calculated for both cancer and non-cancer effects for the contaminants of concern (COCs) attributed to past operations at the site in soil on-site, as well as off-site residential areas (Rosewood Terrace/Oak Park/Escambia Arms and Pearl Street/Hermann Avenue neighborhoods). Remedial alternative for soils acting as contaminant sources considered the following COCs; the PAHs, collectively considered as benzo(a)pyrene equivalents (BaP EQ), and dioxins, collectively considered as 2,3,7,8-TCDD toxicity equivalents (TEQ). In addition, the following groundwater COCs also were considered: naphthalene, acenaphthene, fluorene, phenanthrene, 2-methylnaphthalene, dibenzofuran, carbazole, and pentachlorophenol. Residential and industrial RGOs, using the Summers model to calculate values for protection of ground water and EPA interim cleanup standards for dioxin, resulted in the following estimated volumes, including stockpiled soils, for the soil cleanup:

~	Residential	1E-6/HQ=0.1	651,050 cubic yards (cy)
		1E-5/HQ=1	456,838 cy
		1E-4/HQ=3	347,537 cy
~	Industrial	1E-6/HQ=0.1	481,404 cy
		1E-5/HQ=1	361,816 cy
		1E-4/HQ=3	269,182 cy

- **2005 Feasibility Study and Additional Soil Investigation**

The objective of the 2005 FS (CDM, 2005a) was to revise the 1998 FS to incorporate the results of the 2004 Additional Soil Investigation (CDM, 2004) and to update the depiction of the extent of contaminated soil and estimate of contaminated soil volumes as well as the remedial alternatives and cost estimates presented in the 1998 FS. The primary objectives of the FS are to: identify remediation goals for soil; determine the extent of soil contamination above remediation goals; present remedial action objectives (RAOs) for soil contamination; develop general response actions (GRAs); identify, screen, and select remedial technologies and process options applicable to the soil contamination associated with the site; and develop and analyze remedial action alternatives.

The Additional Soil Investigation consisted primarily of collection of surface soil samples from off-site properties. This data was used to fill data gaps and refine the extent of contamination in areas known to be impacted by releases from the Site. Additionally, the area known as the Clarinda triangle was investigated during this effort. Elevated concentrations of PAH (as BaP EQ) and dioxin (as TEQ) were identified within the Clarinda triangle, and EPA has determined that this contamination is attributable to the ETC Site.

2.3 Community Participation

There is a high-degree of interest within the nearby community, and throughout the City of Pensacola and Escambia County, in the ETC Site cleanup. This is attributable to a number of factors, including: the location of the Site in a mixed commercial and residential area on a major thoroughfare near downtown; the interim remedial action that resulted in the relocation of over 350 households; and, the existence of active community interest groups. There have been numerous Congressional inquiries related to this project, and two Grand Jury Reports at the local government level. A Technical Assistance Grant is in place with Citizens Against Toxic Exposure, a local environmental group. There also has been a recent investigation by the EPA Ombudsman that resulted in an update of the Community Involvement Plan and increases in direct community contacts. A number of Fact Sheets and Public Availability sessions have been held over the course of the RI/FS.

In support of this decision, the Proposed Plan Fact Sheet was made available to the community on August 17, 2005. The Administrative Record file is available to the public and is placed in the information repository maintained at the EPA Region 4 Superfund Record Center and at the West Florida Regional Library at 200 West Gregory Street, Pensacola, Florida. The notice of the availability of the Administrative Record and an announcement of the Proposed Plan public meeting was published in the Pensacola News Journal newspaper on August 19, 2005. A public comment period was held from August 17, 2005 to September 15, 2005, and this was subsequently extended through November 28, 2005. The Proposed Plan was presented to the community during a public meeting on September 1, 2005 at the New Hope Missionary Baptist Church. At this meeting, representatives from EPA, FDEP, and local government answered questions from the community concerning the proposed remedy and the remedial alternatives evaluated. Based in large part on the expressed community concerns, EPA re-evaluated the proposed remedy and issued a Proposed Plan Update to address these concerns. The Proposed Plan Update was issued on October 30, 2005, and EPA held a public availability session on November 14, 2005 to present the modifications of the proposed remedy to the community. EPA's responses to the comments received during the public comment period are included in the Responsiveness Summary, located in Part 3 of this ROD. The transcript from the public meeting can be found in the Administrative Record and as Appendix A to this Record of Decision.

2.4 Scope and Role of Operable Unit or Response Action

EPA has chosen to use two Operable Units for the ETC Site. OU-1 addresses contaminated soil and waste that is present on-site, including excavated material from the 1991 removal action stockpiled on-site, and contaminated soil present in off-site areas attributable to the ETC Site. OU-2 addresses contaminated ground water present beneath and down gradient of the Site associated with releases from the Site. This decision document presents the final remedy for OU-1. This action will reduce or eliminate risks to human and ecological receptors from contaminated soil, and reduce or eliminate any further impacts to ground water.

2.5 Site Characteristics

2.5.1 Conceptual Site Model

The conceptual site model describes the release mechanisms, migration pathways, and potential exposure mechanisms for human receptors. A summary of the conceptual model is provided as Figure 4, and is summarized below:

- Releases from spills, former impoundments, and airborne sources contaminated surface and subsurface soils;
- Volatilization and dust generated from contaminated soils creates a potential airborne exposure pathway for site workers and nearby residents through inhalation;
- Contaminated surface and subsurface soils pose a potential direct contact risk to site workers and nearby residents; and
- Leaching of contaminants from soil to ground water could potentially impact municipal and/or private users of ground water as a potable supply.

2.5.2 Site Overview

The Escambia Treating Company operated as a wood treating facility from 1942 to 1982. The facility is located in a mixed industrial and residential area of the City of Pensacola, Escambia County, Florida. Facility operations resulted in extensive creosote and PCP contamination in soil and ground water. Soil at the Site also is contaminated with dioxin, which is a common impurity in commercial-grade PCP.

To address the immediate threat posed by contamination at the site, EPA completed an extensive removal action in 1992. The removal activities were designed to stabilize the site while EPA evaluated long-term cleanup-solutions for site contamination. After installing a 12-foot high fence to restrict unauthorized access, EPA excavated approximately 255,000 cubic yards (cy) of contaminated soil and stockpiled these materials, which are still on-site, under a secure cover to prevent direct contact and further migration of contaminants into the ground water. Two large excavated areas, approximately 40 feet deep, remain adjacent to the stockpiled material.

In 1995 EPA Region 4 nominated ETC for the National Relocation Pilot Project, and an Interim Record of Decision was signed in 1997 The basis for this action included human health risk reduction, overall community welfare, cost/benefit and operational factors, configuration of the land area around the Site, and community development goals. Activities completed during the interim action include permanent relocation of 358 households (Rosewood Terrace, Oak Park, Escambia Arms, and Goulding neighborhoods), demolition of existing structures, institutional controls, and site maintenance pending the final remedial action for OU-1. The interim action will facilitate accomplishment of the OU-1 remedial action.

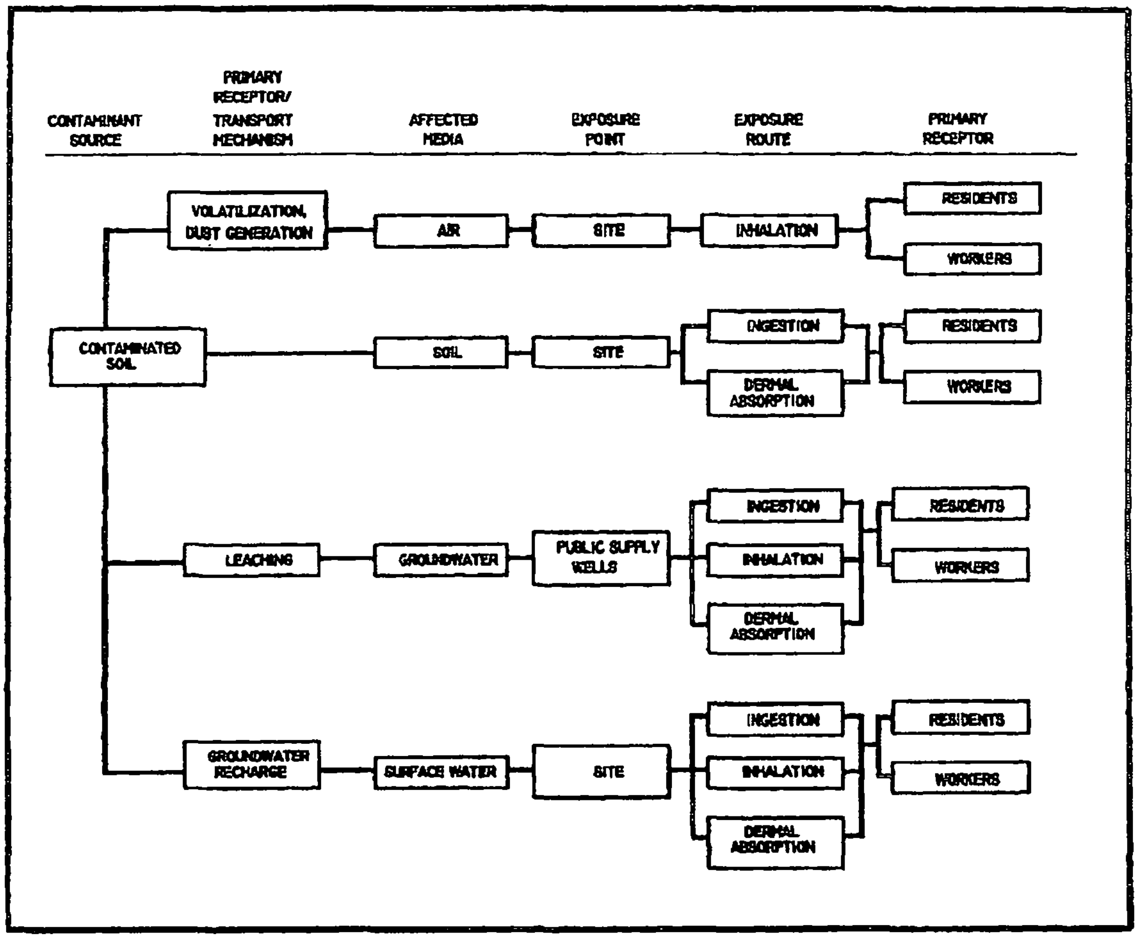

Figure 4. Site Conceptual Model

The portion of Western Florida that includes the ETC Site is located in the physiographic division known as the Coastal Plain Province, and the Site is located within the Coastal Lowlands subdivision of this province. The Coastal Lowlands are relatively undissected, nearly level, and lie at or below 100 feet above mean sea level (amsl). A distinctive topographic feature of the Coastal Lowlands are step-like Pleistocene marine terraces. One terrace is located in the downtown area of Pensacola; and the ETC site is located on this terrace at an elevation ranging from 85 feet to 92 feet amsl. Two excavations located on-site receive surface water runoff from the covered soil stockpile and from upslope areas. Runoff that does not discharge to the on-site excavations will flow with the natural gradient of the land surface to off-site discharge points located along the southern boundary of the Site. Site drainage also is controlled by perimeter ditching which routes runoff to the excavations on site.

2.5.3 Geology

The Coastal Lowlands are typified by stepped, marine terraces that consist of unconsolidated marine sedimentary deposits of Pleistocene and Holocene age that dip gently toward the coast. Escambia County lies on the north flank of the Gulf Coast geosyncline and the east bank of the Mississippi Embayment. Figure 5 illustrates the general stratigraphic sequence for the Pensacola area. The unconsolidated deposits are generally composed of sand, with varying proportions of silt, clay and gravel. Abrupt facies changes are common, and numerous lenses of clay, sandy clay and gravel characterize the sedimentary deposits that overlie deeper, consolidated limestone, rock units.

Surficial deposits consist of alluvium and terrace deposits of Holocene and Pleistocene age. These deposits consist of undifferentiated silt, sand, and gravel, with some clay (Weston 1992e). The primary lithology of these surficial deposits is sand.

Underlying the surficial sediments are Pliocene aged sedimentary deposits that make up the Citronelle Formation. These deposits consist of quartz sand, fine to very coarse in size. The maximum thickness of the Citronelle Formation is estimated to be 115 feet (LMJA 1986, Weston 1992e).

Below the Citronelle Formation are the sedimentary deposits of the Alum Bluff Group. The thickness of the Alum Group in the site area is estimated to be 130 feet (LMJA 1986). These Miocene-aged deposits consist of fossiliferous sand with lenses of silt, clay, and gravel. The primary lithology of this stratigraphic unit is sand. The Alum Bluff Group contains lenses of coarse- grained sediments (sand and gravel) that typically are highly permeable (Weston 1992e).

The Pensacola Clay underlies the Alum Group. This unit consists of clay and sandy clay, gray to dark gray in color. The fine grained deposits that make up this unit are of Miocene age and reach a maximum thickness of 370 feet (Weston 1992e). The base of the Pensacola Clay marks the contact between the unconsolidated (soil) sediments and consolidated (rock) limestone units that constitute the Floridan Aquifer. The Floridan Aquifer is comprised of the Chickasauhay and Tampa Formations (upper) and Ocala and Lisbon formations (lower). The consolidate rock units of the upper Floridan Aquifer consist of limestone, grayish white in color, with thin interbeds of gray clay and sand. Fossils are present; their percentage increases with increasing depth. The thickness of the upper Floridan Aquifer is estimated to be 350 feet (Weston, 1992e).

2.5.4 Hydrogeology

The aquifer system underlying the ETC Site consists of unconsolidated and consolidated sedimentary deposits that make up the surficial soils, the Citronelle Formation, the Alum Bluff Group, the Pensacola Clay, and the Tampa Limestone. The surficial aquifer is unconfined to semiconfined and exists under phreatic or water-table conditions. The surficial aquifer in this area is formally referred to as the Sand and Gravel Aquifer. It consists of surficial soils, the Citronelle Formation and the Alum Bluff Group. The Sand and Gravel Aquifer in the site area is approximately310 feet thick and is a primary source of groundwater used to supply potable water to

Series	Stratigraphic and hydrologic units			Lithology
Holocene and Pleistocene	Alluvium and terrace deposits		Sand and gravel aquifer	Undifferentiated silt, sand, and gravel, with some clay. Surficial zone of aquifer.
Pliocene	Citronelle Formation		Sand and gravel aquifer	Sand, very fine to very coarse and poorly sorted. Hardpan layers in upper part.
Miocene	Unnamed coarse clastics	Choctawhatchee Formation Alum Bluff Group Shoal River Formation Chipola Formation	Sand and gravel aquifer	Sand, shell, marl, sand with lenses of silt, clay, and gravel (includes unnamed coarse clastics and Alum Bluff Group). Main producing zone of aquifer.
Miocene	Pensacola Clay		Confining Unit	Dark to light gray sandy clay. Is basal confining unit in southern one-half of area.
Miocene	St. Marks Formation		Floridan Aquifer system	Limestone and dolomite - top of the Floridan aquifer system.

MODIFIED FROM USGS GROUNDWATER ATLAS OF THE UNITED STATES
http://capp.water.usgs.gov/gwa/ch_g/jpeg/G021.jpeg

Figure 5. General Stratigraphy of the ETC Site

area residents. The water table for this aquifer occurs at a depth of approximately 45 feet below land surface (bls).

Within the Sand and Gravel Aquifer, three zones of varying hydraulic character have been reported (Kennedy, 1986). The uppermost (shallow) zone is located at 40 to 60 feet bls. During a previous investigation, the water table within this zone was measured in 12 on-site wells at depths ranging from 42.5 feet to 44.2 feet bls, with associated elevations ranging from 47.1 to 49.6 feet above mean sea level (amsl). Based on the water level data collected on that date, groundwater flow is to the southeast.

The second (intermediate) zone was reported at a depth of 95 feet to 115 feet bls. This zone was identified during the drilling of three deep soil borings that were logged to 150 feet bls (LMJA, 1986). The deepest (deep) zone within the Sand and Gravel Aquifer has been reported as approximately 170 feet to 190 feet bls. This zone is one of the most productive sections of the Sand and Gravel Aquifer and is tapped by public water supply wells down gradient of the site that supply potable water to residents in the area. The three zones are not separated by distinct, defined, low permeability strata. As previously indicated, the existence of a clay layer of sufficient competence to prevent continued vertical migration of contaminants at approximately 215 ft bls, suggests that while contamination may migrate deeper than the monitored deep zone, the clay layer may keep it from migrating to the deepest depths of the Sand and Gravel Aquifer. A typical cross-section of the ETC Site hydrostratigraphy is presented in Figure 6.

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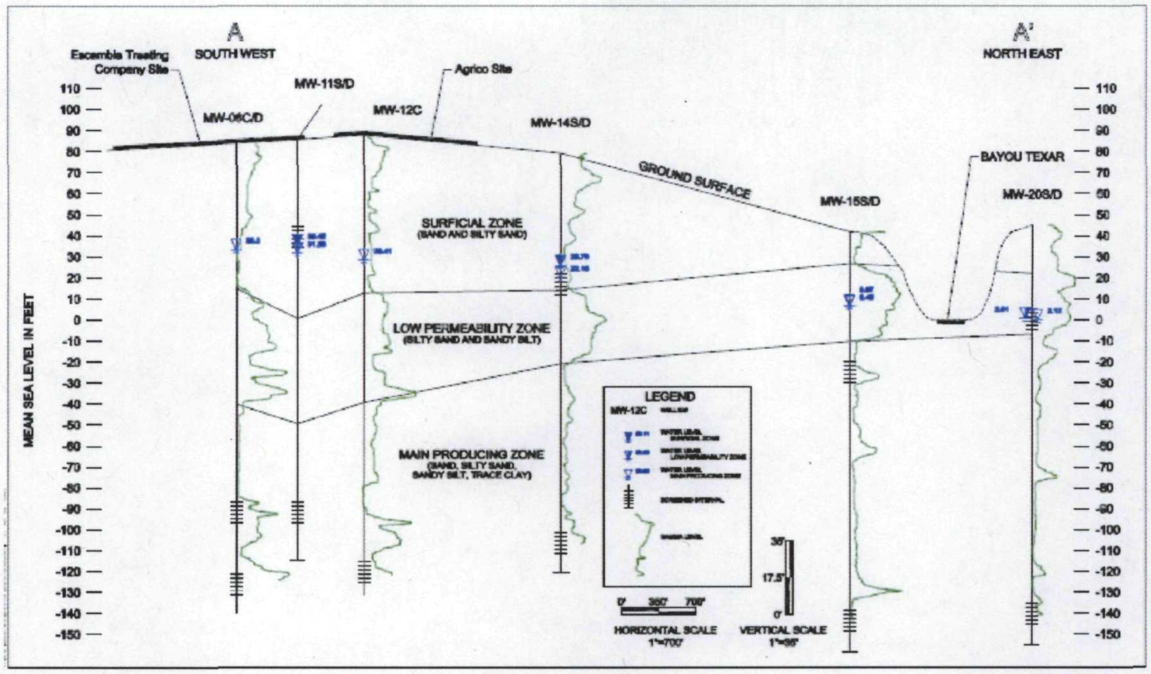

Figure 6. Cross-section of the ETC Site Hydrostratigraphy (Parallel to Ground Water Flow Direction)

2.5.5 Ecological Assessment

A bioassessment was completed as part of a preliminary assessment conducted at ETC in 1991 (Weston 1991). Species observed on the site are reported to be common in the region, and included cardinals, mockingbirds, house mice, rabbits, toads, and small lizards. Most of the plants found on-site during the bioassessment are common in the region or throughout the county. Some are considered nuisance species and opportunistic colonizers of disturbed areas. A review of the Natural Wetlands Inventory Map showed no wetlands on the site, but did indicate several small open-water, forested, and emergent marsh areas located within 1 kilometer of the site.

2.5.6 Nature and Extent of Contamination

This section summarizes the results and presents conclusions derived from testing of OU-1 media (surface soil and subsurface soil) during the 1998 RI and 2004 FS supplemental investigation activities.

2.5.6.1 1998 Remedial Investigation

Characterization of surface and subsurface soil contamination during the 1998 RI substantially defined the nature and extent of contamination on-site and in nearby residential areas. During the investigation, 61 surface soil and 71 subsurface soil samples were collected on-site, and 88 surface soil and 30 subsurface soil samples were collected off-site (Rosewood Terrace, Oak Park, Escambia Arms, Pearl Street, and Hermann Avenue). The RI data, and some data collected during previous investigations, were used to develop a series of drawings illustrating the distribution of contamination. Figures 7 through 14 present the nature and extent of on-site contamination defined during the 1998 RI (off-site contamination data is aggregated with data presented with the 2004 FS).

Based on the findings during the 1998 RI, the following conclusions were made:

SWMU 10/Process Area Excavations

The ETC RI results suggest that the removal action completed in 1992 was successful in removing the most highly contaminated soil, however, it did not remove all the contaminated soil associated with the SWMU 10 and Process Area portions of the ETC site. Some hot spots still remain on-site, and some of the highest PAH, pentachlorophenol, and dioxin concentrations were detected in surface and subsurface soil samples collected adjacent to the eastern perimeter of the SWMU 10 excavation (SS/SB28, SS/SB29), and on the western sidewall of the SWMU 10 excavation (SS/SB32, SS/SB33, SS/SB34). PAHs (ppm levels) were also detected at elevated levels (above background sample concentrations) in several of the Process Area subsurface soil samples. Except for 2378TCDD, TEQ concentrations, contamination in surface soil samples collected near or in the Process Area excavation generally were found at lower levels than those detected in the SWMU 10 excavation, although still at levels greater than detected in background samples.

Perimeter of Stockpile

The concentration range and number of contaminant detections for the samples collected around the perimeter of the stockpile indicate that the stockpile is not currently a contributing source to site contamination. However, the data along with the locations of some of the stockpile perimeter samples suggest that the detected contaminants may be attributable to the Process Area or SWMU 10. The levels detected in the perimeter samples, along with the pattern of positive hits, suggest that portions of the pile may be covering contaminated soil.

Remainder of ETC Site

The sampling results indicate that three other general areas of the site have notable concentrations of contaminants in surface soils. The three other areas include the rubble pile in the southeast corner of the site, the area south-southwest of the old ETC office building, and a small area just north of the Process Area excavation and south of the Rosewood Terrace neighborhood. In the area of the rubble pile, notable detections included PAHs and other semi-volatile organic compounds, dieldrin, and endrin. In the area south of the ETC office building, several pesticides, including dieldrin, gamma chlordane, 4,4'-DDT, and heptachlor epoxide were detected at elevated concentrations. In addition, several metals were detected at levels greater than the highest background concentration. Arsenic, cadmium, chromium, copper, lead, nickel, potassium, vanadium, and zinc all were detected at elevated concentrations in the area south of the ETC office. Although the highest 2,3,7,8 TCDD TEQ concentrations were associated with the SWMU 10 excavation and these other areas, elevated dioxin levels were common across the Site.

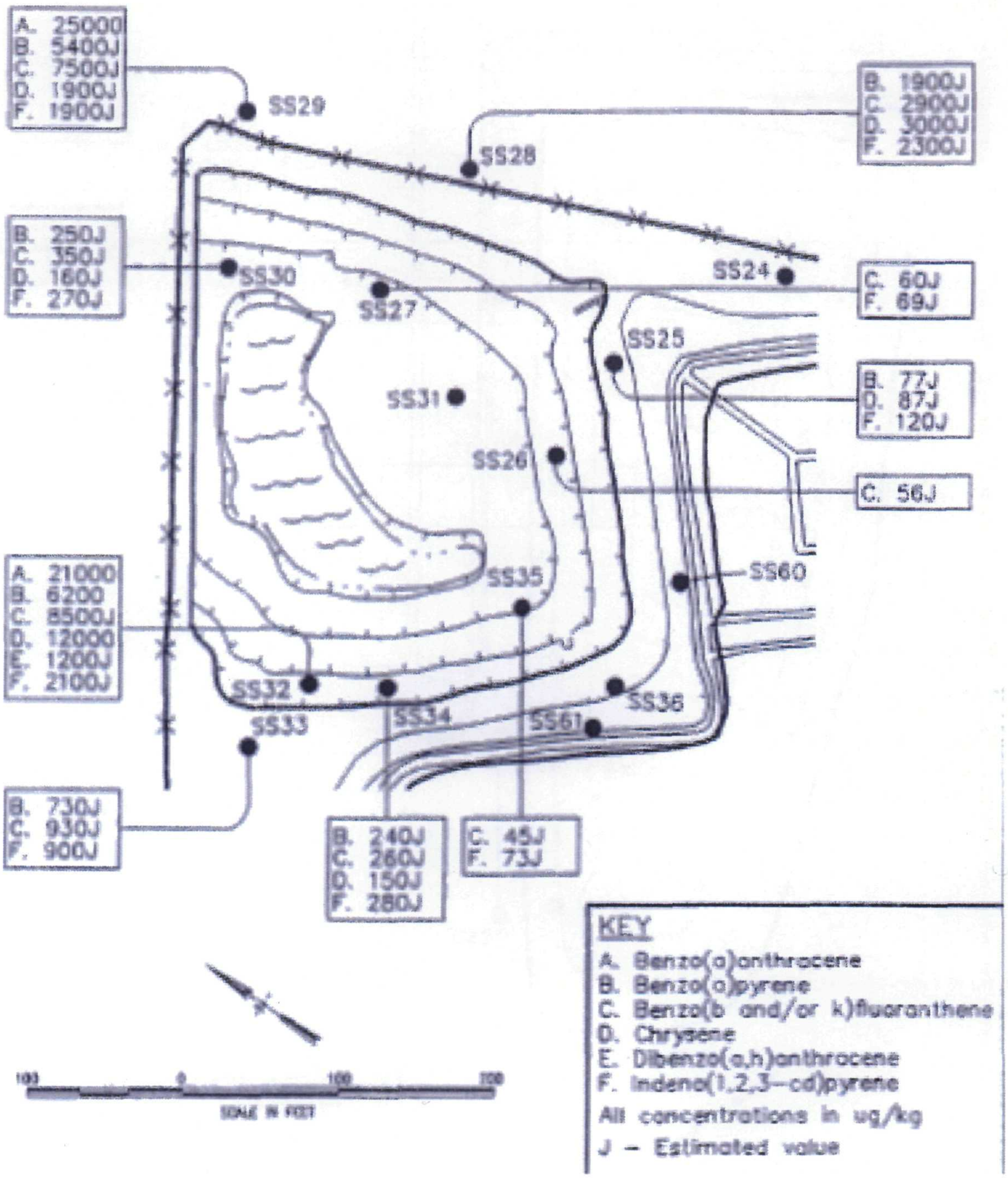

Figure 7. Distribution of Carcinogenic Polyaromatic Hydrocarbons in Existing Northeastern Excavation Soil

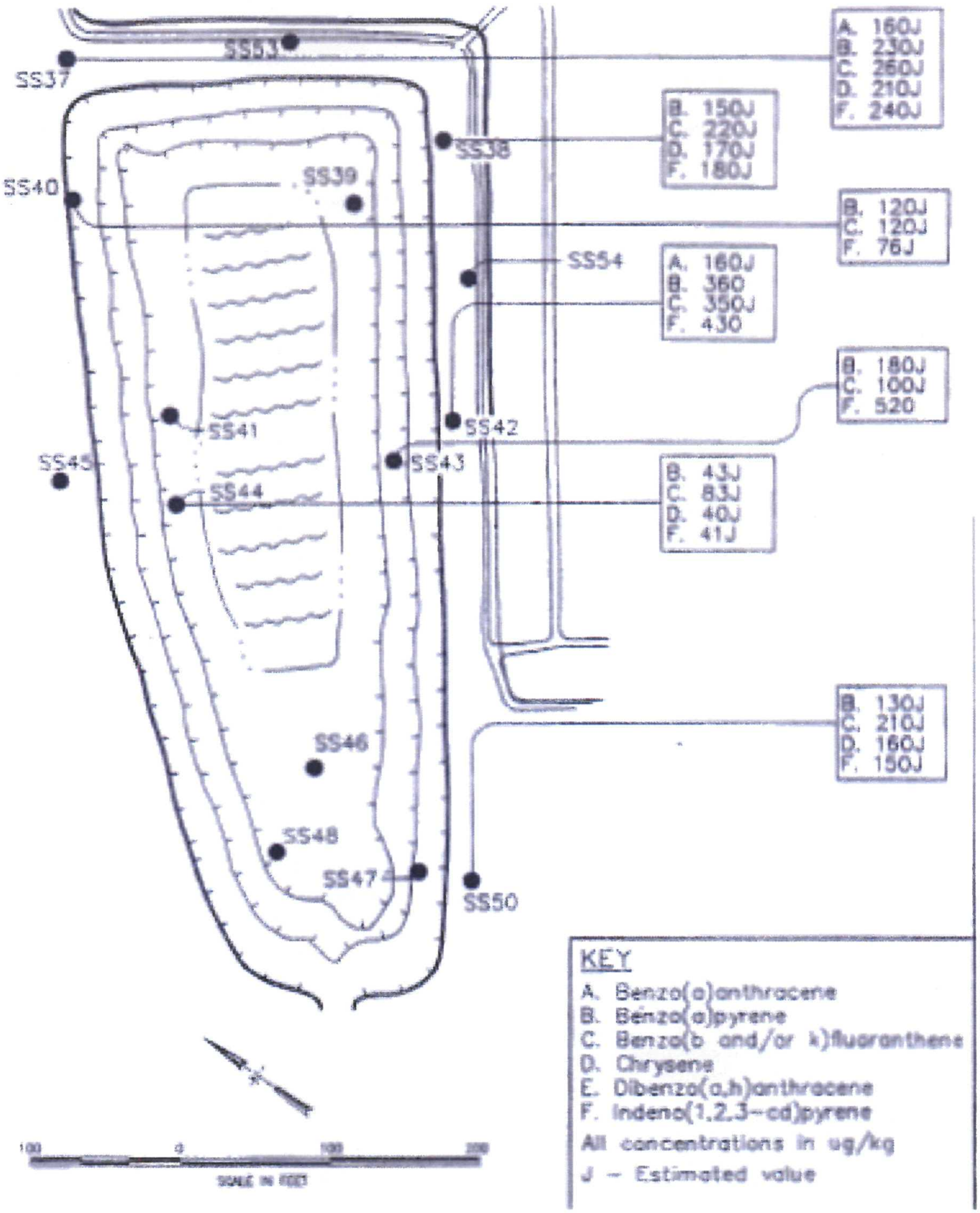

Figure 8. Distribution of Carcinogenic Polyaromatic Hydrocarbons in Existing Northwestern Excavation Soil

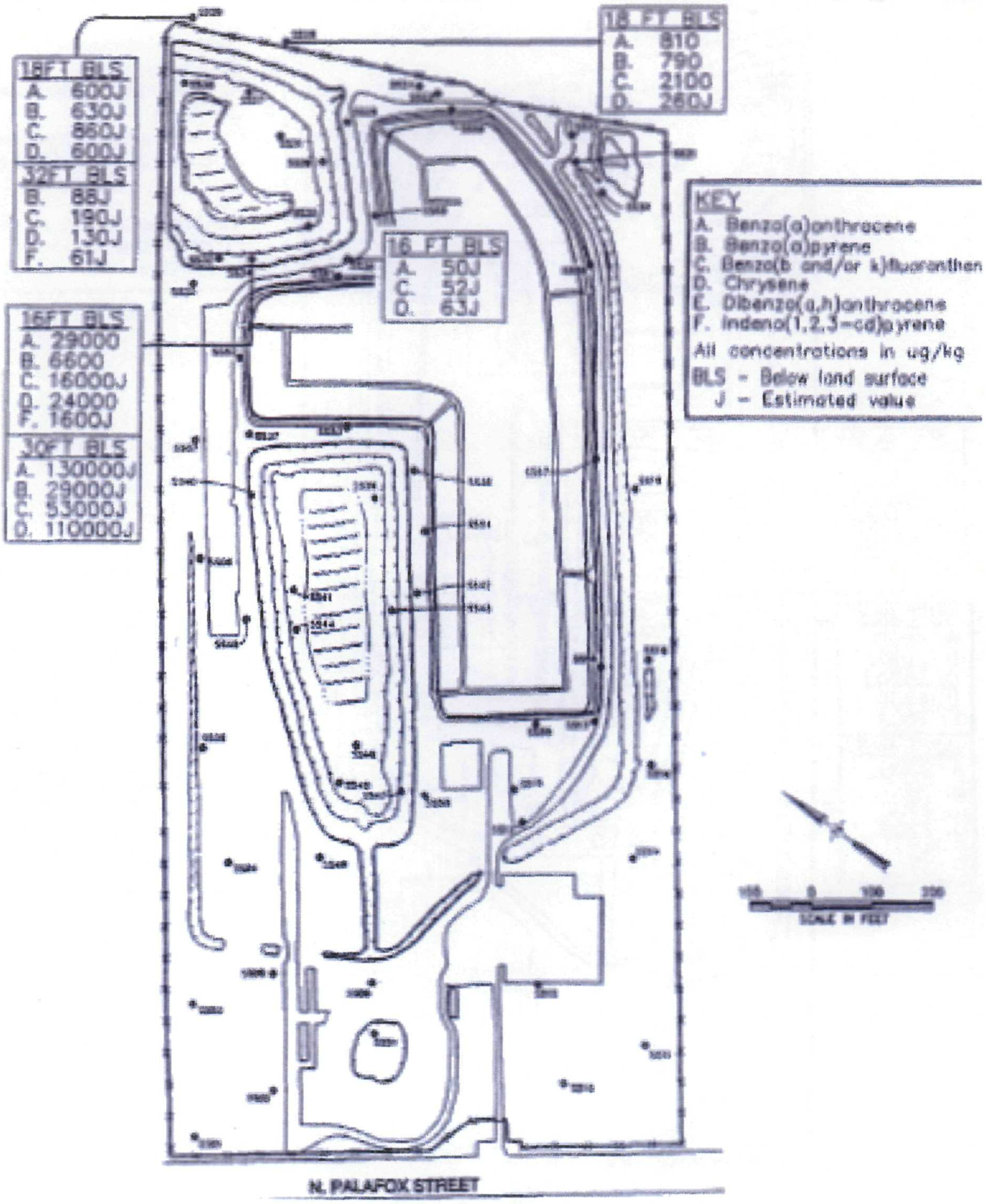

Figure 9. Distribution of Carcinogenic Polyaromatic Hydrocarbons in On-site Subsurface Soil

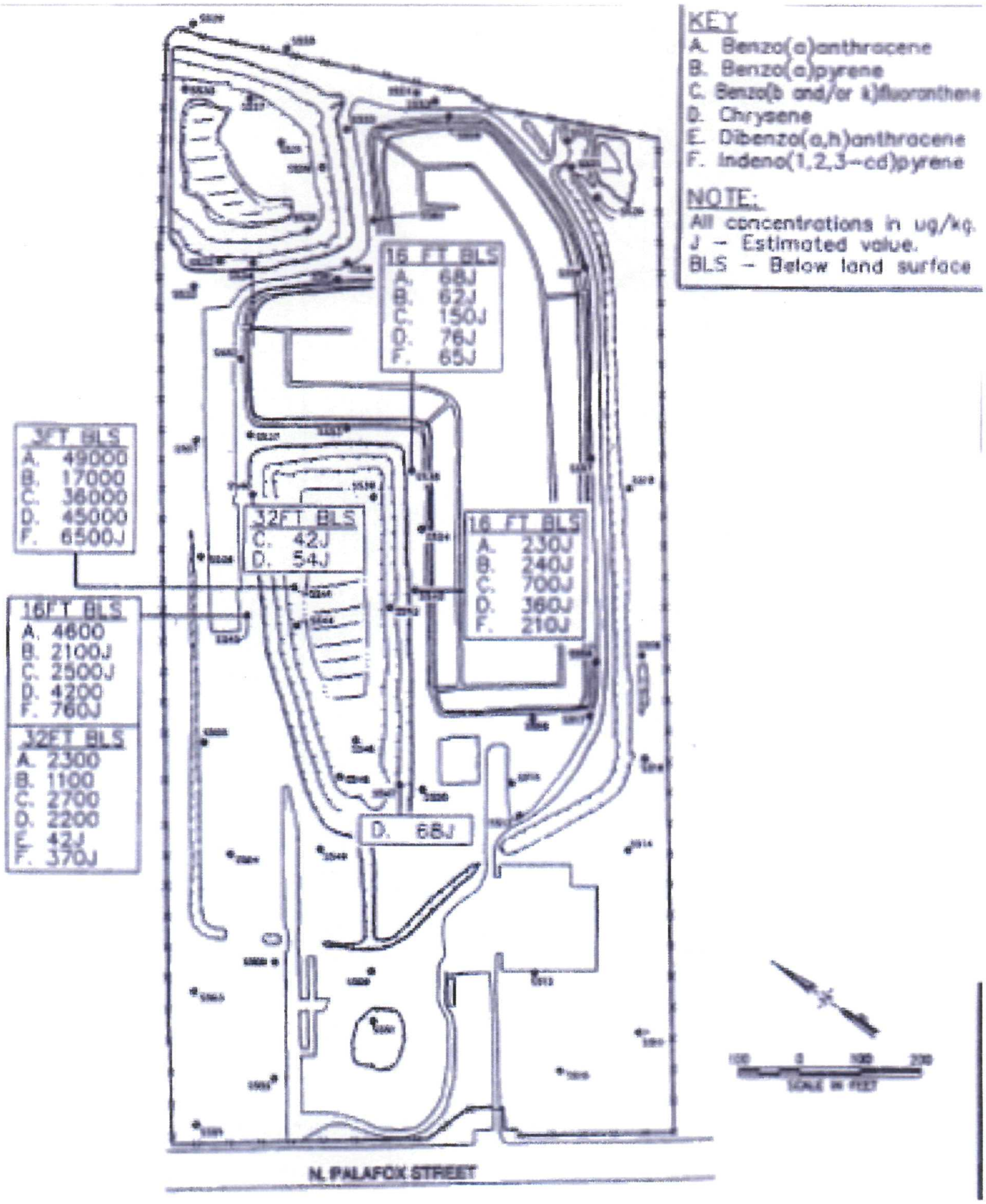

Figure 10. Distribution of Carcinogenic Polyaromatic Hydrocarbons in On-site Subsurface Soil (cont.)

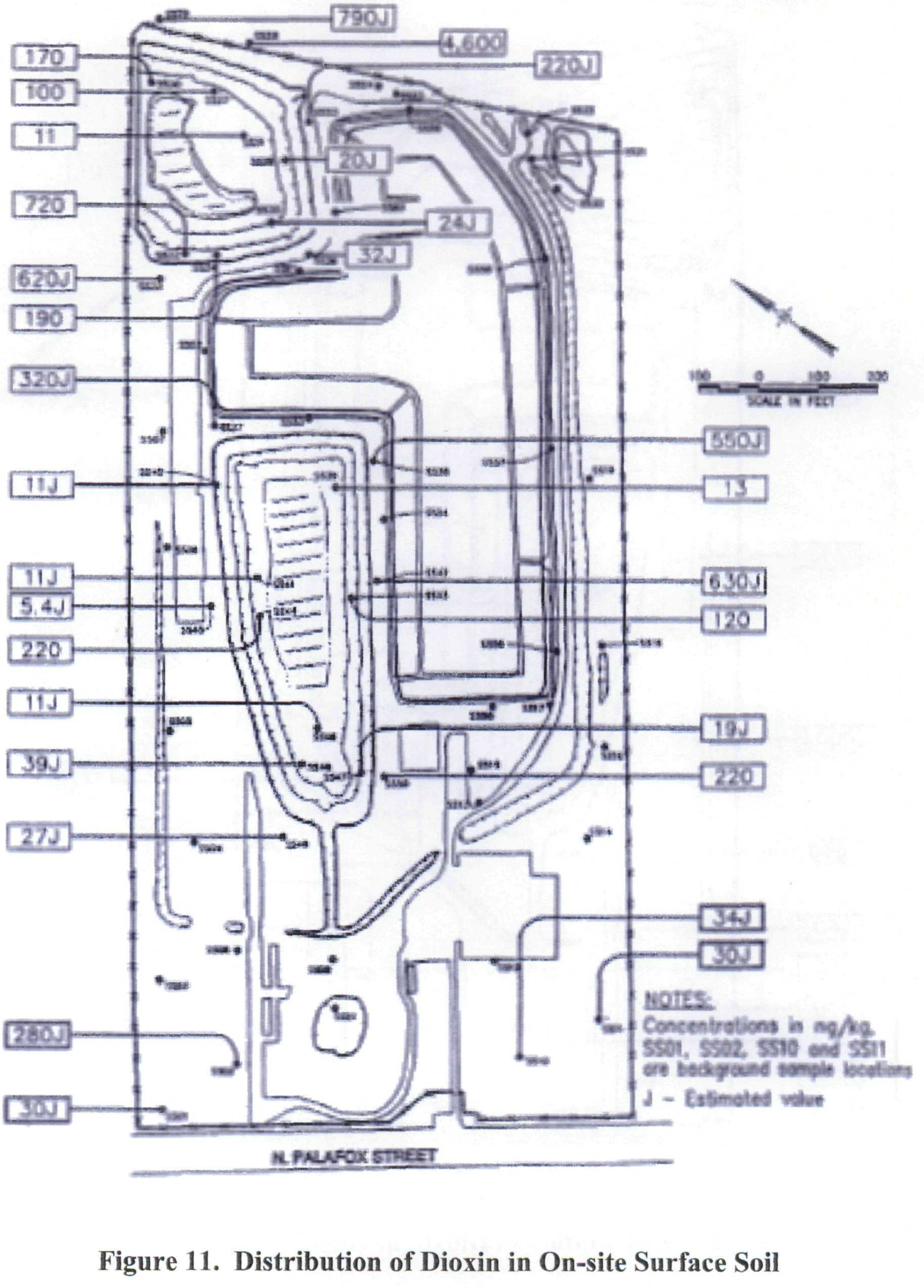

Figure 11. Distribution of Dioxin in On-site Surface Soil

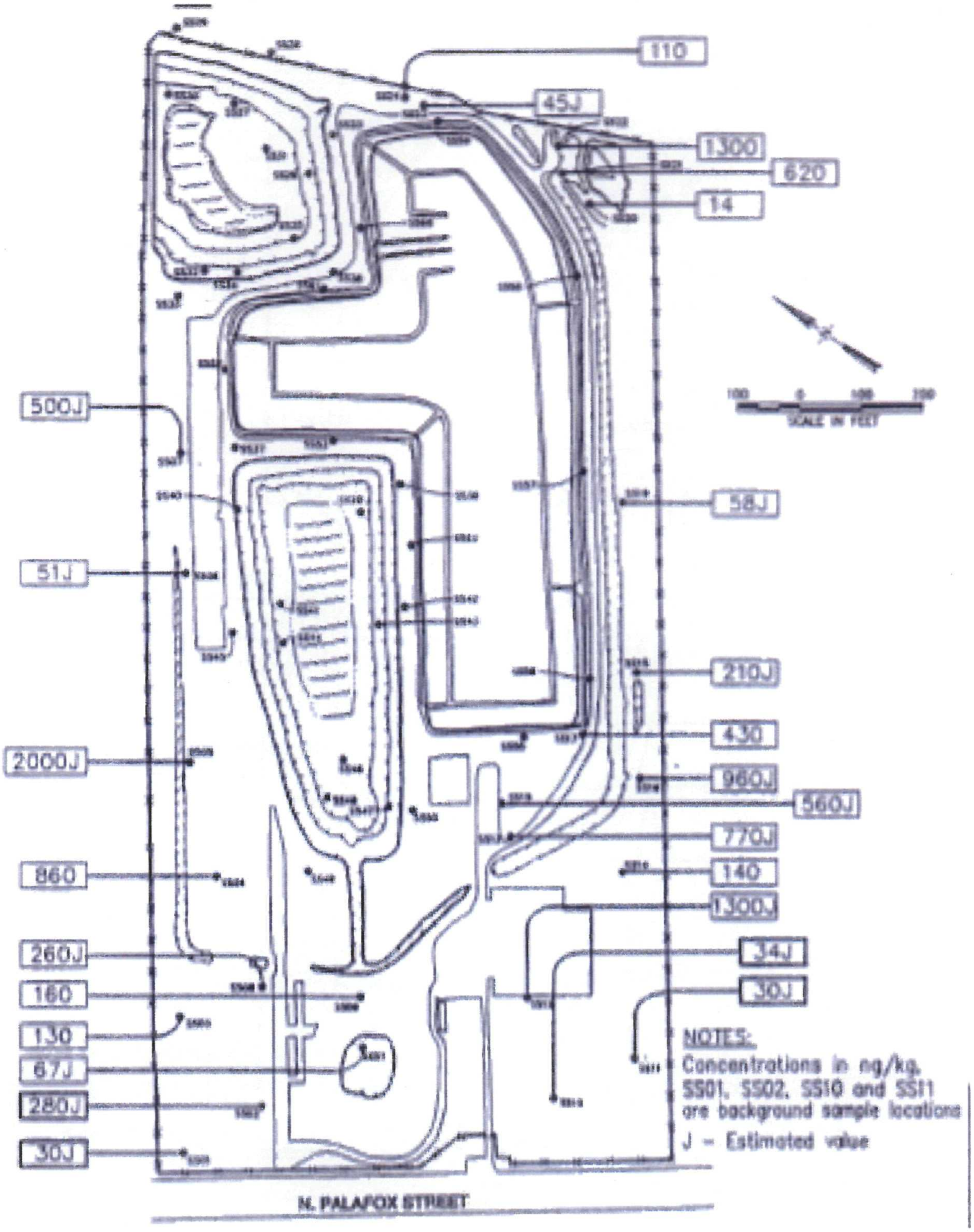

Figure 12. Distribution of Dioxin in On-site Surface Soil (cont.)

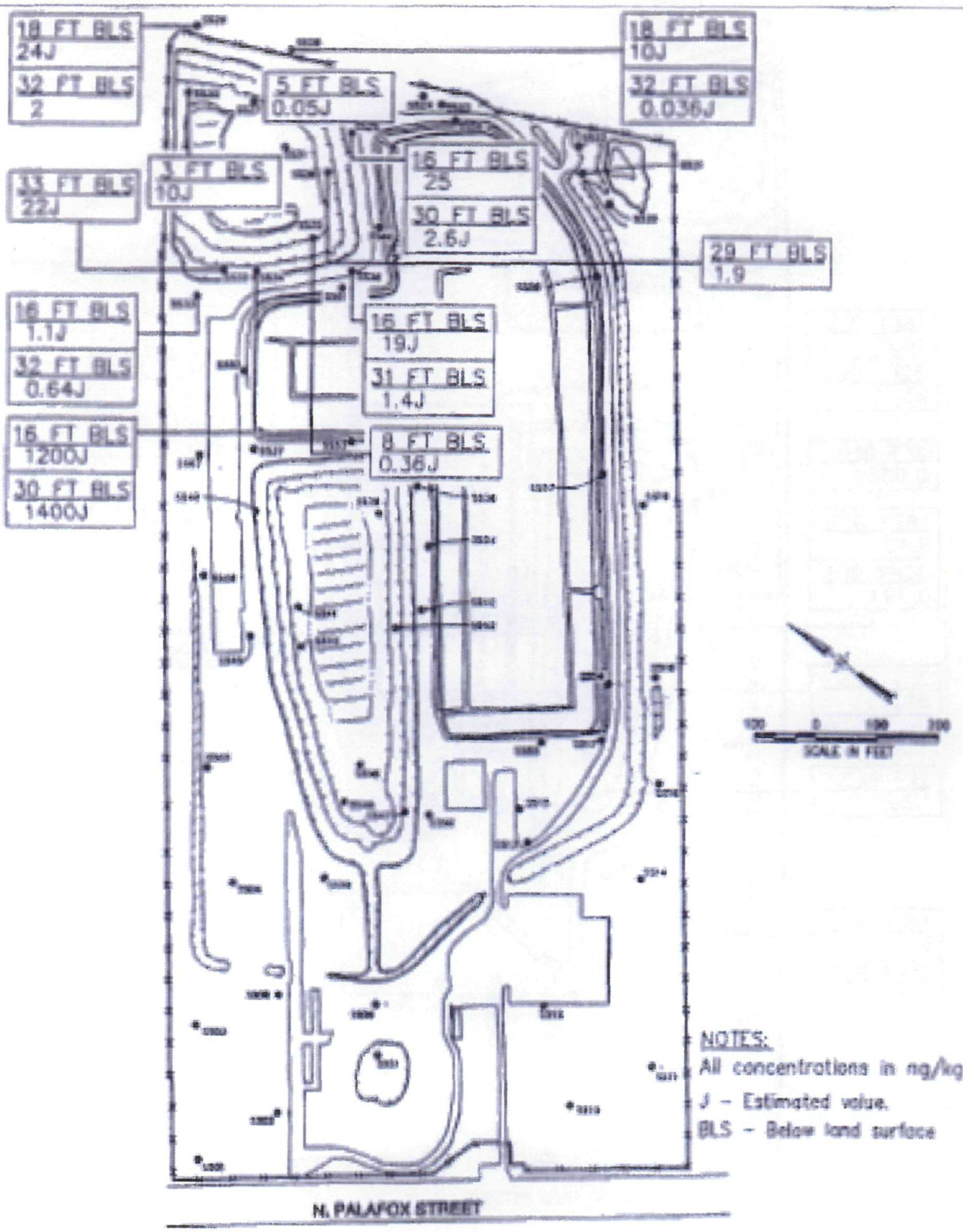

Figure 13. Distribution of Dioxin in On-site Subsurface Soil

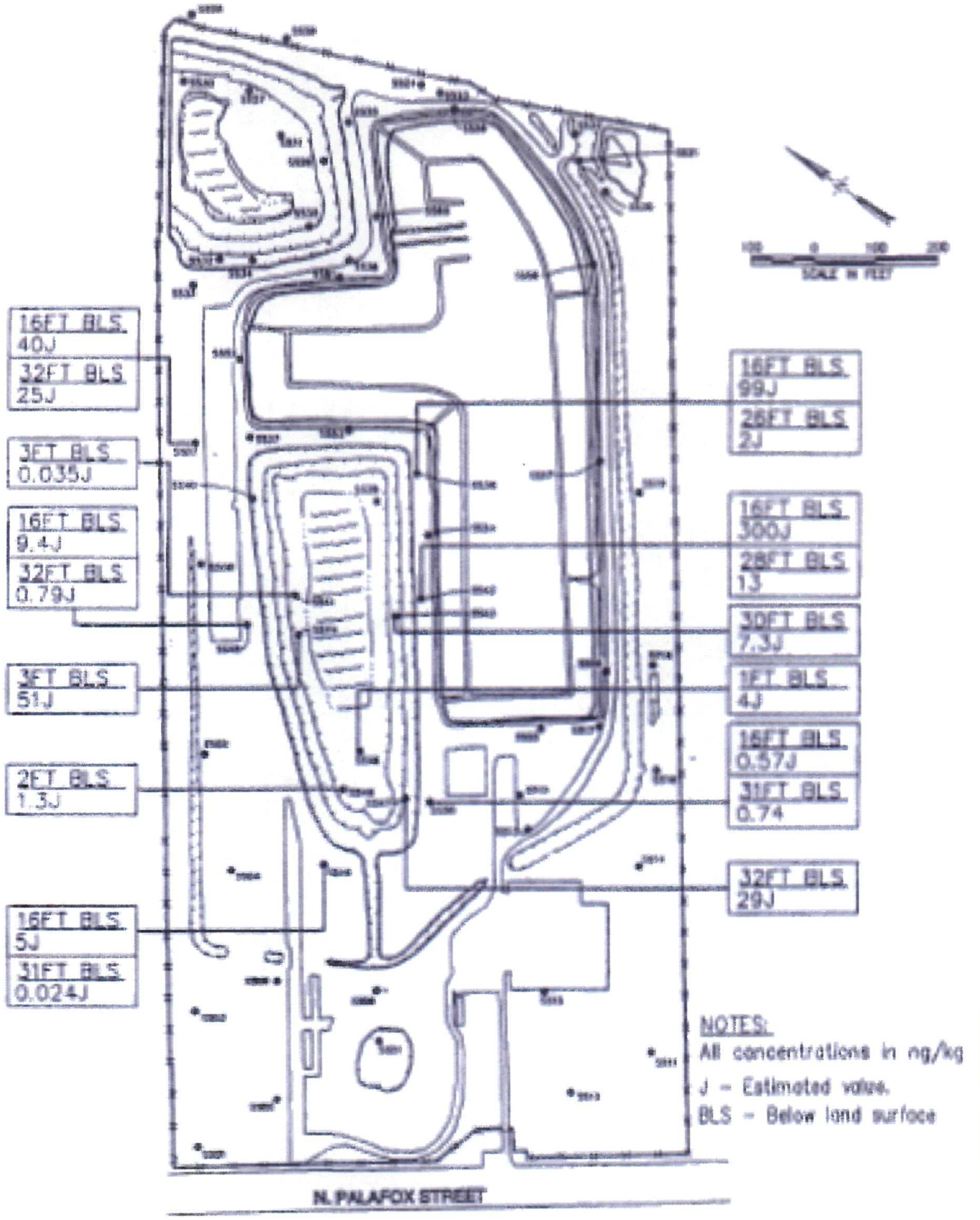

Figure 14. Distribution of Dioxin in On-site Subsurface Soil (cont.)

Rosewood Terrace/Oak Park/Escambia Arms Neighborhood

Although PAHs were detected in many of the surface soil samples collected in the neighborhood north of the ETC site, the greatest concentrations of PAHs appear to occur in two general areas within these neighborhoods. These areas include several residences adjacent to the ETC site and a portion of the Escambia Arms complex. The area adjacent to the ETC site also includes the highest levels of 2,3,7,8 TCDD TEQ concentrations. Several pesticides were detected in some of the neighborhood samples, but the highest concentrations were found in the area adjacent to the ETC site. Inorganic contamination was widely detected in the neighborhood, and arsenic, lead, zinc, and mercury were the most frequently detected potential contaminants. A limited number of subsurface soil samples were collected in the neighborhood, so the extent of subsurface contamination was not established. However, the subsurface soil samples collected in the area adjacent to the ETC site showed the highest levels of 2,3,7,8 TCDD TEQ concentrations. In addition, most of the subsurface soil samples contained zinc and manganese at concentrations greater than the onsite subsurface soil background concentration.

Pearl Street/Hermann Avenue Neighborhood

The occurrence of PAHs in the Pearl Street/Hermann Avenue neighborhood surface soil samples appear to be more widespread than in the Rosewood Terrace/Oak Park/Escambia Arms neighborhood. The highest levels were detected in sampling grids located north of Hermann Avenue and grids located north and south of Pearl Street closest to the railroad. Pesticide detection also was widespread in the Pearl Street/Hermann Avenue neighborhood. Some of the highest concentrations of 4,4-DDT, 4,4'-DDE, dieldrin, and gamma-chlordane were detected in several sampling grids located north of Hermann Avenue. Arsenic, copper, and chromium also were detected frequently at levels greater than the highest onsite background concentration. Finally, lead and zinc were detected frequently at levels greater than the highest onsite surface soil background concentration. Lead was generally found at higher levels in the Pearl Street/Hermann Avenue neighborhood than in the Rosewood Terrace/Oak Park/Escambia Arms neighborhood or on the ETC Site. Many of the highest contaminant concentrations were detected in the sample collected from the drum manufacturing facility located north of the ETC site.

The full extent of dioxin contamination in the Pearl Street/Hermann Avenue neighborhood was not established during the 1998 RI as only a limited number of the surface soil samples were analyzed for dioxins. The highest detection of 2,3,7,8 TCDD TEQ was 36.06 ng/kg. Similarly, the full extent of any subsurface soil contamination was not determined since only a limited number of subsurface soil samples were collected as part of the investigation.

2.5.6.2 2004 Feasibility Study Supplemental Investigation

Characterization of surface and subsurface soil contamination during the 2004 FS Supplemental Investigation focused on collection of additional data to further evaluate and refine the extent of off-site contamination, establish background concentrations for naturally occurring and ubiquitous constituents, and address on-site data needs identified during development of the FS. During the investigation, 6 surface soil and 12 subsurface soil samples were collected on-site, and 89 surface soil samples were collected off-site (Palafox Industrial Park, commercial strip, the Clarinda triangle, Pearl Street, and Hermann Avenue). The 2004 FS Supplemental Investigation, 1998 RI data, and some previous investigation data, were used to delineate areas with soil contamination above potential cleanup levels. Figures 14 through 22 present the extent of on-site and off-site contamination defined during these investigations.

Based on the findings during the 2004 FS Supplemental Investigation, the following conclusions were made:

- The portion of the railroad yard near the SWMU-10 Area is not contaminated with ETC-related constituents at levels above the industrial Florida Cleanup level;
- Surface soil around the perimeter of the SWMU 10 excavation site exceeds the likely risk-based cleanup levels;
- A substantial portion of the residential neighborhood within the Clarinda Triangle has surface soil that exceeds the residential cleanup values for dioxin TEQ, or the risk-based screening level for BaP EQ. It is noted that non-site-related sources for some of these contaminants may be present this area;
- A substantial portion of the residential neighborhood within the Hermann Street/Pearl Avenue Area has surface soil that exceeds the residential cleanup values for dioxin TEQ. As with the PAH results from this area, reported in previous studies, there is some indication that there may be additional/alternate sources for some of this contamination;
- Soil in the Palafox Industrial Park that that exceeds relevant commercial standards is limited to soil along the fence line with the ETC Site;
- None of the samples from the Palafox Highway/Hickory Street Commercial Strip exceed the industrial cleanup or risk-based levels for dioxin or BaP EQ; and,
- Twenty percent (2 samples) of the background samples contain levels of dioxin TEQ that exceed the residential Florida Cleanup Value indicating that other sources of dioxin are likely present in the Pensacola area.

2.5.7 Location of Contamination and Exposure Pathways

2.5.7.1 Extent of Contamination

Based on the results of the 1998 RI and the 2004 FS Supplemental Investigation, soil contamination by site-related constituents is present both on and off the former ETC property. Subsurface soil contamination at unacceptable concentrations for leaching to ground water are primarily found in the vicinity of the former process area (location of prior removal action) and in the SWMU-10 area. Surface soil contamination is more widespread, and is found at concentrations exceeding the relevant commercial or residential cleanup standards on-site, in the Rosewood Terrace/Oak Park/

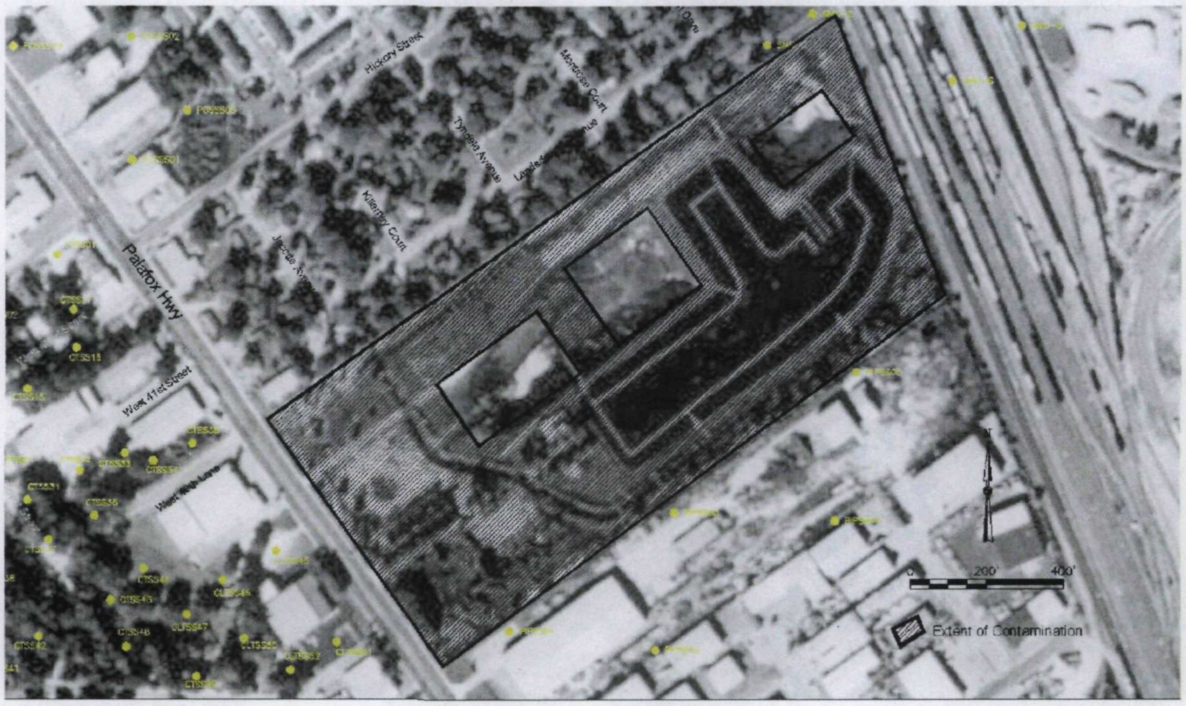

Figure 15. Extent of On-site Surface Soil Contamination Exceeding Commercial Cleanup Standards

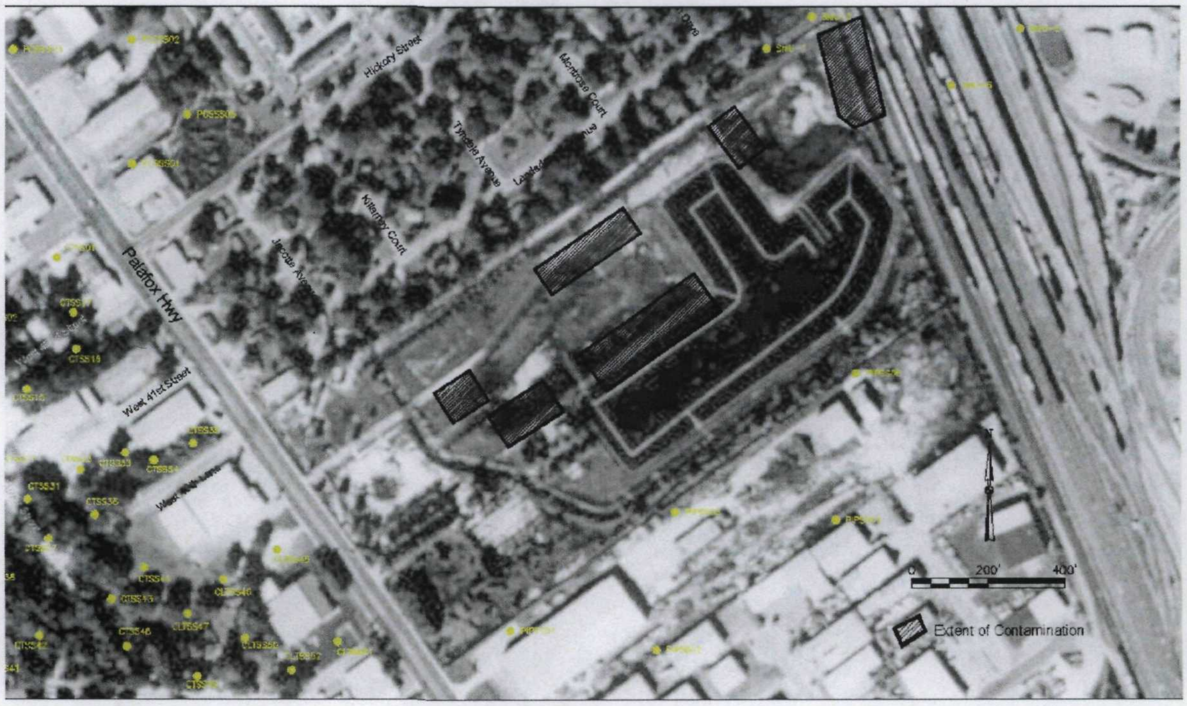

Figure 16 Extent of On-site Subsurface Soil Contamination Exceeding Ground Water Protection Levels

Figure 17. Extent of Surface Soil Contamination Exceeding Commercial Cleanup Standards in Rosewood Terrace/Oak Park/Escambia Arms

Figure 18. Extent of Surface Soil Contamination Exceeding Commercial Cleanup Standards in SWMU-10

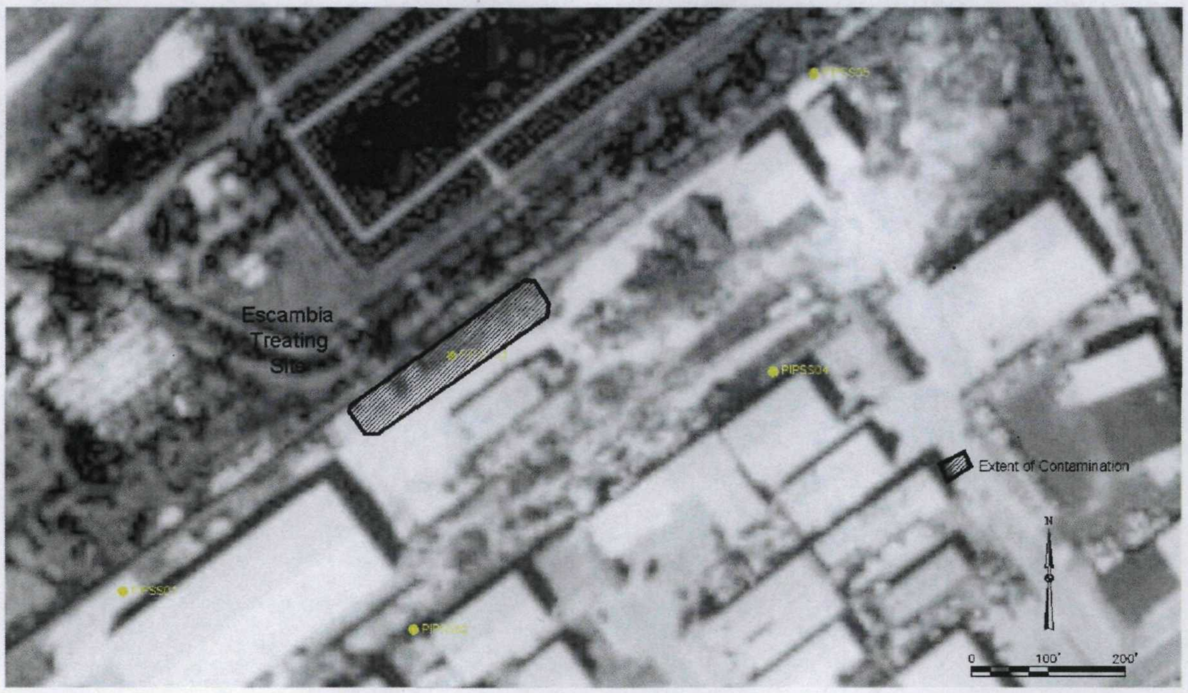

Figure 19. Extent of Surface Soil Contamination Exceeding Commercial Cleanup Standards in the Palafox Industrial Park

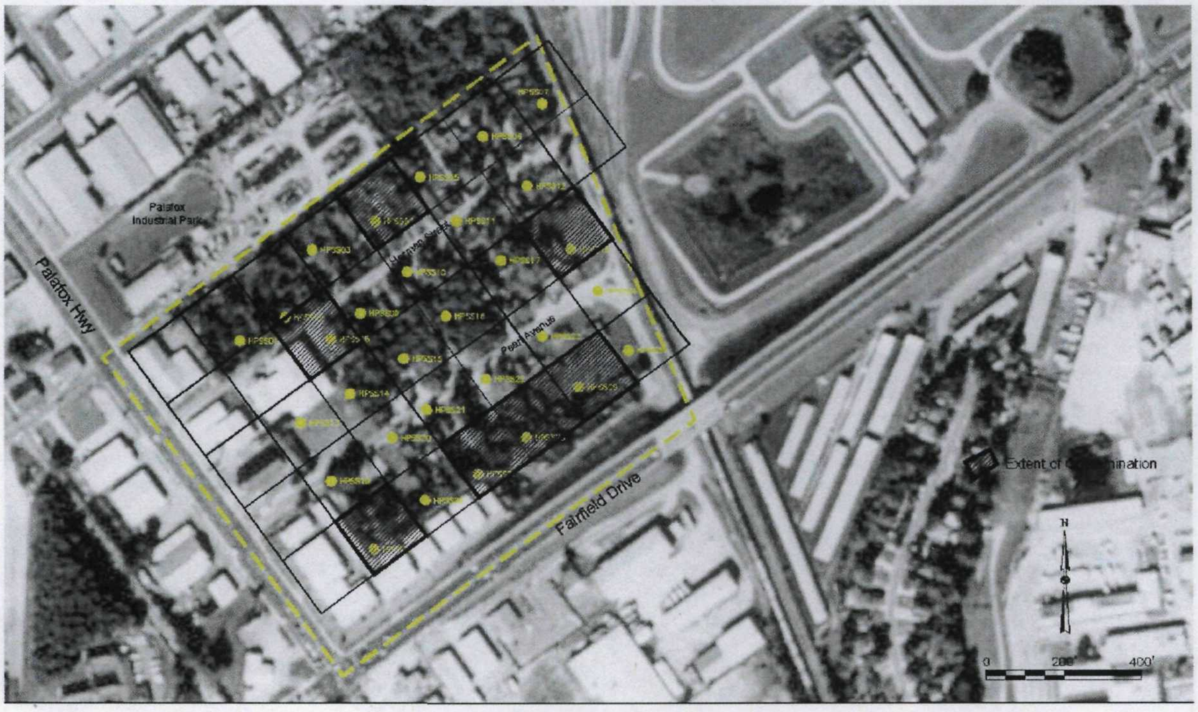

Figure 20. Extent of Surface Soil Contamination Exceeding Commercial Cleanup Standards in Hermann Street and Pearl Avenue

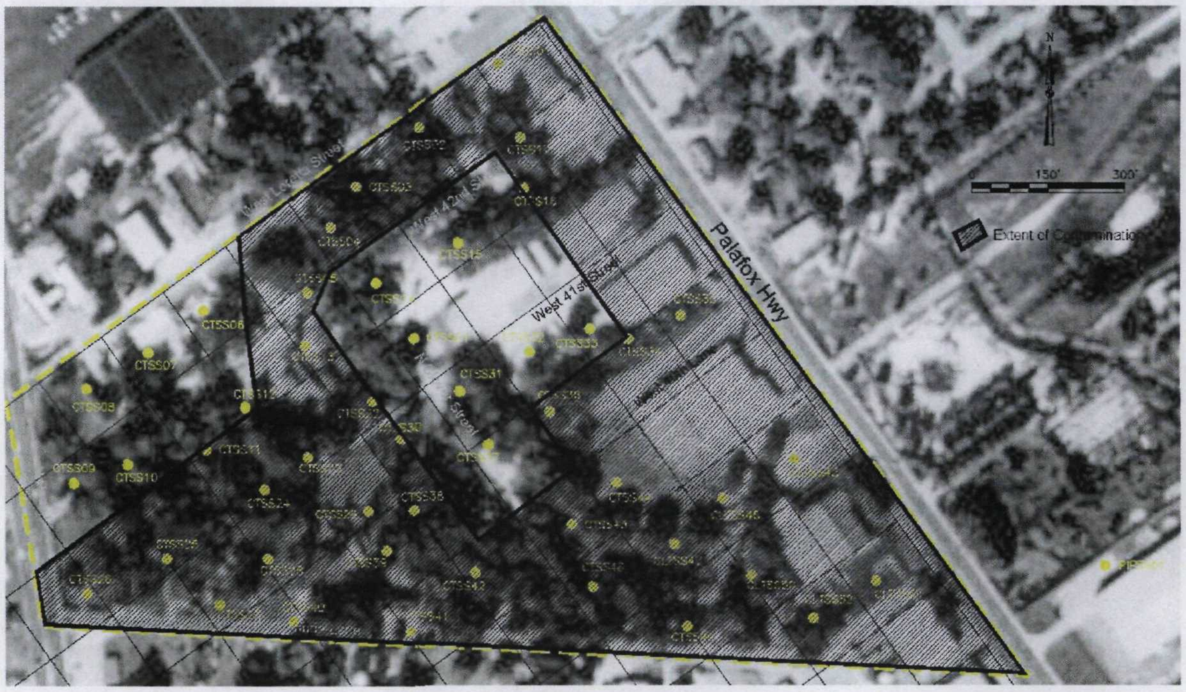

Figure 21. Extent of Surface Soil Contamination Exceeding Residential Cleanup Standards in the Clarinda Triangle Area

Figure 22. Extent of Surface Soil Contamination Exceeding Commercial Cleanup Standards in the Clarinda Triangle Area

Escambia Arms neighborhood, in the vicinity of SWMU-10, in a portion of the Palafox Industrial Park, in the Hermann Street & Pearl Avenue neighborhood, and in the Clarinda Triangle. The principle contaminants found in surface soil are carcinogenic PAH (as BaP EQ) and dioxin (as 2378 TCDD TEQ).

2.5.7.2 Attribution for Off-site Contamination

To determine if the contamination detected on off-site properties near the ETC Site can be attributed to releases from past operations or waste disposal practices at the Site, several lines of evidence must be evaluated. The first involves determining if there is a potential for migration of contamination to off-site areas. The primary transport pathways associated with the ETC site include:

- Horizontal and vertical contaminant migration via groundwater movement in soil and in the Sand and Gravel aquifer to off-site receptors

- Migration of contaminants from past operational releases, surface soil volatilization, and dust generation.

- Migration of contaminants from surface soil via surface water runoff.

The migration of contaminated ground water is not expected to impact on-site or off-site soil contamination, and will be addressed separately by OU-2. Migration of contaminants from volatilization and dust generation to off-site soils is a feasible pathway. Volatilization and release of contaminants likely occurred during past wood treating operations, from the former waste ponds, and from surface soils impacted by spills or run-off. Similarly, dust generated by past operations and wind may have entrained contaminants from surface soils that were impacted by spills, track-out, or run-off. Once airborne, these contaminants would move with the prevailing wind and settle in areas with lower wind velocities, like the heavily wooded neighborhoods around the ETC Site. This mechanism of release, transport, and deposition is likely the predominant source of off-site surface soil contamination.

The migration of contaminants via the surface water runoff pathway appears to be the least feasible in terms of affecting significant off-site areas prior to stabilization of the contamination by the EPA removal action (although specific on-site and off-site areas may have been affected by overland run-off). Before the removal action, topographic relief on the site varied from 84 to 89 feet above mean sea level and sloped from north to south on the east side and northwest to southwest on the west side (A.T. Kearney 1990). During a visual site inspection, the soil was observed to be porous, limiting runoff, but conducive to leaching of contaminants to ground water. A slightly clayey soil, present at a depth of 3.5 to 9.0 feet below grade, could temporarily perch infiltrating rainwater after periods of extended heavy rainfall, and this layer appears to dip to the northwest which may cause temporary lateral flow in a northwest direction within the shallow soil (towards the Rosewood Terrace/Oak Park/Escambia Arms neighborhood). This pathway and transport mechanism is unlikely to have contributed significantly to the spread of contamination.

In addition to a viable transport pathway, the types, levels and locations of contaminants found on- and offsite must be considered in order to establish a link between on-site and off-site contamination. A comparison of the types of contaminants detected on the ETC Site with those detected in the Rosewood Terrace/Oak Park/Escambia Arms neighborhood indicate that many of the same chemicals (particularly the PAHs and dioxins) were found in both areas. The proximity of the Rosewood Terrace/Oak Park/Escambia Arms neighborhood to the ETC Site, and the relative contaminant concentrations found on- and off-site suggest that the ETC Site is the likely source for soil contamination detected in the neighborhood.

A comparison of ETC Site soil contaminant types and levels to those detected in the Pearl Street/Hermann Avenue neighborhood again indicates that many of the same chemicals are found in both areas. However, the levels of contamination found, along with the location of the Pearl Street/Hermann Avenue neighborhood in relation to the ETC Site, make it more difficult to attribute this off-site contamination solely to the ETC Site. The Pearl Street/Hermann Avenue neighborhood and the ETC Site are separated by the Palafox Industrial Park, which may provide other potential sources of PAH and dioxin contamination which are common industrial pollutants. Additionally, a number of compounds (including several PAHs) were detected at higher levels in the Pearl Street/Hermann Avenue neighborhood than on the ETC Site, or were detected in the neighborhood but not on the ETC Site. Based on the types of contaminants, their concentrations, and their distribution, some of the contamination in this neighborhood is likely attributable to the ETC Site and some is likely from other unidentified sources.

The presence of dioxin TEQ and BaP EQ contamination in surface soils in the Clarinda Triangle is attributed to the ETC site because the distribution is different than the pattern seen in most of the background soil samples that were collected. Specifically, nearly 50% of the sample locations in Clarinda Triangle included both dioxin TEQ and BaP EQ exceedances of residential cleanup levels. This pattern is similar to the on-site distribution, where approximately 50% of the surface sample locations included exceedances of residential levels for both dioxin TEQ and BaP EQ, and is distinct from the background distribution. In addition, several of the groundwater protection COCs detected on-site, including acenapthene, fluorene and carbazole were detected at significant levels in the Clarinda Triangle sample location nearest the site, and phenanthracene was detected in samples collected from several of the Clarinda Triangle locations.

Since there are numerous anthropogenic sources of dioxin, and since these can be distinguished from one another by the different mixtures of chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) that make up the material, a congener profile was developed for on-site contamination and compared to off-site sample results. A congener profile can be drawn by calculating the percentage of the total CDD/CDF concentration contributed by each congener, and drawing a bar chart to graphically display the information. Based on previous profiling, this information also can be used to distinguish chemical/manufacturing/processing sources. The congener profile for technical grade PCP is dominated by OCDD (approximately 70 percent of the total CDD/CDF concentration). Relatively smaller amounts of 1,2,3,4,6,7,8,9-OCDF, 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,6,7,8-HpCDF, as well as trace amounts of 1,2,3,4,7,8,9-HpCDF also may be present. All other congeners are essentially absent from the mixture.

The congener profiles from samples of the stockpiled soil and the 2004 FS soil samples from the Clarinda Triangle are very similar, and OCDD contributes between 70 and 83 percent of the CDD/CDF concentration on both sets of profiles. These results are consistent with a PCP source for the dioxin. These profiles, particularly the large contribution of OCDD to the total CDD/CDF concentrations in both sets of samples, indicate that the ETC Site is the likely source for dioxin contamination found in the Clarinda Triangle surface soil.

Based on the presence of a viable transport pathway, similarities in the types and concentrations of contaminants detected, the locations of the off-site areas, differences in the local background contaminant chemistry, and similarities in congener profiles for dioxin, the ETC Site is the source, or a contributor, of off-site surface soil contamination in the surrounding neighborhoods. A Health Consultation has been performed by the Florida Department of Health of contaminated surface soil in the Clarinda triangle area, and the area was categorized as posing "No Apparent Public Health Hazard".

2.5.7.3 Potential Exposure Pathways

Exposure pathways are determined by evaluating a conceptual site model that incorporates information on the chemical sources, affected media, release mechanisms, transport mechanisms, and known or potential receptors to identify potentially complete exposure pathways. A human exposure pathway is considered complete if (1) there is a source or chemical release from a source; (2) there is an exposure point where contact can occur; and (3) there is a route of exposure (oral, dermal, or inhalation) through which the chemical may be taken into the body.

The conceptual site model for the ETC Site is presented in Figure 4. The primary sources of contamination are the wood treating chemicals that were released from process areas and cooling ponds when the site was active. Most of the contamination in these source areas was excavated and isolated from the environment during the EPA removal action. The ETC property, including the stockpiled soil, pits, and unexcavated areas, is surrounded by a 12-foot high fence. Properties in the surrounding neighborhoods where permanent relocation of the residents has been completed (the EPA Interim Action for OU-1) have also been fenced. The Hermann Avenue & Pearl Street neighborhood has not been fenced since a resident remains in the neighborhood, and the Clarinda Triangle neighborhood was not known to have been impacted by the ETC Site at the time of the Interim Action so there is no access restriction in this neighborhood.

Based on the expected fate and transport of contaminants identified at the Site, and the potential for human contact, the following media/receptors were identified:

(1). Surficial soil. Potential current receptors are site visitors. In the future, residents and/or workers are potential receptors.

(2). Air. Dust or vapors released from the soil may impact current site visitors. In the future, residents and/or workers are potential receptors.

In terms of potential impacts to human health, the most significant contaminants present in media with potential for human exposure are dioxin, PAH, and PCP. In general, these compounds resist degradation, which explains their presence several years after operations ceased. In addition, they are relatively insoluble in water, and thus they remain in the soil matrix. Once bound to soil particles, they can be transported by wind or run-off. Human exposure for potential receptors may occur through ingestion of contaminated surface soil, dermal contact with contaminated surface soil, and/or inhalation of dust derived from contaminated soil and vapors from heavily contaminated soil (vapors are likely only associated with the stockpiled soil). Therefore, potentially complete exposure pathways for contaminated surface soil exist for both current and future human receptors.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Current Land Use

The former Escambia Wood Treating Company property is currently abandoned, and all structures associated with past operations have been demolished. The most prominent features on the property are the ~255,000 cubic yard contaminated soil stockpile and the corresponding excavation pits. A debris pile consisting primarily of concrete rubble is located on the southeast corner of the property. The Site is fenced to prevent unauthorized access, and mowing and periodic maintenance inspections are performed by the U.S. Army Corps of Engineers, Mobile District. The Rosewood Terrace/ Oak Park/Escambia Arms neighborhood residents have been permanently relocated, and the former dwellings have been demolished. This neighborhood has been fenced to prevent unauthorized access. The Pearl Street & Hermann Avenue neighborhood residents have been permanently relocated with the exception of one resident with two contiguous parcels on the southeast corner of Pearl Street. The former dwellings have been demolished, but the neighborhood has open access since it still has a resident. The Palafox Industrial Park continues to operate as a commercial/light industrial area. The Clarinda Triangle area is a mix of commercial and residential properties with the businesses concentrated along the main roads and around sixty residences in the neighborhood area. Ground water beneath the site is not currently used for supply, but is part of an aquifer that is used for municipal supply.

2.6.2 Future Land Use

The Escambia Board of County Commissioners designated the ETC Site a Community Redevelopment Area in 1995. EPA Region 4 subsequently awarded a redevelopment grant to Escambia County to develop a reuse plan for the Site. Escambia County, in consultation with area residents and interested stakeholders in the community, produced the Palafox Commerce Park Master Plan to encompass redevelopment of the former Escambia Wood Treating Company property and surrounding impacted properties following relocation of the residents and cleanup of the Site. The plan envisions a mixture of commercial/retail and light manufacturing with 600,000 to 650,000 sq. ft. of new development. Figure 23 presents the conceptual reuse for the ETC Site as presented in the Palafox Commerce Park Master Plan. The expected future land use for the Site is commercial/industrial, and this cleanup decision is based on that use. Ground water use is not expected to change prior to selection of a remedy for OU-2 (Ground Water).

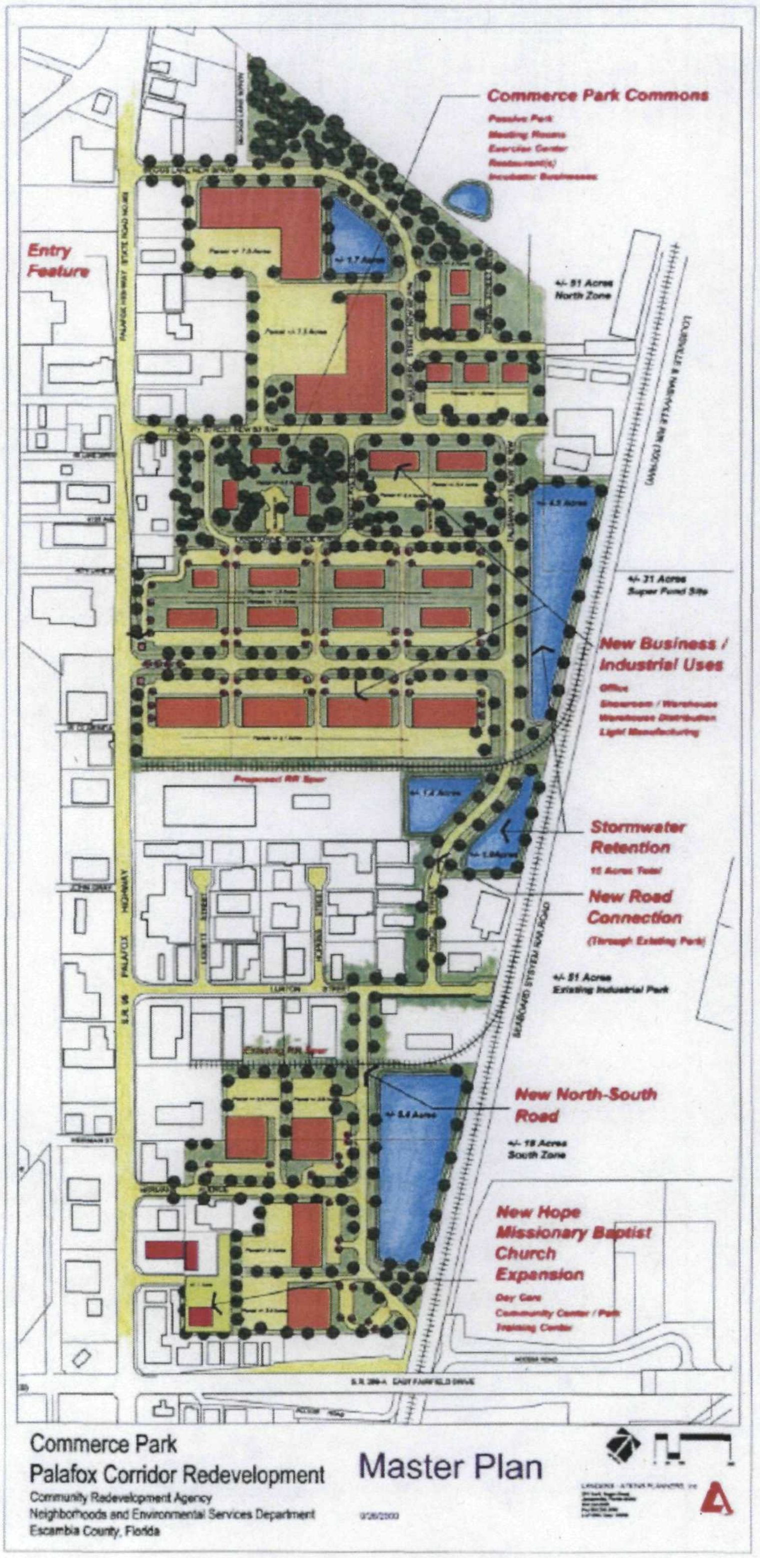

Figure 23. Planned Future Use for the ETC Site

2.7 Summary of Site Risks

2.7.1 Summary of Human Health Risk Assessment

A baseline human health risk assessment was performed in 1998 based on the results of the 1998 RI. The baseline risk assessment estimated what risks were posed by the Site if no action were taken, but did not consider the risk posed by the soil in the contaminated soil stockpile. Since the remedy decision for OU-1 also addresses the contaminated soil stockpile, a risk assessment addendum was prepared in 2005 (CDM, 2005b) to consider the risk posed by these soils if the temporary cover were to fail or was removed. Together, these risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1.1 Identification of Chemicals of Concern

The 1998 baseline human health risk assessment identified and evaluated contaminants of concern (COC) in surface soil, subsurface soil, and air. Risks posed by ground water will be evaluated in the OU-2 baseline risk assessment. The COCs identified in the 1998 risk assessment have not required amendment based on the results of the 2004 FS Supplemental Investigation or the 2005 risk assessment addendum

All valid laboratory results (unqualified results, estimated concentrations, and tentatively identified compounds detected more than once) from the 1998 RI data set were evaluated as COCs. These positively identified chemicals were then screened to exclude chemicals that, although present, are not important in terms of potential health effects. The screening criteria fell into three categories:

(1). Inorganic compounds whose maximum detected concentration did not exceed two times the average background concentration were excluded;

(2). Inorganic compounds that are essential nutrients or are normal components of our diets; and

(3). Inorganic and organic chemicals whose maximum concentration in soil was lower than a risk-based concentration corresponding to an excess cancer risk level of 1 x 10-6 or a Hazard Quotient (HQ) level of 0.1.

Table 1 summarizes the COCs for OU-1 in on-site and off-site soil.

Table 1. Chemicals of Concern

Constituents of Concern (COCs)	Environmental Medium			
	On-site Soil		Off-site Soil	
	Surface	Sub-surface	Surface	Subsurface
Polyaromatic hydrocarbons (as BaP EQ)	X	X	X	
Dioxin (as 2,3,7,8 TCDD TEQ)	X	X	X	
Naphtahlene		X		X
Acenaphthene		X		X
Fluorene		X		X
Phenanthrene		X		X

Constituents of Concern (COCs)	Environmental Medium			
	On-site Soil		Off-site Soil	
	Surface	Sub-surface	Surface	Subsurface
2-Methylnaphthalene		X		X
Dibenzofuran		X		X
Carbazole		X		X
Pentachlorophenol		X		X

2.7.1.2 Exposure Assessment

There were three potentially exposed populations evaluated in the 1998 baseline risk assessment and 2005 risk assessment addendum. The exposure pathway scenarios evaluated included current visitor, current resident, future worker, and future resident. The residential scenario was selected due to uncertainty at the time of the risk assessment regarding future land use, and to provide comparison for an unrestricted use/unlimited exposure endpoint. A conceptual exposure model based on the conceptual site model, incorporating potential exposure to the contaminated soil stockpile, is presented in Table 2.

Table 2. Conceptual Exposure Model (Human Receptors)

Scenario	Receptor	Exposure Pathway(s)	Exposure Routes
Current Use	Visitor	Dust/Vapor	Inhalation
		Direct (Soil)	Incidental Ingestion
			Dermal Contact
Current Use	Resident	Dust/Vapor	Inhalation
		Direct (Off-site Soil)	Incidental Ingestion
			Dermal Contact
Future Use	Visitor	Direct (Stockpile)	Incidental Ingestion
			Dermal Contact
Future Use	Worker	Dust/Vapor	Inhalation
		Direct (Soil)	Incidental Ingestion
			Dermal Contact
		Direct (Stockpile)	Incidental Ingestion
			Dermal Contact
Future Use	Resident	Dust/Vapor	Inhalation
		Direct (Soil)	Incidental Ingestion
			Dermal Contact
		Direct (Stockpile)	Incidental Ingestion
			Dermal Contact

The current and future exposures were quantified using reasonable maximum exposure point concentrations calculated using EPA Region 4 guidance and using half the detection limit as a proxy concentration where COCs were not detected above the laboratory practical quantitation limit. Exposure point concentrations were calculated for a site wide average, on-site, Rosewood Terrace/Oak Park/Escambia Arms neighborhood, Hermann Avenue & Pearl Street neighborhood, and for the contaminated soil stockpile.

Human intakes were calculated for each chemical and receptor using these exposure point concentrations. Estimates of human intake, expressed in terms of mass of chemical per unit body weight per time (mg/kg-day), were calculated differently depending on whether the COC is a non-carcinogen or a carcinogen. For non-carcinogens, intake was averaged over the duration of exposure, and, for carcinogens, intake was averaged over the average lifespan of a person (child-adult for 70 years). These intakes were calculated using standard assumptions and professional judgment.

2.7.1.3 Toxicity Assessment

The Baseline Risk Assessment utilized information from the Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), National Center for Environmental Assessment (NCEA), and Center for Environmental Assessment, in that order, to obtain a chemical-specific reference dose or cancer slope factor, as appropriate. The assessment looked at both carcinogenic and non-carcinogenic effects.

2.7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess incremental lifetime cancer risk (ILCR) is calculated from the following equation:

Risk = CDI X SF

where:

risk = a unitless probability of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

EPA's generally acceptable risk range for site-related exposures to a carcinogen is 1X10-4 to 1X10-6.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified period with a reference dose (RfD) that an individual may be exposed to that is not expected to cause any deleterious effect. The ration of exposure to toxicity is called a hazard quotient (HQ). A HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A HI less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. A HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

CDI = Chronic daily intake

RfD = reference dose

Table 3 presents a summary of the risk characterization from the 1998 baseline human health risk assessment and the 2005 risk assessment addendum.

Table 3. Summary of Carcinogenic and Non-carcinogenic Risks for ETC OU-1

Receptor/Location	Scenario			
	Current		Future	
	ILCR	HI	ILCR	HI
Visitor (on-site)	2X10-5	<1	N/A	N/A
Visitor (stockpile)	N/A	N/A	9X10-3	0.4
Worker (on-site)	6X10-5	<1	1X10-5	<1
Worker (stockpile)	N/A	N/A	4X10-2	0.7
Resident (off-site*/on-site)	1X10-4	<1	4X10-4	<1
Resident (stockpile)	N/A	N/A	3X10-1	18

* Aggregate maximum current risk for all off-site surface soil, some individual grids exceed an ILCR = 1X10-4 or HI = 1

Total current risks of ETC OU-1 soils are within the EPA risk range, but potential future risks associated with stockpiled contaminated soils are well above acceptable levels. Further, several individual soil grids in the off-site areas also produce unacceptable risk levels. Since the scope of OU-1 includes all on-site and off-site contaminated soil, the results of the risk assessment constitute a trigger for action. ETC OU-1 represents a current or future unacceptable risk to human health and the environment.

2.7.1.5 Uncertainties

There are uncertainties which are inherent in the risk assessment process. The factors which may lead to either an overestimation or an underestimation of the potential adverse human health effects and associated environmental risks posed by exposures to contaminants from ETC OU-1 soils include the following:

- The exposure scenarios contribute a considerable degree of uncertainty to the risk assessment. Actual exposure frequencies are unknown; estimates were based on available guidance. Actual exposure is not expected to exceed the values presented but may be significantly lower. The use of conservative assumptions in the exposure assessment is believed to result in a potential overestimate of risk. Actual site risk may be lower than the estimates presented here but is not likely to be greater.

- RfDs and CSFs for the COCs were derived from EPA sources. RfDs are determined with varying degrees of uncertainty depending on such factors as the basis for the RfD (no-observed-adverse-effect-level, NOAEL vs. lowest-observed-adverse-effect-level, LOAEL), species (animal or human) and professional judgment. The calculated RfD is therefore likely overly protective, and its use may result in an overestimation of noncancer risk. Similarly, the CSFs developed by EPA are generally conservative and represent the upper-bound limit of the carcinogenic potency of each chemical.

- The intake and risk calculations assume that the exposure conditions can be represented by a deterministic approach which views each variable separately and may result in inappropriate targets because conservative assumptions are layered on top of one another.

- The 2005 risk assessment addendum was based on data collected during the removal action. Only 10 samples were analyzed for dioxin during the removal action, and the range of concentrations was large: 0.0024 mg/kg to 1.22 mg/kg. Given the small data set and large variability of the data, the calculated UCL exceeded the maximum detected concentrations. In these situations, Region 4 policy is to use the maximum concentration as the exposure point concentration. It is likely that in so doing, the risk associated with exposure to dioxin in the stockpile is overstated. Risks associated with the contaminated soil stockpile also were calculated omitting dioxin, and produced calculated risks of 2X10-4 (visitor), 1X10-3 (worker), and 8X10-3 (resident).

2.7.2 Summary of Ecological Risk Assessment

A baseline ecological risk assessment was not performed for ETC OU-1. A bioassessment was completed in 1991, and no threatened, endangered, or protected species were identified. The ETC property and surrounding off-site properties are characterized as an urban area with poor habitat. No further ecological investigation of OU-1 was warranted. An ecological risk assessment has been performed for OU-2 because ground water discharges to Bayou Texar, an estuarine stream and significant local ecological feature, and is currently under evaluation.

2.8 Remedial Action Objectives

Remedial Action Objectives (RAOs) for the Escambia Wood Treating Company Superfund Site OU-1 were developed based on a review of the results of the site sampling data, site-specific risk and fate and transport evaluations, and review of applicable, or relevant and appropriate, requirements (ARARs). The key contaminants of concern for ETC OU-1 are chemicals related to wood treating operations that have been identified in both soil and ground water on- and off-site.

Clean-up goals were derived from the human health risk assessment, calculation of soil RGOs using the Summers model (EPA, 1989), and from ARARs. Contaminated soils exceed the acceptable potential cancer risk for future visitors, workers, and residents, and exceed acceptable non-cancer risks for future residents.

Soil RGOs for the protection of groundwater were determined using the Summers Model to address the possibility of contaminants leaching to ground water at concentrations exceeding probable groundwater remediation levels. However, the soil RGOs were determined only for those COCs found in ground water and for which an identified source does or did exist onsite.

Based on the Summers Model, conservative soil RGOs for the protection of ground water were calculated as follows:

$$C_{soil} = \frac{[\, C_{gw} * (Q_a + Q_p) - Q_a * C_b \,] * K_d}{Q_p}$$

where,

C_{soil} = soil RGO (ug/kg)

C_{gw} = RGO for groundwater (ug/*l*)

C_b = average background concentration in groundwater (ug/*l*)

Q_a = volumetric flow rate of groundwater (ft^3/day)

Q_p = volumetric flow rate of contaminated infiltration into the aquifer (ft^3/day)

K_d = soil/water partition coefficient (*l*/kg)

For the ETC Site, the average Kd was used, and Cb for all the COCs was assumed to be zero since they were not detected in any of the background monitor wells. The Cgw values used were human health risk-based values calculated using various human health risk-based assumptions (residential and industrial scenarios with different residual risk and hazard quotient endpoints) and/or Maximum Contaminant Levels established in the Safe Drinking Water Act.

Under the National Contingency Plan, EPA's goal is to reduce the excess cancer risk to the range of $1x10^{-4}$ to $1x10^{-6}$ for the expected future land use at the Site. The cleanup goals being selected for OU-1 are based on a future commercial/industrial land use for the ETC Site and on achieving a residual excess cancer risk of less than $1x10^{-6}$ with a hazard quotient less than 0.1. The ARAR-based cleanup goal for dioxin TEQ (2,3,7,8 TCDD) is based on Florida Statute Section 376. 30701 requiring cleanups to attain an incremental lifetime cancer risk of $< 1 X 10^{-6}$ and a hazard index of < 1 for non-carcinogens. This standard results in a more stringent cleanup goal than the current EPA cleanup standard for dioxin TEQ in soil of 1.0 μg/kg.

The RAOs developed to address the above issues include the following:

- Prevent ingestion, inhalation, or direct contact with surface soil that contains concentrations of contaminants in excess of the remedial cleanup goals;
- Control migration and leaching of contaminants in surface and subsurface soil to ground water that could result in ground water contamination in excess of EPA drinking water standards (Maximum Contaminant Levels);
- Prevent ingestion or inhalation of soil particulates that contain contaminant concentrations in excess of remedial cleanup goals; and,
- Control future releases of contaminants to ensure protection of human health and the environment.

Based on the human health risk-based criteria, calculated ground water protection values, and analysis of ARARs, the proposed cleanup goals for contaminated soils at the Escambia Wood Treating Company Superfund Site are presented on Table 4.

Table 4. Contaminated Soil Remedial Cleanup Goals for ETC OU-1

Contaminant of Concern	Cleanup Goal (ug/kg)	Source/Basis
Benzo(a)pyrene EQ (cPAHs)	400	Risk Assessment/1X10^{-6} Commercial
Dioxin TEQ (2,3,7,8-TCDD)	0.030	F.S. 376.30701*/1X10^{-6} Commercial
Naphthalene	419	Summers Model/Ground Water Protection
Acenaphthene	1,954	Summers Model/Ground Water Protection
Fluorene	1,525	Summers Model/Ground Water Protection
Phenanthrene	3,829	Summers Model/Ground Water Protection
2-Methylnaphthalene	2,394	Summers Model/Ground Water Protection
Carbazole	6.5	Summers Model/Ground Water Protection
Pentachlorophenol	5.1	Summers Model/Ground Water Protection

* Florida Statute 376.30701

2.9 Description of Alternatives

Seven remedial alternatives were developed for detailed evaluation to address surface and subsurface soil contamination in on- and off-site areas associated with ETC OU-1. The alternatives encompass a representative cross-section of proven and reliable removal, treatment, and containment technologies, as well as a no action alternative. Each of these alternatives share a number of common elements, that are discussed below, to allow for a fair comparison of the alternatives based on established criteria. Each alternative (except, no action) includes two options: Option A assumes permanent residential relocation and cleanup to commercial cleanup levels is carried out in all areas. Option B assumes that commercial cleanup levels are applied to all areas except Clarinda Triangle. Temporary relocation and residential cleanup levels are assumed for Clarinda Triangle under Option B. Additionally, each of the containment alternatives was evaluated for potential cost savings associated with extending a cap/cover over moderately contaminated (generally defined as those soils posing a risk less than 1 X 10^{-5} and not including highly mobile constituents) on-site surface soils rather than excavating these materials. This approach will be evaluated further during the value engineering study.

The Proposed Plan Update, issued in October, 2005, provided two modifications to the proposed remedy for ETC OU-1. The first modification entailed the inclusion of the approximately ten additional residential properties adjacent to the Clarinda Triangle neighborhood within the scope of the remedy. Since these properties would have represented the only remaining residential land use in close proximity to the ETC site, and since it is likely that surface soils on these properties have been similarly impacted by site-related contamination, their inclusion through this modification is appropriate. This modification would result in the same increase in scope and cost for all the alternatives evaluated, and, therefore, has no impact on the relative evaluation of the alternatives. The second modification, solidification/stabilization of the principal threat waste material to form a sub-cap, is a change to Alternative 2, Capping/Containment. The effect of this modification has been included in the evaluation and comparison of remedial alternatives.

2.9.1 Detailed Remedial Alternatives Evaluation

2.9.1.1 Alternative 1 -- No Action

Under this alternative, no action would be taken to remedy the contaminated soil (both on- and off-site). The alternative would only involve the continued monitoring of soil in the impacted areas. For estimating purposes, it was assumed that 64 samples would be collected for routine monitoring. These surface soil samples would include the requirement for analysis of all COCs. Subsurface soil would be monitored by sampling the existing monitor wells at the site (assumed to be included under the groundwater remedial action). Samples would be collected every five years for 30 years. Public health evaluations would be conducted every five years and would allow EPA to assess the ongoing risks to human health posed by the site. The evaluations would be based on the data collected from the monitoring.

Overall Protection of Human Health and the Environment

Because remedial actions would not be initiated as part of this alternative, it would not provide any increased protection to human health. If no action is taken, contaminants on- and off-site would remain in place.

Compliance with ARARs

This alternative does not achieve the RAOs or chemical-specific ARARs established for the contaminated surface and subsurface soil. Action-specific ARARs do not apply to this alternative since further remedial actions will not be conducted.

Long-Term Effectiveness and Permanence

The continued exposure of receptors to surface soil is a potential long-term impact of this alternative. The cleanup goals for protection of human health and the protection of groundwater would not be met. Because contaminated material remains on-site under this alternative, a review/reassessment of the conditions at the site would be performed at 5-year intervals to ensure that the remedy does not become a greater risk to human health and the environment.

Reduction of Mobility/Toxicity/Volume (M/T/V) Through Treatment

No reductions in contaminant M/T/V are realized under this alternative.

Short-Term Effectiveness

Since no further remedial actions would be implemented at the site, this alternative poses no short-term risks to onsite workers. It is assumed that Level D personal protection would be used when sampling surface soil and groundwater.

Implementability

This alternative could be implemented immediately because monitoring equipment is readily available and procedures are in place.

Cost

The total present worth cost for this alternative is approximately $126,000. There is no capital cost associated with this alternative.

2.9.1.2 Alternative 2 -- Capping/Containment with Solidification/Stabilization of Principal Threat Material

Capping and containing the contaminated source soils at the ETC site would serve to prevent rainfall infiltration and future leaching of contaminants into the ground water. In addition capping would also limit direct contact exposure to contaminated soils under the cap. Varying degrees of capping and containment can be implemented depending on the nature and concentration of contaminants in the area. For example, caps can range from a simple, natural soil cap to a multilayer soil/synthetic cap. This alternative evaluates a soil/clay and geomembrane cap underlain by a solidified/stabilized sub-cap composed of a soil/cement mixture. This type of cap would provide a multi-layer low permeability barrier sufficient to control human or ecological exposure to contaminated soil and prevent rainwater infiltration and leaching of contaminants to ground water.

This alternative includes the relocation of residents within the Clarinda Triangle neighborhood, excavation of contaminated soil in the Clarinda Triangle, Rosewood Terrace/Oak Park/Escambia Arms, PIP and Pearl Street/Herman Avenue areas, and placement of the contaminated soil, along with soil from the existing stockpile and contaminated on-site areas, back into the existing onsite excavations after they have been expanded as needed and lined with an appropriate geomembrane liner. Principal threat wastes consisting of the more contaminated soils contained within the existing stockpile would be segregated for inclusion in a soil/cement sub-cap. The sub-cap would consist of three- to four-feet of a soil/cement mixture to produce a geotechnically sound base for the cap and prevent inadvertent exposure and water infiltration to the waste. A soil/clay and geomembrane cap would be constructed above grade to provide a low permeability barrier sufficient to further reduce infiltration and contaminant migration. The cap system would consist of the following layers in ascending order. First, the three- to four-foot thick soil/cement sub-cap, then a two-foot thick clay layer compacted to a permeability of 1 x 10-7 cm/s or less. Next, a 60-mil thick geomembrane liner would be installed, and the geomembrane liner would be covered by at least 18 inches of native soil and six inches of topsoil. The uppermost layers would protect the liner and clay layer from heat and other environmental factors. The topsoil layer of soil/clay cap would be graded to a minimum slope of 3% and a maximum of 5% to promote surface drainage away from the waste cell and reduce infiltration. A vegetative cover of native grass would be established to minimize cap erosion. Surface drainage controls would be constructed around the perimeter of the cap to collect surface runoff.

Leaving waste on-site in containment systems that protect people and the environment from exposure and prevent contaminant migration is not incompatible with a successful redevelopment of the site. Understanding and accommodating future use in selecting and implementing remedies is an important part of EPA's cleanup responsibility. Modifications to the design can be considered that better reflect the future use of the area, as those plans become better defined. For example, the design and location of waste containment areas may provide for future utility access in anticipating future use. Because EPA has a responsibility to choose and implement (as far as possible) remedies that are consistent with anticipated use, this example of accommodating the remedy to anticipated future use can be considered part of the remedial activities because it contributes to the long-term protectiveness of the remedy. However, EPA is prohibited from funding, or requiring others to fund, activities that are considered "enhancements" to the remedy.

Additional necessary components of this alternative include the operation, maintenance, and monitoring of the containment system, institutional controls, and periodic inspections and reviews. The existing fence would be inspected and upgraded, as necessary, and restrictive covenants would be placed on the property to restrict the future use of the property to those uses compatible with the remedy. State and local agencies would be responsible for the implementation and enforcement of these restrictions. Monitoring would be required to assess the effectiveness of the remedial action. An appropriate ground water monitoring program will be designed for at least 30 years of performance monitoring of upgradient and downgradient aquifers surrounding the capped area. Periodic maintenance of the cap and surface drainage system also would be required.

Overall Protection of Human Health and the Environment

Excavation and isolation of contaminated surface soil in lined and capped cells eliminates all risks associated with the direct exposure pathways. Groundwater contamination also would be reduced through the removal and isolation of contaminated subsurface soil.

Compliance with ARARs

This alternative achieves the RAOs and chemical-specific ARARs established for the site by consolidating and isolating contaminated surface and subsurface soil and implementing restrictions on land use. Air quality and emission standards also would have to be met during the implementation of this alternative.

Long-Term Effectiveness and Permanence

Removal and isolation of contaminated material permanently eliminates the long-term health risks at the site by effectively immobilizing the source of contamination. Risks associated with direct contact or migration of waste to groundwater would be eliminated.

Reduction of M/T/V Through Treatment

This alternative significantly reduces the mobility of surface and subsurface soil contaminants through containment and partial treatment. Solidification/stabilization of the principal threat wastes would constitute partial treatment of the contaminated soil. The principal threat waste contains the highest concentrations of the mobile COCs, and soil/cement solidification and stabilization of this material will significantly reduce or eliminate its leaching potential. In combination with the other elements of the containment system and the inherently low mobility of the remaining soil contaminants, this alternative reduces mobility through treatment. Soil volume and contaminant toxicity are not significantly changed by this alternative.

Short-Term Effectiveness

Short- and long-term monitoring would be required under this alternative, since construction activities could result in the release of fugitive dust. Also, operation of heavy equipment during construction would produce some noise nuisance. Air monitoring during construction activities would be necessary to ensure that a safe working environment is maintained, and that no threat to human health or the environment is created by air emissions from any of the areas during construction. Activities resulting in increases in ambient noise levels, windblown dust, and soil erosion would be mitigated by limiting the hours of operation, soil moisture control, erosion and surface runoff control measures, and reestablishing vegetative cover. The excavation work would be staged and coordinated with the backfill and seeding activities to minimize the potential for dust production and erosion. Health and safety requirements during the implementation of this alternative would include the use of personal protection equipment by all construction personnel when necessary. It is assumed that Level D personal protection would be used, with Level C as a contingency, during construction activities. Equipment and personnel decontamination facilities would be necessary. A heavy equipment washdown pad would be constructed and excavation equipment would be decontaminated prior to leaving the site. Since construction activities would be restricted to on-site areas (including the surrounding former neighborhood areas), short-term impacts to the community would be minimal.

Implementability

Excavation, solidification/stabilization, capping, and containment of contaminated soil are established methods that have been successfully demonstrated in large scale applications for many of the COCs. Conditions external to the site, such as equipment availability, materials, and services present no problems at this time. Monitoring the excavation of contaminated material as well as the containment cells to verify structural integrity and that contamination is not leaching from the containment areas would be required to verify that the RAOs are met.

Design and construction planning are estimated to require 1 year. The actual implementation and consolidation of contaminated surface and subsurface soil, including excavation, may take another 1 to 2 years.

Cost

The total present worth for this alternative, prior to the modifications presented in the Proposed Plan Update in October, 2005, is approximately $24.9 million for Option A and $24.6 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $24.3 million and $600,000, respectively. For Option B, capital and O&M costs are approximately $24 million, and $600,000. Detailed cost estimates are presented in Appendix B.

As discussed in Section 4, although they cannot be funded by EPA, it may be beneficial to consider enhancements during the remediation process in anticipation of future land use. For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $29.2 million and $28.9 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with an extension of the cap's soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $24 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment. The addition of solidification/stabilization of principal threat wastes to construct a sub-cap increases the capital cost of this alternative, and, while improving the long-term reliability of the alternative, has a negligible impact on the estimated O&M costs. The estimated cost to construct a soil/cement sub-cap three- to four-feet in thickness using a pug mill to produce a homogeneous mixture with a minimum compressive strength of 250-psi is $2,300,000.

The estimated total present worth cost of Alternative 2 – Capping/Containment is $28,100,000 (Option A) and $27,800,000 (Option B).

2.9.1.3 Alternative 3 -- Excavation, Onsite Treatment w/ Thermal Desorption/BCD, and Onsite Disposal

This alternative involves relocating residents within the Clarinda Triangle, excavating contaminated surface and subsurface soil both on- and off-site, and transporting it to a central area on-site for consolidation and staging. Depending on the moisture content of the excavated material, dewatering may be required prior to treatment; however, this condition is not expected. On-site treatment would be performed and the treated material would be backfilled onsite. To reduce costs associated with material handling and transportation, it is assumed that off-site, excavated/treated material would be backfilled onsite and not taken back into the neighborhoods. Together, thermal desorption and BCD (creating a closed-loop system), would be the main treatment of the organics. The final treatment system would depend upon the outcome of treatability testing and would be determined during the remedial design phase.

Preprocessing requirements would include solids separation and sizing. Techniques could include screens, shredders, and grinders. This process would remove any material larger than two inches in diameter so that it could be appropriately dealt with; create a more uniform soil mixture that can be treated more efficiently; and prevent large-diameter material from damaging any components of the treatment system.

The BCD process is a chemical dehalogenation technology developed by EPA's Risk Reduction Engineering Laboratory. BCD is initiated in a medium temperature thermal desorber (MTTD) at temperatures ranging from 600 to 950 °F. Chemicals are added to contaminated soil containing hazardous chlorinated organics. BCD then chemically breaks down the condensed organic contaminants by removing chlorine from the contaminant and replacing it with hydrogen. Because the chlorinated organics have some volatility, there is a degree of volatilization that takes place in parallel with chemical dechlorination. The remaining organic contaminants are thermally desorbed and removed with the offgas. Clean soil exiting the solid reactor can be returned to the site. The remaining contaminants from the vapor condensate and residual dust are captured and treated for two to four hours at approximately 650 °F in the BCD liquid tank reactor. The reactor uses reagents to help dechlorinate the remaining organics. The treated residuals are recycled or disposed of using standard, commercially available methods, including solvent reuse and fuel substitution. The result is a clean, inexpensive, permanent remedy where all process residuals (including dehalogenated organics) are recyclable or recoverable.

This process would be used at the ETC site to treat the COCs. Organic contaminants such as PAHs would be treated through the MTTD, while the chlorinated COCs such as PCP and TCDD would be treated through the BCD reactor.

Before full-scale implementation of thermal desorption/BCD could occur, a treatability study would be required to confirm that this alternative would be able to meet the RAOs for the site. A trial run would be required before full-scale thermal desorption/BCD to determine if on-site treatment by this method would meet the remedial cleanup levels for the COCs and to optimize the process. In addition, this trial run would demonstrate whether or not an increase in the concentration of metals resulting from soil volume reduction would occur.

Site access would be restricted by the existing fence around the site (with upgrades, as necessary). Deed restrictions may be placed on the site while the remedial action takes place. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust and runon/runoff emissions. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the RAOs were being met, as well as to assess the effectiveness of the remedial action.

Overall Protection of Human Health and the Environment

Removal of contaminated surface soil with on-site treatment virtually eliminates all risks associated with the exposure pathways. Ground-water contamination also would be reduced through the removal and treatment of subsurface soil. Treatability studies would ensure that the selected treatment system would remediate contaminant concentrations to meet remedial cleanup levels.

Compliance with ARARs

This alternative achieves the RAOs and chemical-specific ARARs established for the contaminated surface and subsurface soil at the site since areas of concern are being excavated and treated to meet remedial cleanup levels prior to on-site disposal. Air quality and emission standards also would have to be met during the implementation of this alternative. Operation and design of the treatment system would have to comply with all federal and state ARARs concerning hazardous waste treatment facilities. In addition, this alternative would require compliance with RCRA removal, treatment, transportation, and land disposal regulations.

Long-Term Effectiveness and Permanence

Removal and on-site treatment of contaminated material permanently eliminates the long-term health risks at the site by effectively removing the source of contamination. Risks associated with direct contact or migration of waste to ground water would be eliminated. Five year reviews will not be necessary since only treated soils, and no soil above health-based standards, would remain at the site.

Reduction of M/T/V Through Treatment

This alternative significantly reduces the M/T/V of surface and subsurface soil contaminants through destruction of organic contaminants.

Short-Term Effectiveness

Short- and long-term monitoring would be required under this alternative, since construction activities could result in the release of fugitive dust. Also, operation of heavy equipment during construction would produce some noise nuisance. The short-term measures are similar to Alternative 2, but the action would take longer to implement.

Implementability

Excavation, thermal desorption/BCD, and backfilling of treated soil are established methods that have been successfully demonstrated in large scale applications for many of the COCs. The treatment process requires a relatively short time frame to achieve cleanup. Treatability studies would be required to assure achievement of remedial cleanup levels. The studies would be used to refine the processes and design parameters. Testing of the BCD process on site soils has already taken place; however, mixed results were obtained and would require further investigation. Conditions external to the site, such as equipment availability, materials, and services present no problems at this time.

Daily maintenance checks are required for the thermal desorption/BCD technology. Generally, most of the hardware components are relatively well-developed with repair parts readily available to minimize downtime. Normal maintenance concerns include temperature control, waste feed system, dust and particulate collection, and fouling of the heat transfer surfaces with polymers. Substantive permit requirements also must be addressed.

Monitoring the excavation of contaminated material and operation of the treatment system would be required to verify that the excavation areas and treated material meets the remedial cleanup goals. Materials exiting the thermal desorption/BCD system would be analyzed for the COCs to verify compliance.

Treatability studies, design, and construction are estimated to require 1 year. The actual implementation and treatment of contaminated surface and subsurface soil, including excavation, may take another 2 to 4 years, depending on the scenario for implementation (assumes an approximate 500 ton/day treatment time).

Cost

The total present worth for this alternative is approximately $246.8 million for Option A and $260.8 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $246.7 million and $50,000, respectively. For Option B, capital and O&M costs are approximately $260.7 million, and $50,000. As discussed in Section 4, although they cannot be funded by EPA, it may be beneficial to consider enhancements during the remediation process in anticipation of future land use. For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $250.9 million and $265 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with a cap soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $231.4 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment.

The estimated total present worth cost of Alternative 3 – Excavation, Onsite Treatment w/Thermal Desorption/BCD, and Onsite Disposal is $247,700,000 (Option A) and $261,700,000 (Option B).

2.9.1.4 Alternative 4 -- Excavation, On-site Treatment w/ Solid Phase Bioremediation, and On-site Disposal

This alternative involves relocating the residents of the Clarinda Triangle neighborhood, excavating contaminated surface and subsurface soil both on- and off-site, and transporting it to a central area on-site for consolidation and staging. On-site treatment would be performed and the treated material would be backfilled on-site. To reduce costs associated with material handling and transportation, it is assumed that off-site, excavated/treated material would be backfilled on-site and not taken back into the neighborhoods. Solid phase bioremediation would be the main treatment of the organics. The final treatment system would depend upon the outcome of treatability testing and would be determined during the remedial design phase.

Solid phase bioremediation encompasses a variety of aerobic biological processes including land treatment units, composting, and soil piles. In all of these processes, the growth of indigenous and introduced microorganisms is encouraged through the addition of soil conditioners, mineral fertilizers, oxygen, and moisture. The goal of the process is to encourage the microorganisms to biodegrade contaminants in the soil to less toxic chemicals or to mineralize the contaminants. Mineralization occurs when the microorganisms are able to degrade the contaminants to carbon dioxide and water. Often, biodegradation and mineralization of contaminants occur naturally in soils without nutrient enhancement. In solid phase bioremediation, materials are added to increase the microbial population and, therefore, increase the rate of biodegradation.

Utilizing solid phase bioremediation at the ETC site would consist of mixing the excavated soil with soil amendments and placing it in an aboveground land treatment unit or forming biopiles that include both a leachate collection system and some form of aeration. Moisture, heat, nutrients, oxygen, and pH would be controlled to enhance biodegradation. This process would be used at the ETC site to treat the organic COCs.

Before full-scale implementation of solid phase bioremediation could occur, a treatability study would be required to confirm that this alternative would be able to meet the RAOs for the site. Optimal biodegradation requires an appropriate electron acceptor, microbes that are acclimated to the COCs, and optimal microbial growth conditions. Studies would be necessary to determine if particular strains of acclimated microbes would be necessary, the optimal watering and nutrient addition schedules, and the frequency of aeration through tilling.

Site access would be restricted by the existing fence around the site (with upgrades, as necessary). Deed restrictions may be placed on the site while the remedial action takes place. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust and runon/runoff emissions. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the RAOs were being met, as well as to assess the effectiveness of the remedial action.

<u>Overall Protection of Human Health and the Environment</u>

Removal of contaminated surface soil with onsite treatment virtually eliminates all risks associated with the exposure pathways. Ground water contamination also would be reduced through the removal and treatment of subsurface soil. Treatability studies would ensure that the selected treatment system would remediate contaminant concentrations to meet remedial cleanup goals.

Compliance with ARARs

This alternative achieves the RAOs and chemical-specific ARARs established for the contaminated surface and subsurface soil at the site since areas of concern are being excavated and treated to meet remedial cleanup goals prior to onsite disposal. Air quality and emission standards also would have to be met during the implementation of this alternative. In addition, this alternative would require compliance with RCRA removal, treatment, transportation, and land disposal regulations.

Long-Term Effectiveness and Permanence

Removal and onsite treatment of contaminated material permanently eliminates the long-term health risks at the site by effectively removing the source of contamination. Risks associated with direct contact or migration of waste to groundwater would be eliminated. Bioremediation systems may require lengthy operation. Five year reviews will not be necessary since only treated soils and no soil above health-based goals would remain at the site.

Reduction of M/T/V Through Treatment

This alternative significantly reduces the M/T/V of surface and subsurface soil contaminants through degradation of organic contaminants.

Short-Term Effectiveness

Short- and long-term monitoring would be required under this alternative, since construction activities could result in the release of fugitive dust. Also, operation of heavy equipment during construction would produce some noise nuisance. The short-term measures are similar to Alternative 2, but the action would take longer to implement.

Implementability

Excavation, solid phase bioremediation, and backfilling of treated soil are established methods that have been successfully demonstrated in large scale applications for many of the COCs. As with other biological treatments, under proper conditions, solid phase processes can transform contaminants into nonhazardous substances. However, the extent of the biodegradation is highly dependent on the initial concentrations of the contaminants and their biodegradability, the properties of the contaminated matrix, and the particular treatment system selected. Bioremediation could result in a lengthy operation. Treatability studies would be required to assure achievement of remedial cleanup goals. The studies would be used to refine the processes and design parameters, and determine which nutrients and physical condition will optimize degradation, as well as frequency of tilling. Note that both bench-scale and pilot-scale studies may be required before full-scale implementation. Solid phase bioremediation requires relatively simple technologies and is easy to construct and operate. Conditions external to the site, such as equipment availability, materials, and services present no problems at this time.

Monitoring the excavation of contaminated material and operation of the treatment system would be required to verify that the excavation areas and treated material meets the remedial cleanup goals. Material exiting the biodegradation system would be analyzed for the COCs to verify compliance.

Treatability studies, design, and construction are estimated to require 1.5 years. The actual implementation and treatment of contaminated surface and subsurface soil, including excavation, may take another 4 to 8 years (assumes an approximate 80,000 ton/year treatment time). This time frame is highly dependent of the type of solid phase bioremediation selected for implementation and the available space onsite.

Cost

The total present worth for this alternative is approximately $158 million for Option A and $166.2 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $157.9 million and $60,000, respectively. For Option B, capital and O&M costs are approximately $166.1 million, and $60,000.

For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $162.3 million and $170.5 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with a cap soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $148.6 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment.

The estimated total present worth cost of Alternative 4 – Excavation, On-site Treatment w/ Solid Phase Bioremediation, and On-site Disposal is $158,900,000 (Option A) and $167,100,000 (Option B).

2.9.1.5 Alternative 5 -- Excavation, On-site Treatment w/ Chemical Oxidation, and On-site Disposal

This alternative involves relocating the residents of the Clarinda Triangle neighborhood, excavating contaminated surface and subsurface soil both on- and off-site, and transporting it to a central area on-site for consolidation and staging, although it may be appropriate to consider an "in situ" application for the subsurface and stockpile soils. On-site treatment would be performed and the treated material would be backfilled on-site. To reduce costs associated with material handling and transportation, it is assumed that off-site, excavated/treated material would be backfilled onsite and not taken back into the neighborhoods. Chemical oxidation would be used to address COCs. The final treatment system design would depend upon the outcome of treatability testing and would be determined during the remedial design phase.

Oxidation chemically coverts hazardous contaminants to non-hazardous, less toxic compounds that are more stable, less mobile, and/or inert. The most commonly used oxidizing agents include peroxide, ozone, and permanganate. Ozone, which is a molecule comprised of three oxygen atoms, is the oxidant considered for this evaluation. In addition to exhibiting the effectiveness of other oxidizers, ozone has the advantage of being very economical and highly efficient. Ozone is a more powerful oxidizer than either hydrogen peroxide or potassium permanganate. Ozone is generated onsite from process equipment, so there is little recurring expense for production, and being a gas, it is easier to deliver to the subsurface or other "in situ" environment (e.g., the stockpile).

Before full-scale implementation of chemical oxidation could occur, a treatability study would be required to confirm that this alternative would be able to meet the RAOs for the site. A trial run would be required before full-scale chemical oxidation to determine if onsite treatment by this method would meet the remedial cleanup levels for the COCs and to optimize the process.

Site access would be restricted by the existing fence around the site (with upgrades, as necessary). Deed restrictions may be placed on the site while the remedial action takes place. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust and runon/runoff emissions. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the RAOs were being met, as well as to assess the effectiveness of the remedial action.

Overall Protection of Human Health and the Environment

Removal of contaminated surface soil with on-site treatment virtually eliminates all risks associated with the exposure pathways. Ground water contamination also would be reduced through the removal and treatment of subsurface soil. Treatability studies would ensure that the selected treatment system would remediate contaminant concentrations to meet remedial cleanup levels.

Compliance with ARARs

This alternative achieves the RAOs and chemical-specific ARARs established for the contaminated surface and subsurface soil at the site since areas of concern are being excavated and treated to meet remedial cleanup goals prior to on-site disposal. Air quality and emission standards also would have to be met during the implementation of this alternative. Operation and design of the treatment system would have to comply with all federal and state ARARs concerning hazardous waste treatment facilities. In addition, this alternative would require compliance with RCRA removal, treatment, transportation, and land disposal regulations.

Long-Term Effectiveness and Permanence

Removal and on-site treatment of contaminated material permanently eliminates the long-term health risks at the site by effectively removing the source of contamination. Risks associated with direct contact or migration of waste to groundwater would be eliminated.

Reduction of M/T/V Through Treatment

This alternative significantly reduces the M/T/V of surface and subsurface soil contaminants through treatment.

Short-Term Effectiveness

Short- and long-term monitoring would be required under this alternative, since construction activities could result in the release of fugitive dust. Also, operation of heavy equipment during construction would produce some noise nuisance. The short-term measures are similar to Alternative 2, but the action would take longer to implement.

Implementability

Excavation, chemical oxidation, and backfilling of treated soil are established methods that have been successfully demonstrated in large scale applications for many of the COCs. Treatability studies would be required to assure achievement of remedial cleanup levels. The studies would be used to refine the processes and design parameters. Conditions external to the site, such as equipment availability, materials, and services present no problems at this time. Monitoring the excavation of contaminated material and operation of the treatment system would be required to verify that cleanup levels are attained.

Treatability studies, design, and construction are estimated to require 1 year. The actual implementation and treatment of contaminated surface and subsurface soil, including excavation, may take another 4 to 5 years.

Cost

The total present worth for this alternative is approximately $158.1 million for Option A and $166.2 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $158 million and $50,000, respectively. For Option B, capital and O&M costs are approximately $166.1 million, and $50,000.

For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $162.3 million and $170.5 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with a cap soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $148.6 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment.

The estimated total present worth cost of Alternative 5 – Excavation, On-site Treatment w/ Chemical Oxidation, and On-site Disposal is $159,000,000 (Option A) and $167,100,000 (Option B).

2.9.1.6 Alternative 6 -- Excavation, On-site Treatment w/ Solidification/Stabilization, and On-site Disposal

This alternative involves relocating residents of the Clarinda Triangle neighborhood, excavating contaminated surface and subsurface soil both on- and off-site, and transporting it to a central area on-site for consolidation and staging. On-site treatment would be performed and the treated material would be backfilled on-site. The soils would undergo a solidification/stabilization (S/S) process to immobilize COCs prior to disposing of the soil on-site. A soil cap (or other material appropriate to the intended use of the future site) would be placed over the treated material.

Solidification refers to processes that encapsulate a waste to form a solid material and to restrict contaminant migration by decreasing the surface area exposed to leaching and/or coating the waste with low-permeability materials. Solidification can be accomplished by a chemical reaction between waste and binding reagents or by mechanical processes. Stabilization refers to processes that involve chemical reactions that reduce the leachability of a waste which, in effect, chemically immobilizes the waste.

Solidification and stabilization are well-established processes for the treatment of inorganic contaminants within soil and are more typically associated with the treatment of inorganic contaminants; however, the treatment of organic compounds can also be accomplished. For example, S/S was able to achieve cleanup goals for PCP, benzo(a)pyrene, dibenz(a,h, anthracene, and dioxin contamination at the American Creosote Site, a wood-preserving site in Tennessee (EPA 2000).

Before full-scale implementation of S/S could occur, a treatability study would be required to confirm that this alternative would be able to meet the RAOs for the site and to identify the appropriate binding agents and/or additives that would be effective for the ETC COCs . A trial run would be required before full-scale S/S to determine if onsite treatment by this method would meet the remedial cleanup levels for the COCs and to optimize the process.

Site access would be restricted by the existing fence around the site (with upgrades, as necessary). Deed restrictions may be placed on the site during and after the remedial action takes place. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust and runon/runoff emissions. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the RAOs were being met, as well as to assess the effectiveness of the remedial action.

Overall Protection of Human Health and the Environment

Removal of contaminated surface soil with on-site treatment virtually eliminates all risks associated with the exposure pathways. Groundwater contamination also would be reduced through the removal and treatment of subsurface soil. Treatability studies would ensure that the selected treatment system would remediate contaminant concentrations to meet remedial cleanup levels.

Compliance with ARARs

This alternative achieves the RAOs and chemical-specific ARARs established for the contaminated surface and subsurface soil at the site since areas of concern are being excavated and solidified/stabilized to meet remedial cleanup levels prior to on-site disposal. Air quality and emission standards also would have to be met during the implementation of this alternative. Operation and design of the S/S process would have to comply with all federal and state ARARs concerning hazardous waste treatment facilities. In addition, this alternative would require compliance with RCRA removal, treatment, transportation, and land disposal regulations.

Long-Term Effectiveness and Permanence

Removal and onsite treatment of contaminated material permanently eliminates the long-term health risks at the site by effectively immobilizing the source of contamination. Risks associated with direct contact or migration of waste to groundwater would be eliminated.

Reduction of M/T/V Through Treatment

This alternative significantly reduces the mobility and toxicity of surface and subsurface soil contaminants through treatment. Soil volume may increase depending on the solidification/stabilizing agents used.

Short-Term Effectiveness

Short- and long-term monitoring would be required under this alternative, since construction activities could result in the release of fugitive dust. Also, operation of heavy equipment during construction would produce some noise nuisance. The short-term measures are similar to Alternative 2, but the action would take longer to implement.

Implementability

Excavation, solidification/stabilization, and backfilling of treated soil are established methods that have been successfully demonstrated in large scale applications for many of the COCs. Treatability studies would be required to assure achievement of remedial cleanup levels. The studies would be used to refine the processes and design parameters. Conditions external to the site, such as equipment availability, materials, and services present no problems at this time.

Monitoring the excavation of contaminated material and operation of the treatment system would be required to verify that the excavation areas and treated material meets the anticipated remedial cleanup levels.

Treatability studies, design, and construction are estimated to require 1 year. The actual implementation and treatment of contaminated surface and subsurface soil, including excavation, may take another 4 to 5 years.

Cost

The total present worth for this alternative is approximately $51.9 million for Option A and $53.1 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $51.8 million and $50,000, respectively. For Option B, captial and O&M costs are approximately $53 million, and $50,000.

For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $56.2 million and $57.4 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with an extension of the cap's soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $49.5 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment.

The estimated total present worth cost of Alternative 6 – Excavation, On-site Treatment w/ Solidification/Stabilization, and On-site Disposal is $52,800,000 (Option A) and $54,000,000 (Option B).

2.9.1.7 Alternative 7 -- Excavation, Off-site Transportation and Disposal at Subtitle C Landfill

This alternative consists of relocating residents of the Clarinda Triangle neighborhood and transporting contaminated soils offsite to a RCRA Subtitle C landfill. This alternative would be performed in two phases. After installation of a railspur and loading ramp on the ETC site, the existing soil stockpile would be loaded and transported off-site prior to excavating any other contaminated soil. When the existing soil stockpile is nearly depleted, then excavation of on-site and applicable off-site soil would begin. Off-site shipment of soil in covered "gondola" railcars would be the preferred method of transportation.

Deed restrictions may be placed on the site while the remedial action takes place. Water would be used to minimize fugitive dust emissions during soil excavation, transport, and handling. Any stockpiles of material during interim storage would be covered by tarps or plastic sheeting to minimize fugitive dust and runon/runoff emissions. Surface water runoff, fugitive emissions and treated soils would be monitored to ensure that the RAOs were being met. After removal of all applicable contaminated soils, excavated areas would be backfilled with clean soil and vegetation planted.

Overall Protection of Human Health and the Environment

Excavation of contaminated soil from the site and transporting soil to an off-site RCRA regulated landfill for disposal would eliminate exposure pathways and significantly reduce level of risk at and adjacent to the ETC site.

Compliance with ARARs

Transportation of contaminated soil would be in accordance with applicable Department of Transportation hazardous material regulations. Disposal at a RCRA permitted Subtitle C landfill would be in compliance with ARARs.

Long-Term Effectiveness and Permanence

No long-term public health threats would remain onsite related to soil. Property can be returned to any viable land use. Ground water would also be protected through removal of source contaminants.

Reduction of M/T/V Through Treatment

Removal of the contaminated soil offsite and directly landfilling does not meet criteria of reduction of M/T/V through treatment. Even though mobility is eliminated in relation to the ETC site, no reduction of toxicity or volume has been achieved since under this alternative no treatment is planned.

Short-Term Effectiveness

During on-site removal action Level D personnel protective equipment is required. The potential exists for a higher level of protection to be used during excavation or loading of railcars. Excavation and grading may result in release of nuisance or contaminated dust. Use of heavy equipment may cause a noise nuisance. Engineering controls will be utilized for controlling the dust and possible odors. Higher levels of personnel protection may become necessary for onsite workers during activities if engineering controls do not reduce dust, odors, or noise. Transportation risks are the highest for this alternative.

Implementability

This alternative has minimal technical considerations once representative samples are collected and presented to the receiving landfill(s) for their acceptance evaluation. Historical knowledge and current information about soil chemical and physical characteristics would be provided to the landfill(s). No engineering expertise is anticipated except in design and construction of the railspur and loading ramp. The railroad has contractors available to install the railspur and loading ramps are available from local vendors. If a treatability variance cannot be obtained, then the soil will have to be treated to meet RCRA treatment standards which would be more costly than on-site treatment. This alternative assumes that treatment will be required. If railcar (gondolas) are utilized and 10 gondolas are available on average per day for loading and each gondola has a load capacity of about 45 tons, then approximately 450 tons (cy) can be shipped per day. Depending on volume to be shipped, it is assumed that loading and shipping would take from 2 - 4 years.

Costs

The total present worth for this alternative is approximately $312.8 million for Option A and $331.6 million for Option B. Capital and O&M costs for this alternative under Option A are approximately $312.8 million and $60,000, respectively. For Option B, capital and O&M costs are approximately $331.5 million, and $60,000.

For this alternative, several components that can be considered "enhancements" (including additional soil compaction, an additional soil buffer layer, addition of an asphalt layer to containment areas) for the purpose of enhancing the site for future use were included for consideration in the alternative cost estimate. With the addition of enhancements, the total present worth costs for Option A and Option B increase to $317.1 million and $335.9 million, respectively.

Conversely, in an effort to reduce costs, Option A for this alternative was also evaluated with a smaller level of excavation. This could be achieved by foregoing excavation of contaminated surface soils on certain portions of the site, and instead, covering those surface soils with a cap soil cushion, top soil and vegetative cover layers. Following this option reduces the total present worth cost of Option A for this alternative to $293 million.

The Proposed Plan Update incorporated two modifications to the scope of the remedial alternatives. The first, the addition of ten more residential properties within the scope of the relocation of the Clarinda triangle residents, is estimated to add approximately $900,000 to the cost of each alternative. The second modification, construction of a soil/cement sub-cap, is only applicable to Alternative 2 – Capping/Containment.

The estimated total present worth cost of Alternative 7 – Excavation, Off-site Transportation and Disposal at Subtitle C Landfill is $313,700,000 (Option A) and $332,500,000 (Option B).

2.9.2 Common Elements and Distinguishing Features of the Alternatives

With the exception of Alternative 1 – No Action, all of the alternatives address surface and subsurface soil contaminated above remedial cleanup levels, and meet the threshold criteria of protection of human health and the environment and attainment of ARARs. Since Alternative 1 – No Action does not meet these criteria; it will not be discussed further in this section. The contaminated soil is located in both off- and on-site areas, and all of the alternatives are based on excavating the off-site areas and staging all of the contaminated soil on-site for remediation. Table 5 summarizes the volumes of off- and on-site contamination by medium that will be addressed by each of the alternatives. Based on these estimates, approximately 312,000 cubic yards of in-place contaminated soil, and 255,000 cubic yards of currently stockpiled soil, will be addressed by each of the remedial alternatives.

The remedial alternatives consider two basic approaches to address contaminated soil at the ETC Site. Alternatives 2, 6 and 7 reduce or eliminate the mobility of the contaminants through containment and/or solidification/stabilization. Alternatives 3, 4 and 5 address the soil

contamination using various active treatment technologies to reduce the toxicity and volume of contamination. All of the alternatives involve reasonably well-established technologies that can be readily implemented. The containment and solidification/stabilization alternatives use technologies that are better established for the ETC OU-1 COCs and selected cleanup levels than the other alternatives. Both the active treatment alternatives and solidifaction/stabilization meet the statutory preference for treatment to reduce the mobility, toxicity, or volume of contamination, and the off-site disposal alternative does not. While active treatment to attain the selected cleanup levels is feasible,

Table 5. Summary of Estimated Contaminated Soil Volumes for ETC OU-1

Area of Concern	Volume of Surface Soil > Cleanup Levels (yd³)	Volume of Subsurface Soil > Cleanup Levels (yd³)
On-site	103,194	101,025
Stockpiled Soil	255,000	0
Off-site Area Near SWMU 10	1,500	33,125
Rosewood Terrace/Oak Park/Escambia Arms	41,250	0
Pearl Street & Hermann Avenue	15,340	0
Clarinda Triangle	15,700	0
Palafox Industrial Park	800	0
Commercial Strip	0	0
TOTAL	566,934	

the selected cleanup levels are near the limit of demonstrated success for current active treatment technologies. The short-term impacts of all of the alternatives are similar, but the duration of these impacts would generally be shorter for the containment and solidification/stabilization alternatives.

2.10 Comparative Analysis of Alternatives

The seven remedial alternatives have been examined with respect to the requirements in the NCP (40 CFR Part 300.430[e][9]iii), CERCLA, and factors described in *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988). The nine evaluation criteria include the following:

Threshold Criteria

- Overall protection of human health and the environment;
- Compliance with ARARs;

Balancing Criteria

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

Modifying Criteria

- State acceptance; and
- Community acceptance

A comparative analysis of the soil alternatives based on the threshold and balancing evaluation criteria is presented below. The objective of this section is to compare and contrast the alternatives to support selection of the remedy for ETC OU-1. The alternatives compared include:

- Alternative 1 – No Action;
- Alternative 2 – Excavation and On-site Containment/Capping;
- Alternative 3 -- Excavation, On-site Treatment w/ Thermal Desorption/BCD, and Onsite Disposal;
- Alternative 4 -- Excavation, On-site Treatment w/ Solid Phase Bioremediation, and On-site Disposal;
- Alternative 5 -- Excavation, On-site Treatment w/ Chemical Oxidation, and On-site Disposal;
- Alternative 6 -- Excavation, On-site Treatment w/ Solidification/Stabilization, and On-site Disposal; and
- Alternative 7 -- Excavation, Off-site Transportation and Disposal at Subtitle C Landfill

Note that, under each alternative, two options pertaining to applying residential or industrial cleanup levels in the Clarinda Triangle area are presented. The comparative evaluation of the alternatives has been updated to incorporate the modifications contained in the Proposed Plan Update of October, 2005. Table 6 presents a summary of each remedial alternative along with qualitative ranking scores for each evaluation criterion. Each alternative's performance against the criteria (except for present worth) was ranked on a scale of 0 to 5, with 0 indicating that none of the criterion's requirements were met and 5 indicating all of the requirements were met. The ranking scores combined with the present worth costs provide the basis for comparison among alternatives. With the exception of short-term effectiveness, Alternatives 2 through 7 are ranked higher than Alternative 1 across all the criteria. Alternatives 2 through 7 are the same for overall protection, and compliance with ARARs. Alternatives 3, 4 and 7 rank slightly higher in long-term effectiveness and permanence, but lower in implementability than Alternatives 2 and 6. Alternatives 3, 4 and 5 are ranked higher than Alternatives 2, 6 and 7 in reduction of M/T/V.

2.10.1 Overall Protection of Human Health and the Environment

All of the alternatives except Alternative 1 – No Action would provide protection of human health and the environment by eliminating, reducing, or controlling risk through removal, treatment, and/or containment with engineering and institutional controls. Since alternative 1 does not meet the threshold criteria for the cleanup, it will not be discussed further in this section of the ROD.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at Superfund sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

Table 6. Comparative Evaluation of Remedial Alternatives for ETC OU-1

Remedial Alternative	Criteria Rating						Approximate Present Worth ($)
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of M/T/V Through Treatment	Short-Term Effectiveness	Implement-ability	
1 -- No Action	0	0	0	0	5	5	$126,000
2 -- Capping/ Containment	5	5	4	3	4	4	A - $28.1 million B - $27.8 million
3 -- Excavation, Onsite Treatment w/ Thermal Desorption/BCD, and Onsite Disposal	5	5	5	5	4	3	A -- $247.7 million B -- $261.7 million
4 -- Excavation, Onsite Treatment w/ Solid Phase Bioremediation, and Onsite Disposal	5	5	5	5	3	3	A -- $158.9 million B -- $167.1 million
5 -- Excavation, Onsite Treatment w/ Chemical Oxidation, and Onsite Disposal	5	5	5	5	4	4	A -- $159 million B -- $167.1 million
6 -- Excavation, Onsite Treatment w/ Solidification/ Stabilization, and Onsite Disposal	5	5	4	3	4	4	A -- $52.8 million B -- $54 million
7 -- Excavation, Transportation and Offsite landfill disposal	5	5	5	2	4	4	A -- $313.7 million B -- $332.5 million

* Each alternative's performance against the criteria (except for present worth) was ranked on a scale of 0 to 5, with 0 indicating that none of the criterion's requirements were met and 5 indicating all of the requirements were met.

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a Superfund site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Superfund site, address problems or situations sufficiently similar to those encountered at the Superfund site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver. For additional information on ARARs for this site, see Section 2.13.

Each remedial alternative is evaluated for its compliance with ARARs as defined in CERCLA Section 121(f). The following items must be considered during the evaluation:

- Compliance with contaminant-specific ARARs (i.e., MCLs). This consideration includes whether contaminant-specific ARARs can be met and whether a waiver may be appropriate if they can not be met.
- Compliance with location-specific ARARs (i.e., protection of historic sites, regulations regarding activities near wetlands/floodplains). This consideration includes whether location-specific ARARs can be met or waived.
- Compliance with action-specific ARARs (i.e., RCRA treatment technology standards). This consideration includes whether action-specific ARARs can be met or waived.

All of the alternatives would comply with ARARs by addressing on- and off-site soils contaminated above remedial cleanup levels.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain following remediation and the adequacy and reliability of controls. Each alternative, except the No Action alternative, provides some degree of long-term protection. Evaluation of the long-term effectiveness and permanence of a remedial alternative addresses the results of a remedial alternative in terms of the risk remaining at the site after RAOs are achieved. Long-term effectiveness is evaluated based on the following three factors:

- Magnitude of the remaining risk. This consideration addresses the residual risk remaining from untreated waste or treatment residuals at the end of the remedial activities;

- Adequacy of controls. This consideration addresses the adequacy and suitability of the controls, if necessary, that are used to manage the treatment residuals or untreated wastes that remain at the site; and
- Reliability of the controls. This consideration addresses the long-term reliability of management controls, if used, for providing continued protection from the treatment residuals or untreated wastes.

All of the alternatives achieve long-term effectiveness and permanence, but the treatment alternatives (3, 4, and 5) and off-site disposal alternative (7) would not require the same degree of on-site operation & maintenance (O&M) to ensure the remedy remains protective. The on-site containment remedies (alternatives 2 and 6), would require long-term O&M, but the remedy design and future land use will minimize O&M requirements. All of the alternatives result in cleanup to commercial standards, so institutional controls will be necessary to ensure compatible land use is maintained. Similarly, all of the alternatives except, potentially alternative 7, would necessitate Five-Year Reviews of remedy protectiveness since unrestricted use/unlimited exposure criteria would not be met. Adequate and reliable controls can be readily established for all of the alternatives.

2.10.4 Reduction of Mobility, Toxicity, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. This criterion addresses the statutory preference for selecting a remedial action that employs treatment technologies that are able to permanently and significantly reduce the toxicity, mobility or volume of the COCs as their principal element. The ability of a remedial alternative to reduce the toxicity, mobility or volume of the COCs is evaluated based on the following five factors:

- The treatment processes, the remedies employed and the materials they treat;
- The amount (mass or volume) of hazardous materials that will be destroyed or treated by the remedial alternative, including how the principal threat(s) will be addressed;
- The degree of expected reduction in toxicity, mobility or volume of COCs, measured as a percentage of reduction or order of magnitude;
- The degree to which the treatment is irreversible; and
- The type and quantity of treatment residuals that would remain following the treatment actions.

The on-site containment alternatives 2 and 6 provide a reduction in mobility, but not in the toxicity and volume of contaminated soil. Solidification/stabilization would result in an increase in the volume of waste through the addition of cement, but would irreversibly reduce the mobility of soil contaminants. Since alternative 2 incorporates solidification/stabilization of principal threat waste only, it achieves a better balance between increased volume and permanent reduction in mobility than alternative 6 which solidifies/stabilizes the entire contaminated soil volume. The treatment alternatives 3, 4 and 5 are all similar in the reduction of M/T/V through treatment. All of the treatment alternatives are expected to achieve the remedial cleanup levels, completely addressing the principal threats and reducing the remaining M/T/V by more than 95%. All of the treatment technologies are irreversible, and are expected to produce environmentally benign residuals. Alternative 7 relies on removal of contaminated soil from OU1 as the primary method of reducing M/T/V. Only the treatment alternatives (3, 4, and 5) fully meet the statutory preference for treatment as a principal element of the cleanup, but alternatives 2 and 6 partially meet this criterion (treatment to permanently reduce mobility is a principle element of both these alternatives).

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved. The short-term effectiveness of a remedial alternative is evaluated with respect to its effect on human health and the environment during its implementation. Short-term effectiveness is evaluated based on the following four factors:

- Protection of the community during the remedial action. This consideration addresses any risk that results from the implementation of the remedial action (i.e., dust from an excavation or air-quality impact from a stripping tower) that may affect human health;
- Protection of workers during the remedial action. This consideration addresses threats that may affect workers and the effectiveness and reliability of protective measures that may be taken;
- Environmental impacts. This consideration addresses the potential adverse environmental impact that may result from the implementation of the remedial alternative and evaluates how effective available mitigation measures would be able to prevent or reduce the impact; and
- The amount of time required until the RAOs are achieved. This consideration includes an estimate of the time required to achieve protection for the entire site or for individual elements associated with specific site areas of threats.

All of the alternatives involve residential relocation followed by excavation and staging of contaminated soils, and many of the short term impacts are associated with these activities. Alternatives 2 and 7 would have the shortest durations, and would have lower impacts for this reason. Alternative 7 would involve additional considerations associated with transporting material off-site for disposal. Alternatives 3, 5, and 6 are similar in duration and short-term effectiveness regarding worker and community considerations. The biological processes used in alternative 4 are expected to require a significantly longer treatment duration, and would have greater short term impacts as a result. Equipment, materials and techniques designed to control dust and run-off would be required for all of the alternatives.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

This criterion addresses the technical and administrative feasibility of implementing a remedial alternative and the availability of various services and/or materials/supplies required during the implementation. The implementability of a given remedial alternative is evaluated based on the following factors:

- Technical feasibility
  - Construction and operation. This consideration relates to the technical difficulties and unknown aspects associated with a given technology;
  - Reliability of a technology. This consideration focuses on the ability of a technology to meet specified process efficiencies and performance goals, including whether technical problems may lead to schedule delays;
  - Ease of undertaking additional remedial actions. This consideration includes a discussion of what, if any, future remedial actions may need to occur and how difficult it would be to implement them; and
  - Monitoring considerations. This consideration addresses the ability to monitor the effectiveness of the remedial actions and includes an evaluation of the risks of exposure if monitoring is determined to be insufficient to detect a system failure.
- Administrative feasibility. This consideration addresses the ability and time required to coordinate with other offices and regulatory agencies (i.e., obtaining permits for off-site activities or rights-of-way for construction activities).
  - Availability of services and materials/supplies;
  - Availability of adequate off-site treatment, storage capacity and disposal services;
  - Availability of necessary equipment, specialists and provisions to ensure any necessary additional resources;
  - Timing of the availability of each technology; and
  - Availability of services and materials, and the potential for obtaining competitive bids, especially for innovative technologies.

All of the alternatives require residential relocation in the Cl;arinda Triangle neighborhood and excavation of contaminated soil, and rank similarly in the implementability of this portion of the remedy. Alternative 7 is the simplest to implement because it only requires excavation and consolidation prior to transportation by rail and off-site disposal. Alternative 2 involves well established construction materials and methods, and would be straightforward to implement. Alternatives 5 and 6 would be similar in implementability; both would require construction and operation of a batch mixing plant to handle the entire contaminated soil volume using readily available components and chemicals. Alternatives 3 and 4 would be the least implementable, but these alternatives are feasible; involving some specialized equipment and technology.

2.10.7 Cost

For each remedial alternative, a –30 to +50 percent cost estimate has been developed. Cost estimates for each remedial alternative are based on conceptual engineering and design and are expressed in 2005 dollars. The cost estimate for each remedial alternative consists of the following four general categories:

- Capital costs – These costs include the expenditures that are required for construction of the remedial alternative (direct costs) and non-construction/overhead costs (indirect costs). Capital costs are exclusive of the costs required to operate and maintain the remedial alternative throughout its use. Direct costs include the labor, equipment and supply costs, including contractor markups for overhead and profit, associated with activities such as mobilization, monitoring, site work, installation of treatment systems, and disposal costs. Indirect costs include items required to support the construction activities but are not directly associated with a specific item.
- Total construction costs – These costs include the capital costs with the addition of the contractor fee (at 10% of capital costs), engineering and administrative costs (at 15% of capital costs), and a contingency allowance set at 25% of the capital costs with contractor fees and engineering and administrative costs.
- Present worth O&M costs – These costs include the post-construction cost items required to ensure or verify the continued effectiveness of the remedial alternative. O&M costs typically include long-term power and material costs (i.e., operational cost of a water treatment facility), equipment replacement/repair costs, and long-term monitoring costs (i.e., labor and laboratory costs), including contractor markups for overhead and profit. Present worth analysis is based on a 7% discount rate over a period of 30 years.
- Total present worth costs – This is the sum of the total construction costs and present worth O&M costs which forms the basis for comparison of the various remedial alternatives.

Table 7. Comparison of Remedial Alternative Costs for ETC OU-1

Alternative	Capital Cost	Total Construction Cost	Present Worth O&M Cost	Total Present Worth Cost
1 – No Action	$0	$0	$126,381	$126,381
2 – Excavation and Capping/Containment	A-$17,038,562 B-$16,814,262	A-$27,522,753 B-$27,172,284	A-$631,558 B-$628,208	A-$28,154,311 B-$27,800,492
3 – Thermal Desorption/ BCD w/On-site Disposal	A-$157,927,380 B-$166,846,980	A-$247,661,531 B-$261,598,406	A-$50,071 B-$50,071	A-$247,711,602 B-$261,648,477
4 – Solid-phase Bioremed-iation w/On-site Disposal	A-$101,111,880 B-$106,312,580	A-$158,887,313 B-$167,013,406	A-$60,611 B-$60,611	A-$158,947,924 B-$167,074,017
5 – Ex-situ Chemical Oxi-dation w/On-site Disposal	A-$10,125,080 B-106,354,580	A-$158,907,938 B-$167,079,031	A-$50,071 B-$50,071	A-$158,958,009 B-$167,129,102
6 – Solidification/stabiliz-Ation w/On-site Disposal	A-$33,167,500 B-$33,931,000	A-$52,724,219 B-$53,917,188	A-$50,071 B-$50,071	A-$52,774,290 B-$53,967,259
7 – Excavation w/Off-site Disposal	A-$200,185,000 B-$212,171,700	A-$313,689,063 B-$332,418,281	A-$56,121 B-$56,121	A-$313,745,184 B-$332,474,402

Note: Costs attributable to the Proposed Plan Update (October, 2005) modifications are included as follows: Additional relocation costs are included in the Total Construction Cost for all alternatives; and, Alternative 2 solidification/stabilization costs are distributed as a proportion (.64/.36) between Capital Cost and Total Construction Cost for both options under this alternative.

Based on a comparative analysis, Option A is the least expensive option due to the slightly smaller volume of soil requiring treatment except in the case of Alternative 2. Alternative 2 includes treatment of the same volume of principal threat waste under both options, and realizes a relative cost savings between additional excavation costs associated with attaining residential cleanup standards with temporary residential relocation (Option B) and more limited excavation to commercial cleanup standards with permanent residential relocation (Option A). The comparable costs for the alternatives under Option A are: alternative 2 ($28.1 million) is the least expensive, followed by alternative 6 ($52.8 million), alternative 4 ($158.9 million), alternative 5 ($159million), alternative 3 ($247.7 million) and alternative 7 ($313.7 million).

2.11 Principal Threat Wastes

The NCP establishes an expectation that EPA will address the principal threats posed by a site through treatment wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat waste combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile, which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. A portion of the contaminated soil in the on-site stockpile is considered to be "principal threat wastes" because the chemicals of concern are found at concentrations that pose a significant risk to human receptors and includes the more mobile contaminants.

The alternatives described in Section 2.9, except Alternative 1 – No Action, would address these principal threat wastes. Three of the alternatives (3, 4, and 5) would address the principal threat wastes through treatment to reduce the M/T/V of the waste, and two alternatives (2 and 6) rely on containment with varying degrees of treatment to reduce mobility. Alternative 6 incorporates solidification/stabilization of all the contaminated soil, including principal threat wastes. Alternative 2 incorporates treatment through solidification/stabilization of the most contaminated stockpiled soil that constitutes principal threat waste. Alternative 7 utilizes off-site disposal, and does not incorporate treatment of the principal threat wastes. Due to the design of the alternatives and the nature of the COC's, containment with solidification/stabilization is expected to be similar or as effective as other treatment processes in addressing the principal threat wastes present at the Site.

2.12 Selected Remedy

2.12.1 Rationale for the Selected Remedy

The remedy selected for ETC OU-1 is to address contaminated surface and subsurface soil present both on- and off-site, and is intended to be the final action for this OU. This action will be consistent with the prior removal action and interim-remedial action for this OU in addressing the stockpiled soil (containing principal threat waste), on-site soil contamination, and off-site soil contamination that is attributable to the Site. This will not be the final action at the ETC Site; OU-2 (ground water) will be addressed by a separate decision document. The selected remedy will not be inconsistent with a subsequent action to address OU-2.

Each of the alternatives evaluated, with the exception of alternative 1 – No Action, met the threshold criteria of protection of human health and the environment and compliance with ARAR's. Therefore, the selected alternative must provide the best balance among the balancing criteria of short-term effectiveness; long-term effectiveness and permanence; reduction in mobility, toxicity, and volume through treatment; implementability; and, cost. Each of the alternatives was similar in short-term effectiveness and long-term effectiveness and permanence, with alternatives 3, 4, and 5 providing a higher degree of permanence through treatment. This increase in long-term effectiveness and permanence was somewhat offset by the lower short-term effectiveness of the treatment alternatives in terms of the duration and hazard of short-term impacts.

Three of the alternatives (3, 4, and 5) were based primarily on treatment technologies, two (2 and 6) were based on containment with varying degrees of treatment through solidification/ stabilization, and one (7) is based on removal. The three primary treatment alternatives fully satisfy the statutory preference for treatment, the containment with solidification/stabilization alternatives partially satisfy the statutory preference for treatment, and the removal alternative does not. Therefore the treatment technologies offer the best reduction in M/T/V while the containment with solidification/stabilization alternatives offer a smaller degree of reduction in M/T/V through treatment by addressing contaminant mobility only and not toxicity or volume. However, the three treatment technologies also were the least implementable and most costly alternatives, with the exception of Alternative 7 – Excavation and Off-site Disposal, which was the most costly alternative and afforded the smallest degree of reduction in M/T/V through treatment. Alternative 5 -- Ex-situ Chemical Oxidation and On-site Disposal is the most implementable and lowest cost of the treatment alternatives, but it is still estimated to cost more than five times the lowest cost containment with solidification/stabilization alternative. The cost of the treatment alternatives outweighs the relative improvement in the preference for reduction of M/T/V through treatment since they result in a substantially equivalent degree of protectiveness as the containment with solidification/stabilization alternatives.

The remaining containment alternatives were alternative 2 – Excavation with On-site Containment/Capping, and alternative 6 – Solidification/stabilization with On-site Disposal. Alternative 6 provides greater adequacy in control of contaminant mobility by physically immobilizing the waste materials throughout their volume. However, the reliability of solidification/stabilization relative to containment/capping with ongoing O&M is similar. Therefore, Alternative 2 – Excavation with On-site Containment/Capping and Solidification/Stabilization of Principal Threat Waste is the selected remedy for ETC OU-1 since it is just as effective as the other alternatives evaluated and has the lowest cost.

The modifying criteria of state and community acceptance have been incorporated into the selected remedy. The State of Florida through the FDEP concurs with the selected remedy. The community has expressed concern that the selected remedy should incorporate treatment to the maximum extent possible to ensure the long-term permanence and reliability of the remedy, that all potentially impacted residential properties in the Clarinda triangle neighborhood are addressed, and that the remedy provide for the fewest possible restrictions on future land use. Based on these concerns, EPA modified the preferred alternative in the Proposed Plan Update (October, 2005) to incorporate additional elements in the remedy to address these concerns as discussed previously.

2.12.2 Description of the Selected Remedy – Excavation with On-site Containment/Capping and Solidification/Stabilization of Principal Threat Waste

Residential relocation, excavation of on- and off-site contaminated soil with on-site containment, solidification/stabilization of principal threat wastes, and capping will serve to prevent direct contact exposure, migration and leaching of contaminants to ground water, and human or ecological exposure to soil particulates. A combination of O&M, institutional controls, and periodic monitoring will prevent future releases of contaminants and ensure the remedy protects human health and the environment over the long-term. Design and construction of a containment and cap system that is compatible with the expected future use of the Site also is an important component of both long-term effectiveness and community acceptance for the remedy. The selection of commercial cleanup standards is predicated, in part, on the expectation that the off-site properties are converted to commercial land use. To this end, both Escambia County and the City of Pensacola have adopted resolutions supporting commercial reuse of the Site. Since the performance and complexity of O&M will be directly related to the future use of the property, coordination with local government during remedial design and construction also will be critical. The remedy is based on a conceptual design that is compatible with the expected future use of the Site, but does not include "enhancements" that may be desirable but are not necessary to achieve RAOs.

An enhancement is not a remedial feature or activity in that it is not necessary for the effectiveness of the remedy (although it may make some contribution to its effectiveness). Enhancements can include things such as roads, foundations and parking lots. For example, the procedures used to place contaminated soil in the excavated areas are in part determined by the compaction requirements included in the design. An end use encompassing the construction of a structure such as a warehouse or other significant load-bearing structure over the filled area will require more stringent compaction specifications than fill covered by a multilayer cap. Similarly, the use of foundation structures such as footings and the need to evenly distribute load may require thicker or additional cap layers to ensure that waste material remains isolated. Providing additional compaction of soils in waste cells beyond what is needed to support a protective cap or providing additional clean fill above a protective cap to support anticipated future construction would be considered an enhancement. While EPA cannot fund or require the funding of an enhancement, enhancements can still be considered in the remediation process. For example, if there is a commercial interest in redeveloping a site identified early in the process, and the planned redevelopment requires additional compaction, it can be arranged for during the process. This approach was followed at the Raymark Superfund Site in Stratford, Connecticut, where a prospective developer, anticipating future building construction, paid for additional compaction during construction of the containment system (EPA 2002). During remedial design, it is possible that discussions with local government, or other potentially interested parties, will lead to a cost sharing arrangement to include upgrades or enhancements during remedial construction. For these reasons, EPA considers the selected remedy to be compatible with the intended future use of the site.

The major components of the selected remedy include:

- Residential relocation within and immediately adjacent to the Clarinda Triangle neighborhood;
- Excavation of contaminated soil on- and off-site;
- Containment and cap system with solidification/stabilization of principal threat wastes;
- Operation & maintenance;
- Long-term monitoring;
- Institutional controls; and
- Five-Year Reviews

2.12.2.1 Residential Relocation

The Clarinda Triangle area is currently a mixed residential and commercial area. The scope of the residential relocation includes the approximately 65 residential parcels within and immediately adjacent to the Clarinda Triangle. The expected future land use in this area is commercial, but current zoning allows for both commercial and residential use. For this reason, two scenarios for the cleanup of this area were evaluated: 1) temporary relocation of current residents followed by excavation to residential standards (60 µg/kg BaP EQ and 0.007 µg/kg dioxin TEQ) with property restoration and return of the residents; and, 2) permanent relocation of the residents followed by excavation to commercial cleanup standards and property restoration suitable for commercial reuse. Although temporary relocation is less costly than permanent relocation, the additional costs for excavation to residential standards and property restoration broadly offset this difference. Since the community has expressed a strong preference for permanent relocation and since this relocation will be consistent with the prior relocations performed as part of the interim remedial action (National Relocation Pilot Project), residential relocations for this remedy will be permanent. The relocation process will begin as early as possible during the remedial action and will adhere to the requirements of the federal Uniform Relocation Act and relevant EPA Policy.

2.12.2.2 Excavation of Contaminated Soil On- and Off-Site

Excavation of contaminated soil will begin in the off-site areas. The purpose of beginning in the off-site areas is to quickly eliminate potential human exposures, to provide a definitive volume for the containment system, and to allow off-site properties to be returned to use as soon as possible. The off-site areas are predominantly impacted by surface soil contamination, although areas of off-site subsurface contamination are present in the vicinity of former SWMU-10 and in the Rosewood Terrace/Oak Park/Escambia Arms neighborhood immediately adjacent to the ETC property. On-site excavation will address both surface and subsurface soil contamination, and, when combined with the volume of the existing stockpile and off-site soil, will provide the final volume of contaminated soil to be contained. This volume is currently estimated to be 566,934 cubic yards.

During remedial design, additional sampling will be performed to establish "cut-lines" for the excavation in both on- and off-site areas. These cut-lines will be based on achieving remedial cleanup goals both horizontally and vertically using excavation equipment appropriate for this action. The final limits of excavation will be based on the results of verification samples collected during construction.

All of the impacted off-site properties were prepared for excavation during the previous interim-action with the exception of a small strip in the Palafox Industrial Park and the Clarinda triangle neighborhood. On-site excavation will be planned to facilitate and be coincident with the excavation necessary to construct containment adequate for the total volume of contaminated soil excavated. This will require careful segregation of contaminated and un-contaminated soil. Excavation of contaminated subsurface soil will continue to the water table, if necessary based on verification sampling results.

2.12.2.3 Containment and Cap System with Solidification/Stabilization

Excavation for the containment will be performed coincident with excavation of on-site contaminated surface and subsurface soil. Based on the cut-line sampling and remedial design, the limits of the containment will be established prior to excavation of contaminated soil, and these will be adjusted, if necessary, based on the results of verification sampling. The containment excavation area will be based on encompassing areas of excavated contaminated soil, providing a geotechnically sound structure to support the cap, maintaining waste above the seasonal high water table, placing waste at or near existing grades to allow construction of a low-profile cap, and consistent with the conceptual reuse plan to the extent practicable. Following excavation and segregation of contaminated and uncontaminated soils, the containment excavation will be surveyed and lined with an appropriate geomembrane (e.g., 60-mil geotextile) to isolate the contaminated soil from surrounding soils for long-term protection.

The contaminated soil will be placed in the lined containment area and compacted to the extent necessary to support the cap system over the long-term. Principal threat wastes from the existing stockpiled soils will be segregated based on visual observations (i.e., staining, color, oily appearance, etc.) and/or field screening criteria (i.e., soil with contamination greater than 10-times the remedial cleanup goals) for solidification/stabilization. The principal threat wastes will be mixed with cement to form a sub-cap three- to four-feet in thickness above the compacted soil to at or near to existing grade. The sub-cap will have a minimum compressive strength of 250 psi. in order to form a geotechnically stable base for the overlying cap. Due to the anticipated depth of the containment excavation (greater than 20-ft below grade), performance standards for differential settlement will be established in the remedial design to ensure the cap system is not compromised in the future. Following placement and compaction of all contaminated soil and placement of the solidified and stabilized sub-cap within the lined containment area, a low-profile multi-layer cap will be installed.

The components of the multi-layer cap system will be established during the remedial design based on the remedial action objectives and a value engineering study. Value engineering is a specialized cost-control technique that uses a systematic and creative approach to identify and reduce unjustifiably high costs in a project without sacrificing the reliability or efficiency of a project. For purposes of cost estimating and to provide a baseline for the design, the multi-layer cap system will be underlain by a compacted clay layer having a minimum 2-ft thickness and a permeability of less than or equal to 1×10^{-7} cm/sec extending over the entire containment area. The clay layer will be covered by a continuous 60-mil geomembrane. These two layers will provide a durable and functionally impermeable barrier to infiltration of rainwater. The cap system, in whole or in part, may be extended beyond the limits of the containment area to achieve the following design and/or remedial goals: to provide slopes and grades for management of stormwater runoff; to cover areas of unexcavated on-site contaminated surface soil (this is limited to soils producing risks less than 1×10^{-5} and containing relatively immobile contaminants that can be reliably isolated by a cap system); and, to be consistent with the conceptual reuse plan to the extent practicable. The FS determined that a "reduced excavation option" involving capping of contaminated surface soil adjacent to the containment system in place was feasible, and could result in significant cost savings. This option will be further evaluated during the remedial design and value engineering study.

The geomembrane will be covered by a minimum 18-in of native soil to cushion and protect the geomembrane and clay layers, and will include an appropriate drainage layer at its base. To the extent practical, the 18-in native soil layer may be increased in thickness or extent to provide for the productive reuse of uncontaminated soil segregated and stockpiled during excavation of the containment area. A minimum 6-in topsoil layer will be placed above the native soil layer to support a vegetated layer of native grasses. The topsoil layer may be locally replaced by impervious surfaces, such as access roads, sidewalks, parking areas, or building foundations consistent with commercial reuse and the remedial design. Final slopes for the cap system of 3% to 5% will be graded to achieve positive drainage off the cap across the capped area. Surface drainage controls will be constructed around the perimeter of the cap to collect runoff and direct it away from the capped area. Surface runoff from impervious surfaces that may be constructed on the cap will be directed to lined drainage controls to prevent erosion or infiltration into the cap system, and incorporated into the overall site surface drainage controls.

2.12.2.4 Operation & Maintenance

O&M requirements for maintaining the cap system and ensuring the long-term protectiveness of the remedy will be initially developed during the remedial design of the remedy, and an O&M Plan will be developed as part of the post-construction report when the remedy is installed. The basic O&M requirements will include: periodic inspections of the cap system for adequate/appropriate vegetative or other cover, erosion problems, and operation of drainage controls; and, annual surveys of the cap to check for differential settlement during the first ten years of operation (to be determined thereafter based on performance). General maintenance requirements will include maintenance of the vegetative cover (water/fertilizer/over-seeding), and repairs to the cap system, if necessary, due to erosion or settlement.

The O&M of the Site also will include establishment and enforcement of appropriate controls and restrictions on land use (such as limits on excavation within the capped area and maximum loads per square foot for structures). Since responsibility for implementing the O&M Plan may change through time, coordination with State and local government in development of a clear and comprehensive O&M Plan will be necessary. Similarly, clear lines of responsibility for both implementation and enforcement of O&M requirements will be included in the O&M Plan. O&M Reports will be submitted to EPA and FDEP on an annual basis, and any occurrence (to be defined in the O&M Plan) that could threaten the integrity or protectiveness of the remedy will be reported to both agencies within 72-hr.

2.12.2.5 Long-term Monitoring

Long-term monitoring of ground water will be performed as part of the remedy for OU-1 for at least 30 years to verify the performance of the containment and cap system. Since the basis for the design of the remedy is to preclude both rainwater and ground water from infiltrating the waste and, thereby preventing the generation of potentially contaminated leachate, the principle monitoring data will be hydraulic. Piezometers/monitoring wells will be used to collect water level information from up-gradient, down-gradient, and other locations as defined in the remedial design. Geochemical data also will be collected to verify remedy performance and if there is a reason to suspect leachate has collected within the containment system. A Long-term Monitoring Plan will be developed in parallel with the O&M Plan to define the monitoring requirements, and may be provided separately or as a component of the O&M planning and reporting. Since the OU-2 (ground water) remedy is anticipated to be selected prior to or during construction of the remedy for OU-1, long-term monitoring requirements for OU-1 must account for the OU-2 action as well.

2.12.2.6 Institutional Controls

Institutional controls are a required component of this remedy since waste will remain on-site and the remedial cleanup levels are based on commercial cleanup standards. The primary institutional control for this action will be a restrictive covenant applied to the entire Site limiting future land use to commercial/industrial. The restrictive covenant will be completed following construction and prior to transfer of the property. EPA will coordinate establishment of the covenant with FDEP, and this will be drafted in accordance with FDEP's Institutional Controls Procedures Guidance (November, 2004) using the model Declaration of Restrictive Covenant appended as Attachment J.1.1-9. A further restriction on excavation and well drilling within the capped area also will be necessary, and a layered approach will be used to ensure this is accomplished. Written notification will be made to local utility service providers, one-call services, and local agencies that issue construction permits with the coordinates of the capped area and the relevant limitations and contact information. Signs indicating "Excavation Restricted", along with contact information, will be placed in appropriate locations around the capped area, and the O&M requirements will include appropriate control, monitoring, and reporting of excavation, development, and any land use changes.

2.12.2.7 Five-Year Reviews

A statutory review of the ongoing protectiveness of the remedy will be performed by EPA no less often than every five years beginning within five years after initiation of the remedial action. This review is a public process, and will be based on review of Site O&M and monitoring records, interviews, a site inspection, and any updated standards or new regulations. Based on the performance and protectiveness, changes to the remedy may be recommended.

2.12.3 Summary of Estimated Remedy Costs

The estimated present worth (7% discount rate) cost for remedy construction is approximately $27.5 million dollars and is summarized in Table 8. The present worth cost estimate for 30 years of O&M is approximately $630,000 and is presented in Table 9. Additional changes in the cost estimate are likely to occur as new information and data are collected during the engineering design of the remedial alternatives. Major changes, if they occur, may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD Amendment. This is an order of magnitude cost estimate that is expected to be within plus 50 percent to minus 30 percent of the actual project costs.

2.12.4 Expected Outcomes of the Selected Remedy

The results from the implementation of the selected remedy include the long-term containment and isolation of all contaminated soil that may pose a risk to human health in a commercial setting through direct contact or dust generation, the elimination of potential impacts to ground water through leaching of contaminants from soil, and conditions that are compatible with the planned reuse of the Site. The selected remedy is compatible with a full range of potential alternatives to address OU-2 (ground water), and coordination during the remedial design for this remedy and the feasibility study for OU-2 will ensure compatibility. The selected remedy has among the lowest short-term impacts to the community, and returns the Site to productive use sooner than any other alternative except removal. The residents of the Clarinda triangle area will be afforded the opportunity to be permanently relocated. The relocation will be consistent with and performed as an extension of the prior National Relocation Pilot Project. The selected remedy does require more extensive O&M than the other alternatives, but the costs and outcome of O&M on long-term effectiveness and site reuse are manageable and consistent with similar decisions nationally.

2.12.4.1 Available Land Use

During remedy construction, engineering and administrative controls will be used to protect the public from environmental exposure or safety hazards associated with the cleanup activities. Following remedy construction, the planned reuse of the Site is commercial. Since the Site encompasses both on- and off-site properties, and since the containment/cap system will not encompass all of this property, the available land use will be in two categories. The first category is unrestricted commercial use that is expected to apply to the Pearl Street/Hermann Avenue area, most of the Rosewood Terrace/Oak Park/Escambia Arms area, the Clarinda triangle neighborhood, and portions of the ETC property outside the containment. The second category is restricted commercial use that will apply to the area of the containment/cap system. The containment/cap system, without any enhancements, will support light commercial use. The limitations on this use, in terms of static load, live load, foundation depths, utility access, etc., will be defined during the remedial design. During the remedial design, it is anticipated that discussions with local government and/or commercial interests will evaluate enhancements to all or portions of the cap to support higher end uses. Cost sharing contribution can be made to include enhancements during the remedial construction. The ongoing evaluation and subsequent remedy for OU-2 (ground water) will require ongoing access to the Site by EPA. This access is not expected to appreciably interfere with commercial reuse of the Site.

Table 8. Estimated Remedy Construction Costs for ETC OU-1

MOBILIZATION/DEMOBILIZATION	each	1	$80,000	$80,000
EXCAVATION				
Excavation of Contaminated Soil	cy	311,934	$5	$1,559,670
Additional Excavation to Enlarge Containment Areas	cy	100,000	$5	$500,000
Backfill Excavated Areas with Clean Fill	cy	566,934	$5	$2,834,670
Dust Control	cy	666,534	$5	$3,332,670
Confirmatory Sample Analyses (samples/10000 sq. ft.)	samples	197	$300	$59,100
Air Quality Monitoring (samples/week)	samples	139	$1,000	$139,000
CAPPING				
Spread/Compact Waste Soil and Debris	cy	566,934	$3.00	$1,700,802
Solidification/stabilization (soil-cement)	acre-ft	48	$23,916.67	$1,148,000
Installation of 2-ft clay layer	cy	18,600	$14	$260,400
Installation of Geomembrane/Geotextile	sf	940,600	$1	$940,600
Installation of Soil Cushion	cy	13,800	$10.00	$138,000
Installation of Top Soil	cy	6,900	$20.00	$138,000
Installation of Vegetative Cover	acre	10	$2,000.00	$20,000
Runon/Runoff Control-Trenching	ft	5,000	$0.78	$3,900
CLARINDA TRIANGLE				
Permanent Relocation -65 households	LS	1	$3,980,000.00	$3,980,000
Building Demolition	LS	1	$440,000	$440,000
EQUIPMENT & MATERIALS				
Erosion Control	sy	100,000	$2.14	$214,000
Fencing (Remove and Reset)	lf	3,000	$15	$45,750
Health & Safety Equipment	each	1	$80,000	$80,000
Subtotal - Capital Cost				$17,614,562
Contractor Fee (10% of Capital Cost)				$1,761,456
Engineering & Administrative (15% of Capital Cost)				$2,642,184
Subtotal				$22,018,203
Contingency (25% of Subtotal)				$5,504,551
TOTAL CONSTRUCTION COST				$27,522,753

Table 9. Estimated Remedy O&M Costs for ETC OU-1

	UNITS	QUANTITY	UNIT PRICE	ANNUAL COST	TIME YEARS	PRESENT WORTH
CAP INSPECTION	ea	4	$600	$2,400	30	$29,782
MONITORING	sample	10	$2,000	$20,000	30	$248,181
CAP MAINTENANCE	year	1	$15,300	$15,300	30	$189,858
SUBTOTAL				$37,700		$467,821
CONTRACTOR FEE (10% of Subtotal)				$3,770		$46,782
CONTINGENCY (25% of Subtotal)				$9,425		$116,955
TOTAL				$50,895		$631,558

Assume annual cap maintenance costs to be 0.1% of capital cost.

2.12.4.2 Final Cleanup Levels

The final remedial cleanup levels for soil are presented in Table 10, and are the same as the remedial cleanup goals presented in Section 2.8.

Table 10. Final Soil Remedial Cleanup Goals for ETC OU-1

Contaminant of Concern	Cleanup Goal (ug/kg)	Source/Basis
Benzo(a)pyrene EQ (cPAHs)	400	Risk Assessment/1X10^{-6} Commercial
Dioxin TEQ (2,3,7,8-TCDD)	0.030	F.S. 376.30701*/1X10^{-6} Commercial
Naphthalene	419	Summers Model/Ground Water Protection
Acenaphthene	1,954	Summers Model/Ground Water Protection
Fluorene	1,525	Summers Model/Ground Water Protection
Phenanthrene	3,829	Summers Model/Ground Water Protection
2-Methylnaphthalene	2,394	Summers Model/Ground Water Protection
Carbazole	6.5	Summers Model/Ground Water Protection
Pentachlorophenol	5.1	Summers Model/Ground Water Protection

* Florida Statute 376.30701

2.13 Statutory Determinations

The EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element to the extent practical.

2.13.1 Protection of Human Health and the Environment

The selected remedy for ETC OU-1 satisfies the statutory requirement for protection of human health and the environment through containment and solidification/stabilization of contaminated soil, long-term O&M, and institutional controls. The selected remedy includes treatment as a major element through the solidification/stabilization of principal threat wastes. The engineering principles and technology for the selected remedy are well established, and are expected to be reliable over the long-term. Site conditions are conducive to construction of the containment system, and the remedy is compatible with the expected future use of the Site.

2.13.2 Compliance with ARARs

Implementation of the selected remedy will comply with all federal and state chemical-specific, action-specific, and location-specific ARARs.

Chemical-specific requirements include those laws and regulations governing the release of materials possessing certain chemical or physical characteristics, or containing specified chemical compounds. Chemical-specific requirements set health or risk based concentration limits or ranges in various environmental media for specific hazardous substances, contaminants, and pollutants. Requirements related to federal and state drinking water standards address remedial cleanup goals for specific leachable contaminants that are protective of ground water. State requirements to attain risk-based cleanup levels for carcinogens of 1×10^{-6} and a hazard index of 1 or less for non-carcinogens are ARARs. Additionally, federal and state air quality and storm water contaminant limits address specific contaminants during remedy construction. Table 11 presents the chemical-specific ARARs, TBCs, guidance, and criteria for the selected remedy.

Action-specific requirements are technology-based, establishing performance, design, or other similar action-specific controls or regulations for the activities related to the management of hazardous substances or pollutants. Action-specific requirements are triggered by the particular remedial action selected to accomplish the cleanup. Action specific requirements that will be complied with by the selected remedy primarily include federal and state hazardous waste regulations and discharge requirements. A summary of the requirements to be met through the implementation of the selected remedy is provided in Table 12.

Location-specific requirements are design requirements or activity restrictions based on the geographic or physical position of the site and its surrounding area. Location-specific requirements set restrictions on the types of remedial activities that can be performed based on site-specific characteristics or location. Location-specific requirements for soil at the ETC site were evaluated and consist of location standards for work in a floodplain, protection of endangered species, fish and wildlife coordination, archeological and historical preservation, protection of wetlands, and guidelines for dredged or fill material placement. No location specific requirements were identified that would address the conditions at the Site or the selected remedy.

Table 11 Chemical-Specific ARARs, Criteria, and Guidances for ETC OU-1

Standard, Requirement, Criteria, or Limitation	Citation	Description and Comment
Federal	Certain provisions of:	
Safe Drinking Water Act		
National Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs)	40 CFR Part 141	Legally-enforceable Federal drinking water standards that are relevant and appropriate requirements for existing or potential future drinking water sources. Establishes enforceable health-based standards for specific contaminants that have been determined to adversely effect human health. These standards will protect groundwater, a potential drinking water source, from contaminants found in surface and subsurface soil at the site. These contaminants may migrate or leach into the underlying aquifer as a consequence of various alternative response actions.
National Primary Drinking Water Standards, MCL Goals (MCLGs)	40 CFR Part 141	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects with an adequate margin of safety. These non-enforceable goals are guidelines to be considered for protection of groundwater, a potential drinking water source, from contaminants found in surface and subsurface soil at the site. These contaminants may migrate or leach into the underlying aquifer as a consequence of various alternative response actions.
National Secondary Drinking Water Standards	40 CFR Part 143	Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic qualities of drinking water. Secondary MCLs are non-enforceable limits intended as guidelines for use by States in regulating water supplies. These requirements are guidelines that may be considered for protection of groundwater, a potential drinking water source, from contaminants found in surface and subsurface soil at the site. These contaminants may migrate or leach into the underlying aquifer as a consequence of various alternative actions.
Clean Air Act		
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes primary (health-based) and secondary (welfare-based) air quality standards for contaminants emitted from a major source of air emissions. These requirements address the excavation, handling, and treatment (thermal destruction or biodegradation) of contaminated soil at the site.
National Emissions Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR Part 61	Provides emissions standards for hazardous air pollutants for which no ambient air quality standards exist. These requirements address the excavation, handling, and treatment (thermal destruction or biodegradation) of contaminated soil at the site.
State		
Groundwater Classes, Standards, and Exemptions	Florida Administrative Code (FAC) Chapter 62-520	Establishes the groundwater classification system for the state and provides qualitative minimum criteria for groundwater based on the classification. In conjunction with Florida drinking water standards, these requirements address the classification of groundwater, a potential water source, at the site and the protection of that groundwater from contaminants found in surface and subsurface soil at the site.

Standard, Requirement, Criteria, or Limitation	Citation	Description and Comment
Drinking Water Standards, Monitoring, and Reporting	FAC Chapter 62-550	Established to implement the Federal Safe Drinking Water Act by adopting the national primary and secondary drinking water standards and by creating additional rules to fulfill other state and federal requirements. These requirements protect groundwater, a potential drinking water source, from contaminants found in surface and subsurface soil at the site. These contaminants may migrate or leach into the underlying aquifer as a consequence of various alternative response actions.
"Global" Risk-based Corrective Action	Florida Statute Section 376. 30701/F.A.C 62-780	Establishes risk-based cleanup levels (i.e., attainment of an incremental lifetime cancer risk of 1 X 10^{-6} and a hazard index of 1 for non-carcinogens).
Surface Water Standards and Minimum Discharge Criteria	FAC Chapter 62-302	Establishes standards and criteria for protection of state surface water bodies during remedial action of the site soils or groundwater if treated water is discharged from the site.

Table 12 Action-Specific ARARs, Criteria, and Guidances for ETC OU-1

Standard, Requirement, Criteria, or Limitation	Citation	Description and Comment
Federal	Certain provisions of:	
Solid Waste Disposal Act		
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR Part 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on public health or the environment. If a remedial alternative involves onsite disposal, certain limitations in this regulation must be met.
RCRA, as amended		
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 262 through 265, 268, 270 through 271, and 124 and which are subject to the notification requirements of Section 3010 of RCRA. Of specific importance are Subparts B (criteria for identifying the characteristics of hazardous waste and for listing hazardous waste) and C (characteristics of hazardous waste). In addition, Part 261.24 under Subpart C sets forth the maximum concentration of contaminants for the Toxicity Characteristic Leaching Procedure (TCLP).
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR Part 264	Establishes minimum national standards defining the acceptable management of hazardous wastes for owners and operators of facilities that treat, store, or dispose of hazardous wastes. In particular, Subpart N (Landfills) applies to owners and operators of facilities that dispose of hazardous waste in landfills and specifies the requirements for landfill cover design and maintenance. Subpart O (Incinerators) specifies performance standards, operating requirements, monitoring guidelines, inspection guidelines, and closure guidelines for any incinerator burning hazardous wastes. These requirements address the construction of a cap or treatment facility at the site.
	40 CFR 264.552(4)	Provides treatment standards for soil to be placed in corrective action management units (CAMUs) as well as provisions for adjusted standards accounting for technical impractibility, views of the affected community, and engineering design of the CAMU.
Land Disposal Regulations	40 CFR Part 268	Establishes restrictions on land disposal of untreated hazardous waste and provides treatment standards for hazardous waste. These requirements address untreated and/or treated material that is placed back onsite (i.e., capping or treated material placement). They do not apply to placement of CAMU-eligible-waste into a CAMU based on the category of waste present.
Clean Water Act		
EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)	40 CFR Part 122	These requirements address stormwater from landfills, construction sites, and industrial activities that must be monitored and controlled. This is required of all industrial waste and construction sites of greater than five acres that discharge stormwater. The ETC site is 26 acres in size.

Standard, Requirement, Criteria, or Limitation	Citation	Description and Comment
Criteria and Standards for the NPDES	40 CFR Part 125	Requires development and implementation of a Best Management Practices program to prevent the release of toxic constituents to surface water. Establishes specific procedures for the control of toxic and hazardous pollutant spills and runoff. The substantive permit requirements address the prevention of releases from spills or runoff during the implementation of remedial actions.
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes primary and secondary air quality standards for compounds emitted from a major source of air emissions. The principal application of these standards is during remedial activities resulting in exposure through dust and vapors. These requirements apply since contaminated soil will be excavated and handled on-site.
Department of Transportation Rules for Transportation of Hazardous Materials	49 CFR Parts 107, 171, 173, 178, and 179	These regulations establish the procedures for packaging, labeling, and transporting hazardous materials. These requirements will address the transportation of contaminated soil from the off-site residential areas to the site and any laboratory analysis, treatment, and/or disposal of material at the site.
Occupational Safety and Health Administration	29 CFR 1910 Part 120	This rule provides safety requirements for site workers during soil remedial activities conducted at the site.
State		
Regulations of Stormwater Discharge	FAC Chapter 62-25	The discharge of untreated stormwater may reasonably be expected to be a source of pollution of waters of the state and is subject to state regulation. The substantive requirements of this regulation address any on-site remedial actions where stormwater requires management.
Hazardous Waste	FAC Chapter 62-730	Adopts by reference certain Federal regulations and establishes additional minor requirements concerning the generation, excavation, handling, storage, treatment, transportation, and disposal of hazardous waste in contaminated soil at the site.
Environmental Control - Prohibition of hazardous waste landfills	Florida Statute 403.7222	Prohibits permitting of landfills for untreated hazardous waste.

2.13.3 Cost Effectiveness

EPA has determined that the selected remedy is cost-effective and that the overall protectiveness of the remedy is proportional to the overall cost of the remedy. The cost-effectiveness of the remedy was assessed by comparing the overall effectiveness of the remedy (i.e., long-term effectiveness and permanence; reduction in toxicity, mobility, and volume; short-term effectiveness) with the other alternatives considered. More than one remedial alternative may be considered cost-effective, but CERCLA does not mandate that the most cost-effective or least expensive remedy be selected.

2.13.4 Permanent and Alternative Treatment solutions

The selected remedy uses permanent solutions and alternative treatment solutions to the maximum extent practicable. The selected remedy will provide an acceptable degree of long-term effectiveness and permanence. The remedy will require O&M, monitoring, and institutional controls over the long-term to remain effective, but these remedy components are neither unusual nor exceptional in degree or cost. The remedy can be reliably considered permanent.

2.13.5 Preference for Treatment as a Principal Element

In addition to the four statutory mandates previously discussed, the NCP includes a preference for treatment for the selected remedies in addressing the principal threat at the Site. The selected remedy partially meets the preference for treatment as a principal element. The selected remedy is based on containment with solidification/stabilization of principal threat wastes to address the mobility of the wastes. The three alternatives that utilized treatment technologies to address all contaminated soil were the least implementable and most costly alternatives (except removal an off-site disposal). The most implementable and lowest cost of the complete treatment alternatives is still estimated to cost more than five times the cost of the selected remedy. The cost of the treatment alternatives outweighs their relative improvement in the preference for reduction of M/T/V through treatment since they result in a substantially equivalent degree of protectiveness as the containment with solidification/stabilization alternatives.

2.13.6 Five-Year Review Requirement

CERCLA Section 121 and 40 CFR Part 300 require a review of remedial actions at least every five years if the remedial action results in hazardous substances, pollutants, or contaminants remaining in place above levels that allow for unlimited use and unrestricted exposure. Since the selected remedy is based on containment of contaminated soils, a statutory review of the remedial action is required within five years of the beginning of remedial construction.

2.14 Documentation of Significant Changes

Pursuant to CERCLS 117(b) and NCP 300.430(f)(3)(ii), the ROD must document any significant changes make to the preferred alternative discussed in the Proposed Plan. EPA has re-evaluated the preferred alternative presented in the Proposed Plan, and has issued a Proposed Plan Update to address community concerns. The Proposed Plan Update was issued on October 30, 2005, and EPA held a public availability session on November 14, 2005 to present the modifications of the proposed remedy to the community.

The Proposed Plan Update provided two modifications to the proposed remedy for ETC OU-1. The first modification entailed the inclusion of the approximately ten additional residential properties immediately adjacent to the Clarinda Triangle neighborhood within the scope of the remedy. Since these properties would have represented the only remaining residential land use in close proximity to the ETC site, and since it is likely that surface soils on these properties have been similarly impacted by site-related contamination, their inclusion through this modification is appropriate. This modification would result in the same increase in scope and cost for all the alternatives evaluated, and, therefore, has no impact on the relative evaluation of the alternatives. The second modification, solidification/stabilization of the principal threat waste material to form a sub-cap, is a change to Alternative 2, Capping/Containment. The effect of this modification has been included in the evaluation and comparison of remedial alternatives presented in this ROD.

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PART 3: RESPONSIVENESS SUMMARY

3.1 Overview and Summary

This Responsiveness Summary documents public comments and EPA responses to comments on the proposed plan for remediation of Operable Unit 1 (Soils) at the Escambia Treating Company Site in Pensacola, Escambia County, Florida.

EPA Region 4 presented the OU-1 Proposed Plan to the community on August 17, 2005 and held a public comment period from August 17 through September 15, 2005. EPA held a public meeting on September 1, 2005, to present the elements of the proposed remedy and receive oral public comments. EPA published the Public Notice for the Proposed Plan and Public Meeting in the Pensacola News Journal on August 19, 2005. EPA mailed a meeting notice and a Proposed Plan fact sheet to individuals and groups on the ETC site mailing list at this same time.

EPA modified the Proposed Plan in response to community concerns and extended the public comment period through November 28, 2005. A Proposed Plan Update fact sheet was distributed on October 30, 2005 to present the proposed modifications to the community. EPA held meetings with members of Citizens Against Toxic Exposure (CATE), the Pensacola Environmental Advisory Board, and the Pensacola Area Chamber of Commerce on November 10, 2005 to discuss the revisions to the proposed plan, and a public availability session was held in Pensacola on November 14, 2005. Because the session was intended to be an informal discussion, the proceedings were not recorded. Comment cards were provided for written comments.

A verbatim transcript of the September 1, 2005 public meeting is provided in Appendix A. Appendix B contains comments transcribed verbatim from handwritten submittals and electronic mail from community members. Appendix C includes written comments submitted by community groups, including: CATE, CATE's technical advisor, the Clarinda Triangle Association, and the Pensacola League of Women Voters. Comments from local government and business interests, including the City of Pensacola, Escambia County, Pensacola Environmental Advisory Board, and Pensacola Area Chamber of Commerce, are in Appendix D. Comments from federal elected officials and EPA responses to congressional comments are in Appendix E. Appendix F contains the EPA response to the November 10, 2005 verbal comments from CATE, the Pensacola Area Chamber of Commerce, and the Pensacola Environmental Advisory Board. Appendix G contains comments received from cleanup technology vendors and the EPA response to these comments.

3.2 Summary of Public Comments Received and EPA Responses

Several common themes were apparent from the comments heard at the meetings and expressed in writing by individual community members. Excerpts from some of the oral and written comments are grouped below. The categories and representative individual quotes are shown in no particular order. Comments submitted by organizations are summarized below and addressed separately in the Appendices.

3.2.1 Health Effects from Past Site Exposures

Several citizens attributed health problems and deaths to past exposures from the site. Of the 94 written comments received, 10 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "... a lot of birth defects in the community, a lot of people with shingles and Parkinson's disease that is attributed to living in the area."
- "...dioxin...will stay in your system for years...breaks down your immune system; your endocrine system. It affects your reproductive system."
- "Every employee that ever worked at Escambia Treating Co. had yellow/red color tone eyes and they all had some type of skin disorder and breathing discomforts."
- "My father died with cancer. My mother...passed with a bad thyroid condition, and my brother...deceased last year...had a bad breathing problem...my niece just passed with cancer."

Response – EPA is aware of the community's health concerns, and that community members have attributed health problems to past exposures from the ETC Site. To address these long-standing concerns, EPA has requested that the Agency for Toxic Substances and Disease Registry (ATSDR) and Florida Department of Health (FDOH) perform health assessments in the area. These assessments have been performed, and ongoing health monitoring is being conducted through the University of West Florida. Residents concerned about possible exposure and/or health effects should contact their physician or the Escambia County Health Department for further evaluation. The interim remedial action performed by EPA to relocate most of the residents near the ETC Site was, in part, to address community concerns about both actual and perceived exposure to site-related contaminants. The selected remedy in this Record of Decision will address the remaining residents living in proximity to the ETC Site. Taken together, this action and the prior interim remedial action will ensure that no ongoing exposure is taking place.

3.2.2 Relocation of Clarinda Triangle Residents

Several citizens had questions or comments regarding the relocation of the Clarinda Triangle residents. Of the 94 written comments received, 22 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- Timing of the Relocation:

- "I strongly urge EPA to proceed with this relocation with all possible speed, taking into account the need for adequate compensation of residents. It is essential that the residents be moved into new homes before soil disturbance results in additional exposures to the ETC contaminants."
- "The attempt to hold hostage the residents of the Clarinda Triangle until the so-called "cleanup" remedy is decided is unfair. Those issues should be separated and those people moved."
- "[EPA should]...see if there was a provision in [the Uniform Relocation Act]...to have some temporary relocation into a rental until the long-term relocation can be handled..."

Response – EPA has developed an aggressive schedule for implementing the selected remedy. The relocation of residents in the Clarinda triangle neighborhood is the first activity that will be performed during the remedial action. While this relocation will address the community's concerns about potential exposure, the supporting rationale for this relocation is based, in large part, on remediation logistics. The risks posed by soil contamination in the Clarinda triangle neighborhood are within or below EPA's risk range, and do not constitute a trigger for action independent of the other elements of the soil cleanup action. Further, the Florida Department of Health has independently evaluated the contamination within the Clarinda triangle neighborhood and determined that it poses "No Apparent Public Health Hazard". EPA has evaluated the provision of temporary relocation as an approach to the relocation of residents in the Clarinda triangle neighborhood, and has determined that permanent relocation is the preferred approach. This determination is based on the strongly expressed preference of the affected residents, on being consistent with the prior relocations performed in the area, and not withstanding the slightly greater cost associated with this approach.

- Fair Compensation for the Properties:

Property owners requested that appraisals be based on commercial rather than residential value:

- "We are sitting on C-2 commercial...very expensive property...not interested in being relocated at fair market residential because I can sell it as commercial."
- "...if the highest and best use has already been determined to be an industrial park, the highest and best use prices needed to have been paid to the people who lived there before."

Response – Valuation of the properties for purposes of relocation under the Uniform Relocation Act will be based on the highest and best use of the property. The appraisals will be based on the market value under the existing zoning of the properties.

- Approach to Previous Relocations:

- "...people were made to feel intimidated, were made to feel that if you don't accept this, you are not going to get anything...people moved into homes that were not properly inspected. They had problems after relocating...I am afraid that the Clarinda Triangle group will experience the same thing."

Response – EPA and the U.S. Army Corps of Engineers, Mobile District, are aware that some of the prior relocations did not go as smoothly, or as well, as had been planned. Issues, such as the quality of home inspections, have been addressed in the pre-planning for the additional relocations being performed during this action. EPA and the U.S Army Corps of Engineers are committed to an open, informative, and responsive relocation effort on this action.

3.2.3 Comments Expressing Opposition to EPA's Proposed Plan

Several citizens expressed their opposition to EPA's Proposed Plan and Revised Proposed Plan. Of the 94 written comments received, 63 citizens voiced their opposition in their correspondence. Excerpts from some of the comments are provided below.

- "EPA's proposed "Capping" of the 600,000 cubic yards of poisonous soil at the Escambia Treating Company Superfund Site is unacceptable."
- "...[the proposed remedy is] covering up a problem that you are going to continue to live with in this community."
- "...we don't think the proposed cleanup is in the best interest of the community long-term..."
- "This is part of a movement... to use risk-based corrective action...that whole policy has fundamental problems."
- "The people of Pensacola have lived too long with this disease-causing parcel and we respectfully request that the EPA use its resources to eliminate, not put a plastic cap on, the problem."

Response - The EPA shares the community's concern that the remedy for the ETC site contamination be protective of human health and the environment and also be supportive of the intended future use of the site property. The cleanup plan proposed by the EPA does meet both of these objectives. The capping/containment option is an effective remedial alternative used to manage contaminated materials at hundreds of contaminated sites across the country. Several of these sites have been successfully redeveloped as commercial developments as is proposed for the ETC site. The goal of the cap/containment alternative is to isolate the contaminants from direct contact and to prevent the infiltration of water that could potentially mobilize (i.e., leach) the contaminants into the underlying groundwater. Typically, this goal is achieved through the use of a cap alone and many sites do not require the excavation and consolidation of the contaminated soils prior to capping. The remedy at this site will reduce the area impacted by the contamination and provide a secure containment for the collected material. The contaminated soils that are currently spread over the ETC site and surrounding properties (combined total area of about 60 acres in size) will be excavated, consolidated, and isolated in a secure engineered containment cell (currently estimated to be about 10 to 15 acres in size). The ETC containment cell will be designed and constructed as described below with several backup layers of protection to ensure the ETC contaminated soils remain isolated from direct contact and will not leach to the groundwater as described below:

1. The ETC contaminated soils will be consolidated in the containment cell at a depth of approximately 4 to 6 feet below the ground surface, thereby minimizing the potential of direct contact with the contaminants. The capping of the containment cell also will protect the containment closure liner system from the potentially damaging effects of the environment such as UV sunlight and the weather.

2. The ground surface within the redeveloped property will be sloped and the redevelopment plan will include drains, ditches, storm sewers, etc. to encourage the rapid runoff of surface water. In addition, the buildings, roads, and parking lots constructed as part of the redevelopment will limit the amount of potential infiltration into the ground.

3. The top of the cap will include a drainage layer which will be sloped to promote the rapid drainage of any water that infiltrates through the ground surface. The drainage layer and the grading of the land surface will minimize the amount of water coming into contact with the impermeable layers of the cap system.

4. The proposed ETC cap will be a composite liner system. A geomembrane liner will be underlain by an equivalent of 2 feet of compacted clay. These two layers of very low permeability materials will be underlain and supported by a 4 foot thick layer of low permeability solidified/stabilized soils.

5. The bottom of the containment cell will be located several feet above the high groundwater table which will ensure the isolation of the cell from the groundwater.

6. The containment cell will be lined with a geomembrane liner as an additional safeguard to ensure that any water that does infiltrate into the cell will be contained within the cell. In addition, the floor of the containment cell will be sloped to a low point sump that will include a monitoring/extraction well. The well will be monitored and if any water is found in the sump it will be pumped out to ensure that the containment cell remains dry. The selection of the base liner system will be part of the detailed design to meet the operational requirements of the containment cell.

7. A series of groundwater monitoring wells will be located around the containment cell to verify the performance of the containment cell. Groundwater from the wells will be analyzed to verify that contaminants are not leaking from the containment cell. The depth to groundwater in each well will also be measured to verify the separation of the water table from the bottom of the containment cell.

3.2.4 Cost of Proposed Remedy:

Several citizens had comments regarding the cost of the proposed remedy. Of the 94 written comments received, 10 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "Don't put money above life."
- "...funding has been cut...they are nickel and diming you on trying to clean up this mess."
- "...it's going to cost a lot of money, but you need to spend a lot of money to do this."
- "Spend the money."

Response - EPA has evaluated the cost-effectiveness of the various remedial alternatives for the ETC site. Consolidation of the contaminated material, with solidification/stabilization of the principal threat waste within a monitored secure containment cell attains the remedial action objectives established for the soil portion of the remedy. It should be noted that EPA has already spent nearly $29 million on the previous remedial action at the site and is proposing to spend an additional $28 million to complete the remedial action for the soil portion of the ETC site. Although cleanup costs for the ETC groundwater have not yet been evaluated, it is likely that the total cleanup costs for the site will exceed $60 million.

3.2.5 Cleanup Standards:

Several citizens had comments regarding cleanup standards proposed for the site. Of the 94 written comments received, 11 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "...level of dioxin cleanup...The EPA should choose the most protective standard for this site...the residential standard of 2 to 7 parts per trillion..."
- "...complete and permanent cleanup of the Escambia Treating Site to the highest levels."
- "...the Florida industrial dioxin soil standard (30 parts per trillion) is not sufficiently protective because of the multiple contaminants and multiple pathways of exposure."

Response - The cleanup levels EPA has proposed for the ETC contaminated soils are based on a combination of human health risk, state requirements, and modeled values for groundwater protection. The proposed cleanup level for benzo(a)pyrene is based on human health risk assessment and corresponds to a less than one in a million (1x10-6) incremental lifetime cancer risk under commercial use. The proposed cleanup for dioxin is base on an applicable requirement under Florida Statute. The dioxin cleanup levels proposed for the ETC site are among the most stringent ever selected by EPA, and are much more stringent than the current national standard of 1,000 parts per trillion. For comparison, the U.S. Agency for Toxic Substances and Disease Registry has established a minimum screening value for protection of children under residential land use that is nearly twice the proposed ETC cleanup level. The ETC proposed cleanup levels meet or exceed all EPA requirements for protection of human health and the environment.

3.2.6 Advocating an Alternate Cleanup Remedy:

Several citizens advocated an alternative cleanup method in their correspondence. Of the 94 written comments received, 41 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "detoxification of the organics at the Escambia Treating Company site."
- Several comments advocated a three step process: "...detoxify the organics using bioremediation or chemical oxidation, stabilize the inorganics using solidification, and bury the detoxified waste on top of a plastic liner."

Response - Although complete reduction of the toxicity and volume of contamination is a goal for remedial action, at many sites this is not an achievable goal due to the nature of the contaminants, site conditions, or the volume of the contaminated media involved. The contaminants at the ETC site are very resistant to degradation as is shown by the persistence of the contaminants in the soils decades after the ETC plant closed down. Treatment of the contaminants in the ETC soils is difficult and expensive. Even the most current state of the art treatment technologies cannot guarantee successful cleanup to the remedial cleanup levels selected for this project. These facts, in conjunction with the extremely large volume of contaminated soil at the site, make the complete reduction of toxicity and volume of contamination an impractical goal for the ETC site.

The proposed remedy selected by EPA does include treatment of the principal threat waste using solidification/stabilization to reduce the mobility of the contaminants. The principal threat waste for the ETC site is soils containing relatively mobile contaminants such as naphthalene. The S/S process is a cost effective and proven treatment technology for treating waste generated from wood treating sites. The chemical reaction of the S/S reagent forms a microscopic crystalline matrix that binds the contaminants and reduces the permeability of the soil so that the movement of the contaminants through the soil is effectively eliminated. The effectiveness of the S/S treatment will be verified through Quality Assurance testing during construction. Actual samples of the treated soil will be collected and tested for strength, permeability, and leachability at a laboratory during the treatment process. The solidification/stabilization treatment, combined with the composite cap and liner containment system provides the best option for achieving the site's remedial action objectives.

3.2.7 Remedy Location:

During the September 1, 2005 public meeting, a few citizens advocated the removal of the contaminated soil from the site.

- "This community is not going to be satisfied unless you remove the contaminants from their current location..."
- "...possibly a subtitle C RCRA facility ten miles north in the county, not in a populated area, not in an area destined to be commercial..."
- "As a federal, state, local taxpayer, I expect nothing less than removal of this contaminated soil from this site."

Response - The contaminated soils that are currently distributed on the ETC site and surrounding properties (combined total area of about 60 acres in size) will be excavated, consolidated, and isolated in a secure engineered containment cell (currently estimated to be about 10 to 15 acres in size). The contaminated soils will be transported to the containment cell using the roads within the government acquired property. Because the waste will not be trucked through the Pensacola neighborhoods, the potential spread of contamination outside of the site boundaries will be minimized.

None of the remediated property outside of the containment cell area will have restrictions on redevelopment except for a commercial/industrial use restriction. The area above the containment cell will have restrictions primarily dealing with the maximum allowable depths for excavations, the size of allowable loads, and the depth of building foundations over the area; however, these restrictions will not prohibit the construction of most commercial buildings.

The containment cell will isolate the contaminated soil from any direct contact and will also prevent the leaching of contaminants to the groundwater. The remedy is a long term solution which is expected to be effective over the long term.

3.2.8 Implementation of Institutional Controls:

During the September 1, 2005 public meeting, some of the citizens were concerned that the institution controls could not be enforced throughout the life of the remedy.

- "...[based on] review of Superfund sites...problems with engineering and institutional controls...people drilling on sites that were supposed to have well restrictions...using the property for uses which were not supposed to be acceptable."
- "You can't control the future...people are going to get sloppy; somebody is going to forget."

Response – This will be a monitored facility. The institutional controls will be enforced through restrictive covenants which will be implemented by the state and local government. EPA will also verify the enforcement of the institution controls through inspection reports submitted as part of the operation and maintenance of the site, and during the remedy review process which will occur every 5 years as long as contamination remains onsite.

3.2.9 Potential Threat to Groundwater:

Several citizens had comments expressing the potential threat that the proposed remedy poses to the groundwater. Of the 94 written comments received, 11 citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "...less than 50 feet above the sand and gravel aquifer where the majority of our drinking water comes from...risking the future of our water supply to have the contaminants in that containment system without being treated."
- "...with your monitoring...if you detected a leak, how quickly would you know it had happened? And how quickly would it be corrected before it gets to groundwater, which is only eight feet below that?"

Response - The proposed containment will be designed with several layers of security to prevent water infiltration into the containment cell which could result in the leaching of contaminants from the soil to the groundwater. An internal sump and well system within the containment cell will be specifically design to detect and extract any water that may enter the cell. Any water entering the containment cell will be pumped out, treated (if it is contaminated), and discharged to a permitted sewer outfall. The source of the water infiltration will be investigated and breaches of the capping system will be repaired. As an added layer of protection, monitoring wells surrounding the containment cell will be included in the design to detect any leakage from the containment cell.

It should be noted that the groundwater in the area has already been impacted by the previous operating practices of the owners/operators of the wood treating company. EPA is currently evaluating the cleanup of the site ground water under a separate Operable Unit. The existing interim measures (i.e., soil excavation and lined/covered soil stockpile constructed by EPA during 1992) have effectively mitigated the majority of the source soil that contributed to the groundwater contamination. The current proposed remedy provides a permanent long-term remedy for the soil stockpile and the ETC contaminated soils that were not addressed during the 1992 removal action.

3.2.10 Permanence of the Remedy; Integrity of Liner:

Several citizens had comments regarding the long-term performance of the proposed remedy. Of the 94 written comments received, nine citizens included this topic in their correspondence. Excerpts from some of the comments are provided below.

- "The containment of non-treated toxic materials with a geomembrane and capping which will degrade in "hundreds or thousands" of years...is short-sighted and leaves the problem for future generations..."
- "According to liner manufacturers, the liner material has a life expectancy of 30 years. Field data has demonstrated that the liner material has cracks and imperfections from the manufacturing process that allow waste to escape the liner and migrate into the groundwater. The seams and wells used to connect the liners have holes and flaws from the time the welding and testing process is performed and completed on the liner. These holes and flaws in the seams also allow waste to migrate through the liner and into the ground water."
- "In the absence of manufacturer lifetime guarantees or performance bonds, it is impossible to have confidence in assurances that the "containment" system is impervious and will remain so for hundreds of years."

Response - EPA fully expects the remedy to be a long-term solution and remain effective for at least 200 years. The materials used in the cap construction and liner system will not be exposed to environmental stresses such as sunlight or the weather which can degrade the liner material. In addition the closure system will be supported on the stabilized soil to minimize the physical stresses on the capping liner system. The liner manufacture's guarantee should not be confused with the life expectancy of the liner material. Published literature has estimated the durability of the geomembrane material to be used for the liner and cap to be in excess of 200 years based on stringent laboratory testing. Critical flaws to the liner material that affect the performance of the liner are very rare using modern liner manufacturing techniques. There have been no documented failures of liner systems based on manufacturing flaws. All documented failures of liner systems have been attributed to either damage to the liner during installation, inadequate seams, or damage during backfilling operations over the liner.

The ETC construction specifications will include the strictest Construction and Manufacturing Quality Assurance testing measures to ensure that the liner systems are properly installed and that the soil placed into the containment cell does not damage to the liner system. The liner installation and seaming operations will be performed by well qualified and experienced liner crews. Every seam will be tested to the highest industry standards. In addition the containment cell is design with multiple layers of protection so that minor construction flaws, if any occur, will not adversely affect the performance of the entire system.

3.2.11 Five-Year Rreview:

During the September 1, 2005 public meeting, some of the citizens were concerned that EPA's five-year review process could not ensure the effectiveness of remedy.

- "I think a five-year review is too long in between."

Response – EPA will monitor the performance of the remedy through a number of mechanisms in addition to the Five-Year Review process. The operation and maintenance of the containment will require, among other things, routine inspection and monitoring of the containment system. The inspection and monitoring will be reported to EPA and the Florida Department of Environmental Protection such that both agencies can track and trend the remedy performance. If an off-normal occurrence happens, there will be established response requirements to address the condition, including notification of the regulatory agencies. If the inspection and monitoring information indicate at any time that the remedy is not performing as designed, EPA will take action to remedy the problem. The Five-Year Review process ensures that the progress of the remedy operation and maintenance is formally evaluated on a routine basis and made available to the community.

3.2.12 Support for the Proposed Remedy:

Some of the citizens responded favorably to the proposed remedy. Of the 94 written comments received, five citizens expressed support for the proposed remedy. Excerpts from some of the comments are provided below.

- "I have complete trust in EPA decisions. I feel the cheapest way is the best way out (as long as it is safe)."
- "Of all the options available, the EPA plan is the best. It keeps the toxins in one place and places a barrier to keep them from spreading further. To attempt to remove them will only result in contaminating other areas."

3.3 Comments from Organizations

3.3.1 Citizens Against Toxic Exposure (CATE)

September 21, 2005

David Keefer, Project Manager
U.S. Environmental Protection Agency (EPA)
Region IV
61 Forsythe Street SW
Atlanta, Georgia 30303

Dear Mr. Keefer:

Enclosed you will find the comments on the EPA OU-1 proposed plan for the Escambia Treating Company Superfund Site prepared by Ms. Wilma Subra, our Technical Advisor. Please feel free to call Mrs. Margaret L. Williams, President Emeritus or Mrs. Francine Ishmael, President at (850) 478-5799 if you have any questions.

Sincerely,

Francine Ishmael, President
Citizens Against Toxic Exposure (CATE)

COMMENTS ON THE EPA OU-1 PROPOSED PLAN FOR THE ESCAMBIA TREATING COMPANY SUPERFUND SITE

Prepared by Wilma Surba
Technical Advisor to Citizens Against Toxic Exposure (CATE)
September 26, 2005

CLARINDA TRIANGLE

With the exception of the no action alternative, all of the alternatives presented in the Proposed Plan list two options for Clarinda Triangle.

Option A – Permanent Relocation of 55 Clarinda Triangle households

– Excavation of contaminated soils down to commercial cleanup levels

Option B – Temporary Relocation of 55 Clarinda Triangle Households

– Excavation of contaminated soil down to residential cleanup levels

– Return residents to their homes

The permanent relocation option will remove the Clarinda Triangle residential community from current ongoing exposure to the Escambia Treating Compound contaminants which are currently located in the soil in the Clarinda Triangle area and insure the Clarinda Triangle community is not exposed to contaminants associated with the Escambia Treating Company (ETC) site during remediation activities. The slightly higher cot of the permanent relocation option is justified based on the past and current ongoing exposure and potential for future exposure to chemicals associated with the ETC site.

In order to prevent further exposures to residents, relocation of the Clarinda Triangle must occur before implementation of the remedy at the ETC site is initiated.

Response – Permanent relocation of the Clarinda Triangle community is included as part of this action. The relocation of the Clarinda Triangle community will take place prior to the initiation of the ETC OU#1 remedial action construction. Also see EPA's response to General Comment # 2.

DIOXIN REMEDIATION GOAL

The National Contingency Plan directs EPA to use the residential cleanup standard under certain conditions:

"The 10-6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure..."

EPA has based its remediation goals solely on current zoning and a redevelopment plan, apparently without considering the known human health risks of Dioxin or the physical conditions at the site.

EPA is recognizing the Florida standards as ARARs; however, for Dioxin, the 30 parts per trillion (ppt) Florida industrial standard is not sufficiently protective for several reasons:

- First, the Florida industrial / commercial standard is based on exposure for only eight hours per day, rather than the 24-hour per day exposure risk intended in the National Contingency Plan.
- Second, the 30 ppt industrial standard is based on the cancer threat only, ignoring other severe health threats, which include damage to brain and neurological, reproductive, and immune systems that may be caused by exposure to Dioxin levels lower than those that would cause cancer.
- Finally, there are multiple contaminants present at the ETC site and multiple pathways of exposure.

In order to conform to the National Contingency Plan, EPA should use either the Florida residential standard of 7 ppt or EPA's own 10-6 risk level of 2 ppt for Dioxin.

Response – See EPA's response to General Comment # 5.

EVALUATION OF REMEDIAL ALTERNATIVES

EPA used the nine established criteria in the National Contingency plan to evaluate the Remedial Alternatives for Escambia Treating Company soils; however, CATE will show that EPA's evaluation is in error. Sections 4 and 5 of the Final Feasibility Study Report for Source Soils, Operable Unit 1, June 2005, and the Comparison of Alternatives of the Proposed Plan, August 2005, presented the evaluation of the alternatives based on these misinterpretations of the criteria.

Threshold Criteria -- Protection of Human Health and the Environment

The EPA preferred remedy alternative, Capping/Containment, is rated as a 5 on a scale of 1 to 5 (5 = complete compliance) for the first threshold criteria, overall protection of human health and the environment. The evaluation states that capping and containment will eliminate exposure pathways, reduce the level of risk, isolate contamination and eliminate further migration. The use of a liner in the on site excavated areas to separate the contaminated soil from the ground water in the sand and gravel aquifer under the site does not result in elimination of exposure pathways, isolation of contamination and elimination of further migration. According to liner manufacturers, the liner material has a life expectancy of 30 years. Field data has demonstrated that the liner material has cracks and imperfections from the manufacturing process that allow waste to escape the liner and migrate into the groundwater. The seams and welds used to connect the liners have holes and flaws from the time the welding and testing process is performed and completed on the liner. These holes and flaws in the seams also allow waste to migrate through the liner and into the ground water sands. Thus the use of a liner to contain contamination does not eliminate exposure pathways, isolate contamination and eliminate future migration. The placement of the contaminated soil in excavations with only a liner to separate the contaminated waste from the ground water is not an acceptable alternative. The ranking number should be reduced to appropriately reflect lesser compliance with the criteria.

The ground water immediately below this is the source of drinking water for hundreds of thousands of local residents. It also discharges into the Pensacola Bay System, an estuary of the Gulf of Mexico. Prevention of contamination of this ground water is essential to protection of human health and the environment.

Response – This comment does not take into account the containment system as a whole. The geomembrane liner is just one component of the containment system. The primary goals of the containment system are 1) prevent direct contact with contaminated soil and 2) keep water out of the system so that leaching of the contaminants from the soil cannot occur. The containment system will be designed with several layers of backup to ensure no single problem or reasonably possible combination of problems can cause a failure of the remedy as detailed in the responses to General Comments #3, #9, and #10.

Threshold Criteria -- Compliance with Applicable and Relevant and Appropriate Requirements

The second threshold criteria is compliance with applicable or relevant and appropriate requirements (ARARs). The Capping / Containment alternative was ranked as a 5 for compliance with ARARs. According to EPA the compliance was to be achieved by isolation of the contaminated soils (Section 5) and through excavation and on site treatment before on site disposal (Table 5-1). The flaws of the isolation of contamination of contaminated soils approach was presented in the previous paragraph. The statement in Table 5-1 is in error: this Capping / Containment alternative does not include onsite treatment of the waste. This error must be corrected in Table 5-1 and the ranking in Table 6-1 lowered to accurately reflect less compliance with the criteria.

Response – The proposed remedy does meet the ARARs; therefore, a score of 5 is appropriate. Treatment of the Principal Threat Waste using solidification/stabilization technology to reduce the mobility of the contaminants is a primary component of the proposed remedy. See EPA's response to General Comment # 6.

Balancing Criteria -- Long-Term Effectiveness and Permanence

The Capping /Containment alternative was ranked as a 4 for Long-Term Effectiveness and Permanence. EPA listed the long-term public health-threats as greatly reduced and the groundwater protected through isolation. The ground water protection through isolation is not effective over the long term. The problems with the liner have been presented in the discussion of the first criteria. The liner is not a long-term permanent isolation mechanism. The risks associated with direct contact with the waste would be eliminated only if the integrity of the cap is ensured over the long term. Damage to the cap may occur during site redevelopment.

The alternative is not a permanent remedy due to the fact that the contaminated waste will still be present in its current form on and in the site. The ranking in Table 6-1 must be reduced to accurately reflect the less compliant remedy.

Response – As discussed in EPA's response to General Comment # 10, EPA expects that the proposed containment cell will remain effective for at least 200 years; therefore, a score of 4 is appropriate.

Balancing Criteria -- Reduction of Mobility, Toxicity or Volume

The Capping/Containment alternative ranked as a 2 due to the lack of reduction of toxicity and volume. The cap was credited with the reduction of mobility. The ranking of 2 should be reconsidered and reduced to a 1.

Response – The proposed remedy will significantly reduce the mobility of the contaminants in the soil. A score of 2 is appropriate.

Balancing Criteria -- Short Term Effectiveness

The Capping/Containment alternative was ranked as a 4 for short-term effectiveness. EPA indicated the implementation of the remedy will result in the release of dust and noise nuisance. These negative impacts must be considered when scheduling the relocation of the Clarinda Triangle. The relocation of the Clarinda Triangle must occur before implementation of the remedy at the ETC site is initiated.

Response – Agreed. The current plan is to relocate the residents from the Clarinda Triangle community prior to beginning the remedial action construction.

RANKING OF ALTERNATIVES

The seven Remedial Alternatives were ranked according to the nine criteria and the information presented in Table 6-1. The Preferred Alternative Capping/Containment ranked the overall lowest (least compliant) and was the cheapest of all of the alternatives except the no action alternative. The Capping / Containment alternative ranked 24, no action ranked 10, the treatment alternatives ranked from 26 to 28, and the solidification alternative and off site disposal alternative ranked 25. If the Capping /Containment Alternative were re-ranked as suggested as above, the overall ranking of the EPA preferred alternative would be even lower than 24 and more in the range of 13 to 15. It is not appropriate to select the lowest ranking alternative, which is also the cheapest alternative, when addressing a site with a large quantity of extremely toxic contaminated soil in close proximity to a shallow sand and gravel aquifer which serves as the drinking water supply for the municipality.

EPA has stated that remedial activities are necessary at the ETC site to protect public health and welfare from actual or threatened releases of hazardous substances, pollutants, or contaminants in the soils. EPA further indicates that the cancer risk will be reduced by removing off site soils contaminated with Dioxin and Benzo-a-Pyrene above acceptable levels and containing the contaminated on site and off site waste soils in on-site excavations lined with a single liner. The Capping / Containment alternative proposed by EPA for the ETC is not an acceptable remedy. The remedy would not treat the chemicals that contaminate the soil. The failure to reduce and remove the chemical toxicity of the waste prior to disposal will result in negative impacts to public health. Containment is not an effective remedy over the long term.

Response – As discussed above, the selected remedial alternative is ranked appropriately. The EPA shares the community's concern that the remedy for the ETC site contamination be protective of human health and the environment. The selected remedial alternative achieves this goal by isolating the contaminants from direct contact and by implementing engineered measures to greatly reduce the possibility of water mobilizing the contaminants through leaching. EPA expects the containment system to remain effective for at least 200 years.

EPA's PREFERRED ALTERNATIVE

The Remedial Alternative selected by EPA as their Preferred Alternative is unacceptable. The alternative referred to as Capping / Containment will place the untreated, as is, contaminated soil from the stockpile area, other onsite areas and off site areas in onsite excavations that have been lined with only a geomembrane liner.

The flaws with the alternative are as follows:

Lack of Toxicity Reduction or Elimination

The contaminated soil will not be treated to reduce or degrade the waste soil toxicity. It will merely be placed in the ground in its current toxic form. This approach does not protect human health or the environment and is not an acceptable approach.

Response – See EPA's response to General Comment # 6.

Lack of Adequate Containment and Protection of Ground Water Resources

The untreated waste soil from the stockpile, and on site and off site locations will be placed in the on-site excavations, which will be lined with only a geomembrane liner.

The on-site excavations extend into the upper ground water bearing sands.

The waste will be placed in and near the groundwater with only a geomembrane liner separating the contaminated waste from the groundwater.

The geomembrane liner will leak.

- According to the manufacturers of the geomembrane liners, the liners have a 30-year life expectancy.
- The geomembrane liners have manufacturing process flaws, cracks and imperfections in the fabric that will allow the waste to leak and migrate into the groundwater.
- Holes and flaws in the seams and welds connecting the sections of geomembrane liners will allow waste to leak into the groundwater.

The use of a geomembrane liner to contain the contaminated waste soil does not eliminate exposure pathways, does not isolate contamination or eliminate further waste migration. A liner is not a long-term permanent remedy.

Response – See EPA's response to General Comment # 10.

Cost of Geomembrane Liner for Onsite Excavations not Included in Cost Estimates

Upon examination of the Cost Estimates in the Final Feasibility Study (June 7, 2005) Appendix B - FS Cost Estimates, it is clear that the Cost Estimates for the five variations of Alternative 2 all lack a cost item for the geomembrane liner. The Cost Estimates do contain a cost estimate of the various individual layers that are proposed for capping the waste but lack a cost estimate for the geomembrane liner to be placed under the waste.

The cost estimate for the geomembrane capping layer ranges from $940,600 to 956,000. The geomembrane layer needed to line the excavations should be larger and more expensive than the one proposed to cap the waste. Therefore the estimated cost of Alternative 2 is more than one million dollars below the actual cost due to the lack of the inclusion of the cost of the geomembrane liner.

Response – Although the cost spreadsheet is a bit confusing, the cost for the geomembrane liner is included in the cost estimate. Under the cost for CAPPING, the quantity of material listed for the "Installation of Geomembrane/Geotextile" line item is 956,000 square feet which equals about 22 acres. This quantity would provide enough geomembrane material for both the cap and liner for a 10-acre containment cell.

Inadequate Protection of Human Health and the Environment

EPA has determined that remedial activities are necessary at the ETC to protect public health and welfare and the environment from the releases of pollutants from the ETC contaminated soils which may present an imminent or substantial endangerment to public health or welfare.

The EPA remedy is not a thorough and complete cleanup of the contaminated soil. The remedy does not treat the waste to reduce or eliminate toxicity. The remedy only contains the waste, which merely controls risks over the short term and ultimately results in negative impacts to human health and the environment. The remedy does not eliminate risk and thus is not protective of human health and the environment.

EPA has encouraged local interests to anticipate redevelopment of the site; however, Capping / Containment calls into question the viability of redevelopment. Construction of foundations and roadbeds and utility wok on the site may damage the cap, potentially exposing workers to the toxic wastes. EPA makes it clear it will take no responsibility for deed restrictions intended to limit future use of the property, leaving any enforcement to state and local agencies.

Although EPA proposes ground water monitoring for 30 years, no provision made for response to discovery of Capping / Containment system failure. There will be obvious practical challenges to repair of the liner and cap after the redevelopment that must be addressed unless another remedy is selected.

Response – The EPA shares the community's concern that the remedy for the ETC site contamination be protective of human health and the environment. The selected remedial alternative achieves this goal by isolating the contaminants from direct contact and by implementing engineered measures to greatly reduce the possibility of groundwater mobilizing the contaminants through leaching. EPA expects the containment system to remain effective for at least 200 years. See EPA's response to General Comments # 8, #9, and #10.

Extent of Contamination of Off Site Locations Not Complete

Figure 2.6 of the FS presents the extent of surface soil contamination above commercial cleanup levels in the Rosewood Terrace, Oak Park, and Escambia Arms area. The figure failed to include the areas where Carbazole in the soil exceeded the Cleanup Goal. These areas are matrix locations 9, 12, and 30.

Figure 2.7 of the FS presents the extent of surface soil contamination above commercial cleanup levels in the Herman and Pearl area. The figure failed to include the matrix areas 16 and 22 where Carbazole in the soil exceeded the Cleanup Goal.

Figure 2.9 of the FS presents the extent of surface soil contamination above the residential clean up level in the Clarinda Triangle area. The map failed to list CTSS 32, which exceeded the Residential BaP level. The inclusion of these areas would increase the area of contamination and the quantity of soil to be excavated and remediated.

Response – The RI provided sufficient data necessary so that a general estimate of the quantity of contaminated soil could be generated for the Feasibility Study. The extent of contamination will be further defined by a thorough investigation that will include both surface and subsurface soil sampling during the RD phase. All soil impacted by the ETC site, which contains contaminant concentrations above the site Cleanup Goals will be excavated and consolidated in the containment cell. The actual quantity of contaminated soil may be larger or smaller the quantity estimated during the RI but the actual quantity is expected to be relatively similar to the quantity estimated during the RI. The containment cell may be designed larger or smaller as necessary.

Lowest Ranking Alternative

The EPA Preferred Alternative Capping /Containment ranked the overall lowest (least compliant) and was the cheapest of all of the alternatives except the no action alternative. Examination of the details of the ranking scores for the Capping /Containment alternative demonstrates that the rankings should have been even lower. It is not appropriate to select the lowest ranking alternative, which is also the cheapest alternative, when addressing a site with a large quantity of extremely contaminated soil in close proximity to a shallow sand and gravel aquifer which serves as the drinking waste supply for the municipality. In addition the Capping /Containment alternative is not a permanent remedy due to the fact that the contaminated waste will still be present in its current form on and in the site.

Response – See EPA's response to the EVALUATION OF REMEDIAL ALTERNATIVES comment above.

Cost Reducing Alternative

The cost reducing alternative that is being proposed will allow contaminated soil on the ETC site to remain in place and be covered by native and top soil. This alternative is not appropriate for short-term or long-term protection of human health and the environment.

Response – The alternative described in the comment is no longer being considered as presented, and has been modified to address these concerns in the proposed plan update. All soil impacted by the ETC site, which exceeds the site Cleanup Goals will be excavated and consolidated in the containment cell.

COMPONENTS OF AN APPROPRIATE REMEDY, IN SEQUENCE

Permanently relocate Clarinda Triangle residents

Excavate all on site and off site soils contaminated above the cleanup levels

Treat the organics in the soil with Bioremediation or Chemical Oxidation to meet remedial / cleanup goals for organic contaminants and solidify the heavy metals in the soil to attain the cleanup levels for all chemicals in the waste.

Line the onsite excavations with geomembrane liners

Place the treated and solidified soils in the lined excavations

Cover the cleaned up soil with a multilayer cap

Develop institutional controls to insure surface and subsurface activities do not impact the cleaned up and contained soils.

The above detailed Appropriate Remedy is the only acceptable combination that satisfies the NCP criteria for the contaminants at the ETC site.

Response – See EPA's response to General Comment # 6.

3.3.2 Citizens Against Toxic Exposure (CATE)

November 23, 2005

David Keefer, Project Manager
U.S. Environmental Protection Agency (EPA)
Region IV
61 Forsythe Street SW
Atlanta, Georgia 30303

Dear David Keefer:

Enclosed you will find comments on Proposed Plan Update Escambia Treating Company Operable Unite 1-soils October 2005 prepared by Wilma Subra, Technical Advisor of Citizens Against Toxic Exposure

Sincerely,

Francine D. Ishmael, President
Margaret L. Williams, President Emeritus
Citizens Against Toxic Exposure (CATE)

Cyj

Proposed Plan Update
Escambia Treating Company
Operable Unit 1-Soils
October 2005

Comments prepared by Wilma Subra for CATE
November 6, 2005

I. Lack of consideration of previous comments (attached) submitted in response to the Proposed Plan of August 2005

A. Extent of Contamination of Off Site Locations

The OU-1 Proposed Plan Update (October 2005) lacks any indication that the off site locations in excess of commercial cleanup levels not included in the OU-1 Proposed Plan (August 2005) [Rosewood Terrace, Oak Park and Escambia Arms (matrix locations 9, 12, and 30), Herman and Pearl Area (matrix locations 16 and 22) and Clarinda Triangle (CT SS 32)] have been included in the OU-1 Proposed Plan Update.

Response – The Remedial Investigation (RI) provided sufficient data so that a general estimate of the quantity of contaminated soil could be generated for the Feasibility Study. The extent of contamination will be further defined by a thorough investigation that will include both surface and subsurface soil sampling during the RD phase. All soil impacted by the ETC site, which contains contaminant concentrations above the site Cleanup Goals will be excavated and consolidated in the containment cell. The actual quantity of contaminated soil may be larger or smaller than the quantity estimated during the RI, but the actual quantity is expected to be relatively similar to the quantity estimated during the RI. The containment cell may be designed larger or smaller as necessary.

B. Lack of Cost of Geomembrane Liner for On Site Excavations

The OU-1 Proposed Plan update (October 2005) does not indicated that the cost of the Geomembrane Liner has been included in the additional cost estimates. The cost estimate in the Feasibility Study (June 7, 2005) and OU-1 Proposed Plan (August 2005) failed to include the cost of the Geomembrane Liner to be placed in the On Site Excavations.

Response – Although the cost spreadsheet is a bit confusing, the cost for the geomembrane liner is included in the cost estimate. Under the cost for CAPPING, the quantity of material listed for the "Installation of Geomembrane/Geotextile" line item is 956,000 square feet which equals about 22 acres. This quantity would provide enough geomembrane material for both the cap and liner for a 10-acre containment cell.

C. Inadequate Containment System

The lack of adequate protection of ground water resources through the use f the Geomembrane Liner has been presented in previously submitted comments. The Proposed Plan Update does not address the problem areas associated with the use of the Geomembrane Liner. It is still inappropriate to place untreated waste in close proximity to ground water resources with only a 60 mil Geotextile liner separating the waste from the ground water resources.

Response – This comment does not take into account the containment system as a whole. The geomembrane liner is just one component of the containment system. The primary goals of the containment system are 1) prevent direct contact with contaminated soil and 2) keep water out of the system so that leaching of the contaminants from the soil cannot occur. The containment system will be designed with several layers of backup as detailed in the response to General Comment #3.

II. Inadequate Response to Previous Comments

A. Redevelopment of Excavation Area

The Proposed Plan Update includes references to the establishment of and enforcement of appropriate controls and restrictions on land use (such as limits on excavation within the capped area and maximum loads per square foot for structures). The specifics of the controls were not presented in the Proposed Plan Update and thus are not available for public comment.

Response – The institutional controls necessary to ensure the performance of the containment system will be developed during the Remedial Design. It should be noted that the remediated property outside of the containment cell area will not have restrictions on redevelopment except for a commercial/industrial zoning restriction. The area above the containment cell will have restrictions primarily dealing with the maximum allowable depths for excavations, and the size, allowable loads, and depth of building foundations over the area; however, these restrictions will not prohibit the construction of most roads, utility lines, and commercial buildings.

B. Relocation

The relocation of Clarinda Triangle is proposed to adhere to the requirements of the federal Uniform Relocation Act and relevant EPA policy. Due to the problems experienced and documented by community members during the previous relocation, the implementation of the Uniform Relocation Act is not adequate to address the relocation situation of the Clarinda Triangle Area.

Response – See EPA's response to General Comment # 2.

C. Relocation Resources

The cost estimate for the Clarinda Triangle relocation consists of an average per house cost of $57,273. This dollar amount is inadequate to replace existing homes with comparable houses and cover moving expenses. The Proposed Plan Update quotes an average cost per house for the additional 10 homes as $83,273 (assuming $6,727 demolition cost per home). This is still not adequate to cover the replacement cost of comparable houses and moving expenses.

Response – The cost listed for the Clarinda Triangle relocation in the proposed plan update was provided for cost estimating purposes only. The home owners will be fairly compensated for the value of their property and the associated moving expenses in accordance with the Uniform Relocation Act. Also see EPA's response to General Comment # 2.

III. Lack of Waste Treatment to Reduce or Eliminate Toxicity

A. Solidification of just a small portion of the waste is not treatment and does not satisfy the EPA reference for treatment.

The proposed remedy presented in the Proposed Plan Update still lacks treatment of the waste to reduce toxicity. The proposal to solidify a small portion of the waste prior to disposal in the ground still lacks a treatment component. Solidification is not treatment and does not reduce or eliminate the toxicity of the waste.

Response – See EPA's response to General Comment # 6.

B. Solidification/Stabilization of only 13.5% of the Waste

The solidification/stabilization of a portion of the waste is proposed to be added to the proposed remedy. Based on the cost estimate of 2.3 million for the solidification/stabilization of a portion of the waste and a comparison to the initial cost of solidification/stabilization of all of the waste, $17 million, only 13.5% of the waste will be solidified/stabilized. The addition of solidification/stabilization of only a small portion of the waste stream does not address the EPA preference for treatment of the waste and inadequately proposed any method of addressing the majority of the waste stream.

Response – See EPA's response to General Comment # 6.

3.3.3 City of Pensacola Environmental Advisory Board

Eleanor Godwin
City of Pensacola Environmental Advisory Board
2510 N. Yates Ave.
Pensacola FL 32503

August 24, 2005
David Keefer
Superfund Remedial & Technical Services Branch
US EPA
61 Forsyth Street
Atlanta GA 30303

Dear Mr. Keefer:

I am writing in response to the EPA's proposed plan for the Escambia Treating Company Site in Pensacola, FL. As a member or the City's Environmental Advisory Board, I was part of a process to accept a resolution concerning the cleanup for this Superfund Site. It was our understanding that the EPA, FDEP, and the County had reached an agreement to withdraw our request for residential level cleanup and accept the lower standard for commercial/industrial cleanup. In that move, we were led to believe that some kind of cleanup effort would be made, just not to the more stringent residential standards. We reviewed your 7 possible solutions, and though that we would fall somewhere in the middle – certainly not in the category just slightly better than "no action".

Upon reviewing the preferred solution, it appears that the EPA is looking to do the least amount of cleanup for the least amount of money. I realize that the Superfund account is dry, but it is deplorable to think of leaving this amount of contaminated material virtually untreated on this site. The proposed solution is nothing more than a glorified landfill, and we know first hand in this part of the state that landfills do not prevent leaching of contaminants. The mere fact that our water table is very close to the surface should preclude this solution for 560,000 cubic yards of toxic soil. I also realize that the groundwater issue is a separate Operable Unit, but at this juncture, the two cannot be separated. What is in the soil must be stopped from seeping into the groundwater before you can address what to do with what might already be present there. OU1 must at least set up OU2 for some measure of success.

Our community needs and deserves a solution that will adequately clean the soils and protect human health. I wonder whether the solution would be different if the decision makers lived in this area? Would you find this an acceptable solution if it were across the street from your child's school, in a commercial park where you planned to work for the next 20 years, or just upwind of your neighborhood? Our community has worked very hard to come to this latest resolution and to accept the plans proposed for redevelopment of the property. The site has been an eyesore and blight in the area for 20+ years, and we are anxious to move on and make the property productive once again. Every indication was given earlier in this process that the EPA would seek community acceptance of their plan. This proposal is unacceptable, and I think I speak for many others in my wish to reconsider a solution that includes some level of treatment from this mountain of contaminants. Thank you for your consideration.

Sincerely,

Eleanor Godwin

Response – EPA shares your concern that the cleanup for the ETC site be protective of human health and the environment and also be supportive of the intended future use of the site property. The cleanup plan proposed by the EPA does meet both of these objectives. The capping/containment option is an effective remedial alternative used to manage contaminated materials at hundreds of contaminated sites across the country. Several of these sites have been successfully redeveloped for commercial use as is proposed for the ETC site.

Under the capping/containment option, the ETC contaminated soils exceeding the site cleanup goals both on the former facility property and the surrounding property will be excavated and consolidated within an engineered containment cell at a depth of 4 to 6 feet below the land surface, thereby minimizing the potential of direct contact with the contaminants. The engineered containment cell is specifically designed to keep water out of the cell, thereby minimizing potential of the contaminants leaching out of the soil. As described in EPA's response to General Comment #3, the containment system will be designed with several layers of backup protection to ensure that the contaminants remain isolated in the containment cell.

The remedy proposed by EPA in the Proposed Plan Update does include treatment of the principal threat waste using solidification/stabilization (S/S) to reduce the mobility of the contaminants. The principal threat waste for the ETC site is the soils containing the relatively mobile contaminants such as naphthalene. The S/S process is a cost effective and proven treatment technology for treating waste generated from wood treating sites. The chemical reaction of the S/S reagent forms a microscopic crystalline matrix that binds the contaminants and reduces the permeability of the soil so that the movement of the contaminants through the soil is effectively eliminated. The effectiveness of the S/S treatment will be verified through Quality Assurance testing during construction. Actual samples of the treated soil will be collected and tested for strength, permeability, and leachability at a laboratory during the treatment process. The S/S treatment, combined with the composite cap and liner containment system provides the best option for achieving the site's cleanup goals.

3.3.4 Clarinda Triangle Association

Katherine D. Wade

Clarinda Triangle Association

RE: Health Issues

We the residents of the Clarinda Triangle stand together and demand that we be compensated for the exposure that we have lived throughout the years and for most of our lives. We respect the fact that each and every neighbor might all face health issues and this current selective process will have long been extinguished. The opportunity presents itself now to ask for what is due to us currently. We did not ask to be exposed and only feel we should be compensated for the exposure as well as the buying out of our homes, also paying us for irrefutable damage that is continuing taking force and that has yet to come. The government is responsible for the lack of guidelines and the exposure. Our marketability has been compromised, our neighborhood has a stigma attached to it as a contamination area or zone. We have lost the ability to effectively sell our once viable properties in any way other than commercial.

All of our families have been affected. Our work, our children, our homes and church have been compromised. There has been disruption of our personal lives, we have lost friends and neighbors. Death is all around us.

Due to the fact that we are not aware of all of our rights and the contingencies involving this situation, we will be seeking legal advice regarding our options.

Thanks you so much for your time,
Respectfully,

Katherine D. Wade

Response – See EPA's response to General Comment # 2.

Katherine D. Wade

Clarinda Triangle Association

RE: Value of Property

We the residents of the Clarinda Triangle would like to make sure that not only the value of our homes and property but the commercial value be considered. We know that the value of commercial property will be estimated much higher than residential. We have to compensated fairly and with dignity. The sale of our property in the Clarinda Triangle is a matter far more complex than just simply buying us out of our homes. A realtor gave me the value of commercial property versus residential property and I know that this area is now designated commercial, therefore we expect to be paid on that basis.. We demand to be treated fairly and to be given our just due.

We all are joined together and support the best clean up effort available. Put human lives first, do not take short cuts. Relocate us expeditiously and with compassion with respect to all of the residents of this community and the county in general. We expect to be paid what is fair and will not move for any less than what is right.

Please do not take advantage of some of our individuals in the area who lack the understanding of some of these issues and are ignorant to all of the complexities that have come forth. I will stand firm to help them understand and not let or local government, EPA or any organization abuse their power or muscle and the truth. Let's work together so we can get back to normalcy and family life.

Response – See EPA's response to General Comment # 2.

3.3.5 League of Women Voters

Ms. Vivian Faircloth and Ms. Mary Gutierrez Co-Presidents of the League of Women Voters of the Pensacola Bay Area provided these comments to EPA in a letter addressed to LaTonya Spencer (EPA) dated November 14, 2005.

The League of Women Voters of the Pensacola Bay Area continues to support a complete and permanent clean up of the Escambia Treating Company site.

The proposed solution by the EPA is neither of these things.

1. There is no mention in the EPA proposal of detoxification of the organics using either bioremediation or chemical oxidation.

Response - See EPA's response to General Comment # 6.

2. The proposal calls for solidifying "the most toxic soils". The separation of the most toxic soils from all the other toxic soils, we believe is not feasible.

Response - The proposed remedy selected by EPA includes treatment of the principal threat waste using solidification/stabilization (S/S) to reduce the mobility of the contaminants. The principal threat waste for the ETC site is the soils that contain the relatively mobile contaminants such as naphthalene. Representative soil samples will be collected and analyzed and the principal threat wastes will be segregated from the other contaminated soils.

3. Solidification works on metal contaminants like arsenic but not the organic contaminants, such as dioxin and PCP.

Response – Solidification/stabilization (S/S) is a cost effective and proven treatment technology for treating organic waste generated from wood treating sites. The chemical reaction of the S/S reagent forms a microscopic crystalline matrix that binds the organic contaminants and reduces the permeability of the soil so that the movement of the contaminants through the soil is effectively eliminated. It also should be noted that representative samples of the S/S treated soil will be analyzed using laboratory leaching tests such as the Synthetic Precipitation Leaching Procedure (SPLP) test to verify the reduction in mobility of the soil contaminants. Please see the Appendices to this Responsiveness Summary (on Compact Disk) for literature documenting the successful application of S/S treatment of soils contaminated with wood treating chemicals.

4. What life expectancy does the manufacturer guarantee on the proposed geomembrane?

Response – The manufactures guarantee should not be confused with the life expectancy of the geomembrane material. Published literature has estimated the durability of the HDPE geomembrane material to be used for the liner and cap to be in excess of 200 years based on stringent laboratory testing.

What will be done if and when the membrane starts to leak?

Response – See EPA's response to General Comment # 9.

We believe the EPA proposed solution is inadequate to deal with the problem at hand and is therefore unacceptable. Government actions should provide for the long term sustainability of the community by implementing solutions that will not endanger future generations.

3.3.6 City of Pensacola, Florida

The following excerpts were taken from the City of Pensacola Resolution 34-05 adopted on September 7, 2005:

A RESOLUTION REJECTING THE CAPPING AND CONTAINMENT REMEDIATION METHOD SELECTED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA) IN THE PROPOSED PLAN ISSUED IN AUGUST 2005 FOR ESCAMBIA TREATING COMPANY SUPERFUND SITE IN PENSACOLA, FLORIDA.

WHEREAS, the EPA criterion for the use of permanent solutions and alternative treatment technologies or resource recovery technologies is not met by the Plan;

Response – EPA fully expects the remedy to be a permanent long-term solution and remain effective for at least 200 years. EPA has considered alternative treatment technologies and resource recovery technologies in the Feasibility Study and found that such technologies are not practical for treating the soil contamination at the Escambia Treating Company site. This is primarily due to the large volume of soil requiring treatment and the chemical contaminants in the soil which are resistant to degradation.

WHEREAS, the criterion for preference for treatment as a principal element to the extent practical is not met by the Plan;

Response – The proposed remedy selected by EPA includes treatment of the principal threat waste using solidification/stabilization (S/S) to reduce the mobility of the contaminants. The principal threat waste for the ETC site is the soils that contain the relatively mobile contaminants such as naphthalene.

WHEREAS, EPA criterion for long-term effectiveness and performance for protection of human health and the environment is not met by the Plan because the scientific literature clearly demonstrates that at some point in time all landfills leak leachate;

Response – The proposed containment cell will include several layers of backup protection as described in General Comment #3. The containment cell is expected to remain effective for at least 200 years.

WHEREAS, EPA criterion for reduction of toxicity and volume of contaminants of concern is not met by the Plan;

Response – See the response to General Comment #6.

WHEREAS, the chemicals of concern in the soil include known cancer causing polyaromatic hydrocarbons and dioxins that will remain unaltered by the Plan;

Response – See the response to General Comment #6.

WHEREAS, the property will be difficult to market and develop into a commerce park because of public perception of toxic contamination, and the potential legal liabilities of businesses on the site it the chemicals of concern are land filed on site in their toxic forms;

Response – The Capping/Containment technology has been a remedial component at several sites which have been successfully redeveloped for commercial and even recreational end uses. It should also be noted that the capped containment cell will occupy only a small portion of the overall redeveloped area. The contaminated soils that are currently spread over the ETC site and surrounding properties (combined total area of about 60 acres in size) will be excavated, consolidated, and isolated in a secure engineered containment cell (currently estimated to be about 10 to 15 acres in size).

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PENSACOLA, FLORIDA:

Section 1: That the City Council of the City of Pensacola does herby reject the preferred alternative of remediation selected by EPA in the Proposed Plan issued by the EPA in August of 2005 and urge the EPA to implement the following regarding the remediation of the Escambia Treating Company Superfund site in Pensacola, Florida.

1. Perform a complete and permanent remediation that includes but is not limited to: a remedial method or a combination of remedial methods that will yield a reduction and or degradation of the levels of the chemicals of concern for both onsite and offsite contamination identified in OU1.

Response – See the response to General Comment #6.

2. Before the Record of Decision is issued, testing of any remedial methods proposed including treatability, bench, and pilot tests must prove the proposed remedy or remedies to be effective in achieving the remedial goals identified in the Remedial Investigation/Feasibility Study issued by the EPA in June of 2005.

Response – See the response to General Comment #6.

3. Upon completion of the treatability, bench and pilot tests, immediately begin cleanup of the ETC OU1 and the permanent protection of human health, ecological health, and groundwater must be assured through complete cleanup and ongoing monitoring of OU1.

Response – See the response to General Comment #6.

3.3.7 Escambia County, Florida

The following excerpts were taken from the County of Escambia Resolution R2005-172 adopted on September 15, 2005:

WHEREAS, the EPA criterion for the use of permanent solutions and alternative treatment technologies or resource recovery technologies is not met by the Plan;

Response – EPA fully expects the remedy to be a permanent long-term solution and remain effective for at least 200 years. EPA has considered alternative treatment technologies and resource recovery technologies in the Feasibility Study and found that such technologies are not practical for treating the soil contamination at the Escambia Treating Company site. This is primarily due to the large volume of soil requiring treatment and the chemical contaminants in the soil which are resistant to degradation.

WHEREAS, the criterion for preference for treatment as a principal element to the extent practical is not met by the Plan;

Response – The proposed remedy selected by EPA includes treatment of the principal threat waste using solidification/stabilization (S/S) to reduce the mobility of the contaminants. The principal threat waste for the ETC site is the soils that contain the relatively mobile contaminants such as naphthalene.

WHEREAS, EPA criterion for long-term effectiveness and performance for protection of human health and the environment is not met by the Plan because the scientific literature clearly demonstrates that at some point in time all landfills leak leachate;

Response – The proposed containment cell will include several layers of backup protection as described in General Comment #3. The containment cell is expected to remain effective for at least 200 years.

WHEREAS, EPA criterion for reduction of toxicity and volume of contaminants of concern is not met by the Plan;

Response – See the response to General Comment #6.

WHEREAS, the chemicals of concern in the soil include known cancer causing polyaromatic hydrocarbons and dioxins that will remain unaltered by the Plan;

Response – See the response to General Comment #6.

WHEREAS, Resolution R2005-106 adopted at the regular meeting of the Escambia County Board of County Commissioners on June 2, 2005 specifies detoxification of organics:

Response – See the response to General Comment #6.

WHEREAS, the property will be difficult to market and develop into a commerce park because of public perception of toxic contamination, and the potential legal liabilities of businesses on the site it the chemicals of concern are land filed on site in their toxic forms;

WHEREAS, as a result, the Containment and Capping remedy is not compatible with the planned reuse of the site because it will create difficulty of the successful installation of utilities and roadways necessary to develop the proposed commerce park as well as creating legal and financial uncertainty for the park tenants.

Response – The Capping/Containment technology has been a remedial component at several sites which have been successfully redeveloped for commercial and even recreational end uses. It should also be noted that the capped containment cell will occupy only a small portion of the overall redeveloped area. The contaminated soils that are currently spread over the ETC site and surrounding properties (combined total area of about 60 acres in size) will be excavated, consolidated, and isolated in a secure engineered containment cell (currently estimated to be about 10 to 15 acres in size).

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMISSIONERS OF ESCAMBIA COUNTY, FLORIDA AS FOLLOWS:

Section 1. That the Board of County Commissioners requests a soil cleanup remedy, other than containment and capping that will provide long-term protection of human health and the environment of Escambia County and will allow successful development for the intended use of the property as a commerce and light industrial park.

Response – See the response to General Comment #6.

3.3.8 Pensacola Area Chamber of Commerce

Mr. Evon Emerson, President/CEO of the Pensacola Area Chamber of Commerce provided these comments to EPA in a letter addressed to David Keefer (EPA) dated November 22, 2005. These comments were responded to in the Technical Memorandum prepared by Black & Veatch Special Projects Corporation on November 22, 2005. The Technical Memorandum is provided in Appendix __ of this Responsiveness Summary.

The Pensacola-area Chamber of Commerce appreciates this opportunity to provide comments on the proposed Soil Treatment Plan update for the OU-1 (soils) at the Escambia Treating Company Superfund site. The purpose of this letter is to follow up on the meeting that you and the other EPA representatives attended at our Environment Committee and our Sites and Buildings Committee on November 10, 2005. At that meeting, we discussed the proposed Soil Treatment Plan update and provided you with a number of comments and recommendations. Those comments and recommendations are recapitulated in the following text.

Following the publication of the first proposed Soil Treatment Plan for the Escambia Treating Company (ETC) Operable Unit 1 (OU-1) soils, the Pensacola area community requested that EPA consider a number of improvements:

- Provide for the permanent relocation of additional residents in the "Clarinda Triangle" area of off-site soil contamination.
- Provide for additional sampling both on-site and off-site to ensure that all soils contaminated in excess of Florida's "commercial / industrial" cleanup standards are excavated.
- Provide for an improved design of the proposed "containment" facility that would receive the contaminated soil, so as to permit the redevelopment of the area over the "cap."
- Provide for incorporation of contaminated soil treatment into the remedial design.

Subsequently, Region IV published a Proposed Soil Treatment Plan Update (October 26, 2005; hereinafter, "Modified Plan") in an effort to address these concerns.

There appears to be no question that the EPA has made an effort to address the community's concerns with the Modified Plan. As with any document of this type, however, the "devil is in the details." While we understand that many of the details cannot be addressed until such time as a formal "Remedial Design" is undertaken, there are some questions where answers should be able to be forthcoming.

1. One method of determining the effectiveness of a proposed treatment plan for hazardous waste is through use of the Toxicity Characteristic Leaching Procedure (TCLP) test. Are there sites where soils contaminated by equivalent levels of similar contaminants have been treated in the fashion described in the Modified Plan where "pre-treatment" TCLP values have been compared with "post-treatment" TCLP results? Can copies of the test reports be furnished to the Pensacola community? These questions were provided to you verbally at our November 10 meeting and you promised to research the issue and respond prior to the close of the comment period on November 28. Please understand that, as was stated by Mr. Dohms, a satisfactory answer to this inquiry is critical if the community is to be expected to accept the Modified Plan as it bears directly on the question of what constitutes "treatment" of the soils.

Response – Solidification/stabilization of soils contaminated with wood treating chemicals has been used at several EPA Superfund sites. EPA evaluated S/S treatment at four wood treating sites and published the findings in the journal "Remediation" in the summer of 2000. Leachability testing (i.e., TCLP and SPLP tests) has shown that the concentrations of contaminants of concern in leachate for S/S treated soils were generally 95 to 99% less than leachate from untreated soils. Published papers documenting these results have been provided by EPA to the Pensacola-area Chamber of Commerce in the November 22, 2005 memorandum.

2. In determining the potential for migration of those contaminants of greatest concern (dioxin, which very likely originated as a manufacturing contaminant of the wood treating chemical pentachlorophenol), it is important to know the chemical form of pentachlorophenol that was used at the ETC site. Did ETC use the solid form of pentachlorophenol, which would have to be "dissolved" in diesel fuel prior to its use in the treatment process, or did they use the water-soluble sodium- or potassium-pentachlorophenate in the treatment process? It is naturally the case that the solid-phase pentachlorophenol would be far less mobile in the environment than the water-soluble form of that compound. It follows that the associated dioxin would similarly be less likely to migrate if contained in the solid-phase pentachlorophenol.

Response - From 1944 to approximately 1970, coal-tar creosote was used as the primary wood preservative. PCP dissolved in No. 6 diesel fuel was used at the facility as a preservative from 1963, and was the sole preservative in use from 1970 to 1982 (Draft RCRA Facility Assessment Report, Escambia Treating Company, Pensacola, Florida, A.T. Kearney 1990).

There are a few additional points where the Chamber's Sites and Buildings Committee would like to see some additional discussion and/or consideration by Region IV:

- Please clarify that soil placed in the containment would be properly compacted (e.g., 98% of Standard Proctor, or 95% of Modified Proctor).

Response – The soils placed in the containment cell will be properly compacted to support the cap system and are expected to be compatible with the planned redevelopment. EPA's subcontracted engineer currently expects that the soil will be compacted to at least 90% of the maximum dry density as determined by the Modified Proctor test (ASTM 1557). The engineer will re-evaluate the density requirements during the remedial design.

- Discussions with construction firm representatives to the Sites and Buildings Committee indicates that a six-foot thickness of compacted clean soil above the cap would be amenable to site redevelopment much more readily than would a four-foot thickness.

Response – Comment noted. EPA's subcontracted engineer will work closely with the redevelopment team to optimize the design for future redevelopment. Flexibility exists in the design approach to accommodate some changes in cap/cover closure system thickness to support the intended future use of the property.

- Additional placement of a treated soil-cement layer at the base of the contaminated soil and above the geotextile in the containment structure is recommended.

Response - The base liner system will be evaluated during the detailed design to meet the performance requirements of the selected remedy. Preventing the leaching of contaminants from the containment system over the long-term is the primary objective of this remedy.

- Consideration of a treated soil-cement layer separating the contaminated soil from the geotextile along the sides of the containment structure is also recommended.

Response – The base liner system will be evaluated during the detailed design to meet the performance requirements of the selected remedy. Preventing the leaching of contaminants from the containment system over the long-term is the primary objective of this remedy.

The addition of a "3 – 4 foot layer" of solidified / stabilized soil affected with the "greatest degree" of contamination near the top of the containment structure is greatly appreciated. It is the suggestion of the Sites and Buildings Committee that the thickness of this layer be not less than four feet.

Response – The solidified/stabilized sub-cap layer will be at least 4 feet thick.

The Pensacola Bay Area Chamber of Commerce sincerely appreciates the efforts of Region IV EPA to modify and improve the Proposed Soil Treatment Plan for the OU-1 Soils at the Escambia Treating Company site. We look forward to continuing the dialogue and rapidly reaching a point where the site is cleaned up and returned to the community as an asset for future growth and prosperity.

3.3.9 Federal Elected Officials

Response to:

The Honorable Bill Nelson
United States Senate
SH-716 Hart Senate Office Building
Washington D.C. 20510

Dear Senator Nelson:

Thank you for your letter dated September 19, 2005, concerning the Proposed Cleanup Plan for the Escambia Wood Treating Company (ETC) Superfund Site, Operable Unit 1 (Soil). EPA shares your concern that the remedy for ETC soil contamination be protective of human health, address relocation of the residents in the Clarinda triangle neighborhood, and support the intended future use of the site property. The cleanup plan proposed by EPA meets these objectives, but a thorough review of the proposed remedy has been undertaken based on the concerns expressed by yourself and the community. EPA reviewed the Proposed Cleanup Plan, along with the supporting investigations and studies, to evaluate the proposed remedy in context with the risks posed by the contaminated soil, the proposed cleanup levels, and the relevant remediation technologies. This review has resulted in the issuance of a Proposed Plan Update that affirmatively addresses treatment of the waste, relocation of the Clarinda triangle residents, and the long-term permanence of the remedy.

The review was used to identify potential improvements to the proposed remedy and reassess the costs and benefits of the proposed cleanup plan. Two improvements to the cleanup approach were identified. First, a cement and soil sub-cap, to be constructed below the final cap, will be included as part of the remedy. This sub-cap will be constructed of a mixture of cement and the soil containing the most mobile and toxic contaminants at the Site. Thus, these contaminants will be bound up in solid concrete, minimizing the likelihood they will enter the aquifer. The sub-cap will improve the long-term reliability of the final cap operation and maintenance by ensuring that water will not infiltrate into the waste below it in the unlikely event the final cap is compromised. Additionally, inclusion of the sub-cap will allow for greater use of the portion of the Site overlying the containment.

The second improvement is to include the remaining ten residential properties adjacent to the Clarinda triangle neighborhood with the 55 households currently addressed by the proposed cleanup plan within the scope of the remedy. This change results in the opportunity for permanent relocation for the residents from all residential properties impacted by the ETC site at EPA's expense. Recently, a Health Consultation was performed by the Florida Department of Health and U.S.

Agency for Toxic Substances and Disease Registry (June, 2005) for the Clarinda triangle neighborhood and it was determined that there is "No Apparent Public Health Hazard" from surface soil in that neighborhood. These findings are consistent with the results from the prior relocation which included a number of factors in addition to environmental risk in the decision to offer relocation to the residents.

The cleanup levels EPA has proposed for the ETC contaminated soils are based on a combination of human health risk, applicable, or relevant and appropriate, requirements, and modeled values for ground water protection. The mobile contaminants that are threats to ground water are primarily found in the subsurface soil. This contaminated subsurface soil will be excavated and incorporated within the containment system. Surface soil is impacted by two relatively immobile contaminants. These contaminants are benzo(a)pyrene equivalents, abbreviated as BaP EQ, and 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalents, abbreviated as dioxin TEQ. The proposed cleanup level for BaP EQ is 400 μg/kg based on human health risk assessment, which corresponds to a less than one in a million incremental lifetime cancer risk under commercial use. The proposed cleanup level for dioxin TEQ is 0.030 μg/kg and is based on an applicable requirement under Florida Statute. The dioxin TEQ cleanup level is among the most stringent ever selected by EPA, and is much more stringent than the current national standard of 1.0 μg/kg. For comparison, the U.S. Agency for Toxic Substances and Disease Registry has established a minimum screening value of 0.050 μg/kg that is protective of children under residential land use. These proposed cleanup levels meet or exceed all EPA requirements for protection of human health and the environment.

Review of the cleanup technologies provided in the Feasibility Study indicates that an appropriate range of treatment, containment, and disposal alternatives were evaluated. Selection of containment as the basis for the cleanup is consistent with the remedies selected for other wood treating Superfund sites around the country. In fact, the containment system proposed for ETC has the advantage of excavating and completely encapsulating the waste above the water table as opposed to the more typical in situ barrier wall and cap system. The ETC waste and site geology are compatible with the construction and maintenance of a containment system. EPA believes the unqualified support for the proposed remedy by the Florida Department of Environmental Protection confirms the suitability of the selected technology.

EPA has evaluated the cost-effectiveness of the various remedial alternatives for the ETC Site. Containment with solidification/stabilization of principle threat waste and capping attains the remedial action objectives established for ETC Operable Unit 1 (Soil) at a lower cost than other feasible alternatives. This is due to the large volume of soil being addressed (more than 566,000 cubic yards) and the very stringent cleanup standards being selected. A value engineering assessment will be performed during the remedial design to optimize the remedy. In terms of cost, EPA has expended approximately $3.4 million on the prior removal action, $25.5 million on the interim remedial action, and is proposing an additional $28.1 million to address ETC Operable Unit 1. Cleanup options for ground water have not been evaluated yet, but it is likely that total cleanup costs for the ETC site will exceed $60 million. The ETC site is one of the few mega-sites in EPA Region 4, and we are committed to a complete and final cleanup of this site. The Proposed Cleanup Plan with updates achieves this objective and is both protective of human health and supportive of the intended future use of the property.

EPA appreciates your interest in this site, and will continue to work closely with your office and local government through the decision process and remedial design to ensure the remedy meets the needs of the citizens of Pensacola and Escambia County to the maximum extent possible. The comments you expressed in your letter will be made part of the Administrative Record for this site, and will be publicly available. I have enclosed a copy of the Proposed Plan Update, and hope you find these improvements to the cleanup plan address your concerns. If you have questions or need additional information, please contact me or the EPA Region 4 Office of Congressional and Intergovernmental Relations at (404) 562-8327.

Sincerely,

J. I. Palmer, Jr.
Regional Administrator

Enclosure: Proposed Plan Update, Escambia Treating Company Site, Operable Unit1 (Soils) – October, 2005

Response to:

The Honorable Jeff Miller
United States House of Representatives
324 Cannon House Office Building
Washington D.C. 20515

Dear Congressman Miller:

Thank you for your letter dated September 15, 2005, concerning the Proposed Cleanup Plan for the Escambia Wood Treating Company (ETC) Superfund Site, Operable Unit 1 (Soil). EPA shares your concern that the remedy for ETC soil contamination be both protective of human health and supportive of the intended future use of the site property. The cleanup plan proposed by EPA does meet these objectives, but a thorough review of the proposed remedy has been undertaken based on the concerns expressed by yourself and the community. EPA reviewed the Proposed Cleanup Plan, along with the supporting investigations and studies, to evaluate the proposed remedy in context with the risks posed by the contaminated soil, the proposed cleanup levels, and the relevant remediation technologies. This review has resulted in the issuance of a Proposed Plan Update that affirmatively addresses both treatment of the waste and the long-term permanence of the remedy.

The review was used to identify potential improvements to the proposed remedy and reassess the costs and benefits of the proposed cleanup plan. Two improvements to the cleanup approach were identified. First, a cement and soil sub-cap, to be constructed below the final cap, will be included as part of the remedy. This sub-cap will be constructed of a mixture of cement and the soil containing the most mobile and toxic contaminants at the Site. Thus, these contaminants will be bound up in solid concrete, minimizing the likelihood they will enter the aquifer. The sub-cap will improve the long-term reliability of the final cap operation and maintenance by ensuring that water will not infiltrate into the waste below it in the unlikely event the final cap is compromised.

Additionally, inclusion of the sub-cap will allow for greater use of the portion of the Site overlying the containment.

The second improvement is to include the remaining ten residential properties adjacent to the Clarinda triangle neighborhood within the scope of the remedy. This change results in the permanent relocation of the residents from all residential properties impacted by the ETC site.

The cleanup levels EPA has proposed for the ETC contaminated soils are based on a combination of human health risk, state requirements, and modeled values for ground water protection. The proposed cleanup level for benzo(a)pyrene is based on human health risk assessment and corresponds to a less than one in a million incremental lifetime cancer risk under commercial use. The proposed cleanup level for dioxin is based on an applicable requirement under Florida Statute. It is among the most stringent ever selected by EPA, and is much more stringent than the current national standard. For comparison, the U.S. Agency for Toxic Substances and Disease Registry has established a minimum screening value nearly twice the proposed cleanup level that is protective of children under residential land use. These proposed cleanup levels meet or exceed all EPA requirements for protection of human health and the environment.

Review of the cleanup technologies provided in the Feasibility Study indicates that an appropriate range of treatment, containment, and disposal alternatives were evaluated. Selection of containment as the basis for the cleanup is consistent with the remedies selected for other wood treating Superfund sites around the country. In fact, the containment system proposed for ETC has the advantage of excavating and completely encapsulating the waste above the water table as opposed to the more typical in situ containment system used at other wood treating sites. The ETC waste and site geology are compatible with the construction and maintenance of a containment system. EPA believes the unqualified support for the proposed remedy by the Florida Department of Environmental Protection confirms the suitability of the selected technology.

EPA has evaluated the cost-effectiveness of the various remedial alternatives for the ETC Site. Containment with solidification/stabilization of principle threat waste and capping attains the remedial action objectives established for the soil portion of the remedy. This is due to the large volume of soil being addressed (more than 566,000 cubic yards) and the very stringent cleanup standards being selected. In terms of cost, EPA has expended approximately $3.4 million on the prior removal action, $25.5 million on the interim remedial action, and is proposing an additional $28.1 million to address ETC Operable Unit 1. Cleanup options for ground water have not been evaluated yet, but it is likely that total cleanup costs for the ETC site will exceed $60 million. The ETC site is one of the few mega-sites in EPA Region 4, and we are committed to a complete and final cleanup of this site. The Proposed Cleanup Plan with updates achieves this objective and is both protective of human health and supportive of the intended future use of the property.

EPA appreciates your interest in this site, and will continue to work closely with your office and local government through the decision process and remedial design to ensure the remedy meets the needs of the citizens of Pensacola and Escambia County to the maximum extent possible. The comments you expressed in your letter will be made part of the Administrative Record for this site, and will be publicly available. I have enclosed a copy of the Proposed Plan Update, and hope you find these improvements to the cleanup plan address your concerns. If you have questions or need additional information, please contact me or the EPA Region 4 Office of Congressional and Intergovernmental Relations at (404) 562-8327.

Sincerely,

J. I. Palmer, Jr.
Regional Administrator

Enclosure: Proposed Plan Update, Escambia Treating Company Site, Operable Unit1 (Soils) – October, 2005

U.S. ENVIRONMENTAL PROTECTION AGENCY

SUPERFUND PROPOSED PLAN

ESCAMBIA COUNTY TREATING COMPANY SITE

OPERABLE UNIT 1 - SOILS

PUBLIC MEETING OF THE ENVIRONMENTAL PROTECTION AGENCY

TO DISCUSS THE PROPOSED PLAN

FOR THE ESCAMBIA TREATING COMPANY SITE OU1.

HELD AT THE NEW HOPE MISSIONARY BAPTIST CHURCH,

3600 NORTH PALAFOX STREET, PENSACOLA, FLORIDA,

COMMENCING ON THE 1ST DAY OF SEPTEMBER 2005 AT 6:00 P.M.

PROCEEDINGS REPORTED BY DEBORAH G. KHARUF,

COURT REPORTER AND NOTARY PUBLIC,

STATE OF FLORIDA AT LARGE.

ANCHOR COURT REPORTING

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1-800-563-6409

I N D E X

PENSACOLA, FLORIDA; SEPTEMBER 1, 2005, 6:30 P.M.

P-R-O-C-E-E-D-I-N-G-S

MR. KEEFER: Good evening, everyone. If I could ask the folks to kind of work their way to the seats, please?

(AUDIENCE IS SEATED.)

MR. KEEFER: I am David Keefer. I am here with the Environmental Protection Agency to present the proposed clean-up plan for the Escambia Wood Treating Company site. I would like to welcome everyone tonight.

The first order of business, I think, is to thank the Reverend Wright for letting us use his church for our meeting. And we really appreciate that; that's been a real help to use through the years on this project.

I would like to -- also, before we start, I'd like to take a few minutes to acknowledge some of the State, local, and Federal officials that are represented here tonight. I don't think I know everybody.

With the State of Florida, we have Don and Nancy --

(AUDIENCE STATES THEY CANNOT HEAR MR. KEEFER.)

MR. KEEFER: Is the microphone on? Will someone crank it up a little bit? I will try to speak more clearly. It will be okay.

With the local government, I was told we had a City Council person here tonight. We have Marty, and, I believe, from Congressman Miller's office, John Gallagher is here tonight.

Did I leave anybody out?

MS. BENNETT: Me.

MR. KEEFER: Yes, ma'am?

MS. BENNETT: Ann Bennett, Water Conservation District.

MR. KEEFER: Did everyone hear? Ann Bennett with the Soil and Water Conservation District Board is here.

I apologize for the unusual angle of the projection there. Let me know if everybody has any problem reading it. This is the agenda we would like to try to go through tonight.

What we're going through now is the introduction and opening remarks. Then, I have a presentation about the proposed clean-up plan that I would like to make to everybody. Then, there is a question and answer and public comment period.

During that period, that's to allow everyone to put their comments, concerns, or questions about this remedy on the record. We have a stenographer with us this evening, and she will take your comments or questions down. So what we ask is when the public comment period comes up that you stand and identify yourself; make your comments. We prefer that you keep your comments to three minutes, if you can, so that everybody will have a chance to make their comments.

We are also asking since this remedy does involve the temporary or permanent relocation of some residents in the Clarinda Triangle neighborhood, we will allow them to speak first. And then, we will address other issues related to the remedy selection. We will have some closing remarks at that point, and then, we will be available for the media.

MR. CHAFFINS: We would also like to point out that this is not the only opportunity for you to submit comments. Just because you don't get to voice those comments here and get them on the record, we have comment cards that you can mail into us anytime during the comment period, and they are considered just as if they were taken down by the stenographer so you have more opportunities.

MR. KEEFER: I don't know if everybody heard that, but there are a number of different avenues throughout the public comment period after then you can make your comments. These comment cards that we referred to -- you can e-mail us, mail us, fax us; and we will go over all of that at the end of the meeting.

AUDIENCE MEMBER: Will you acknowledge that the Board of County Commissioners for Escambia County could not be here because there is a County board meeting at this time. The commissioners are meeting at this time. They can't be here because they have their own board meeting tonight, but more County staff will be here later on this evening.

MR. KEEFER: The public comments period, as Scott said, we could point out has been extended through September 22nd at the request of Escambia County, and I was going to go over that at the end of the meeting, but we do have an extension that has been made in the public comment period.

Are there any other questions?

(NO AUDIBLE RESPONSE FROM AUDIENCE.)

INTRODUCTION OF PROPOSED CLEAN UP PLAN

MR. KEEFER: Well, I guess I will get started on the presentation. The Escambia Wood Treating site is a former wood preserver. As I think most people are aware, the wood preserving operations there consisted of treating wood with creosote in the early days and pentachlorophenol later on.

In the early 90s, the EPA performed a removal action that resulted in 255,000 cubic yards of contaminated soil stockpiled on the site. That's the black tarp that many people are aware of. This project was also the subject of a national relocation pilot project. Many of the residents -- I know Ms. Williams here -- who lived in this area have been relocated by the Federal Government, and the soils that were contaminated in those neighborhoods are going to be addressed by this remedy.

There are unexcavated areas of surface and subsurface soil contamination both on and off the Escambia Treating Company site. This proposed final remedy that we are bringing before you tonight will meet State of Florida regulations and all other applicable standards and requirements, and I think it's also real important to understand that this remedy is strictly for the soil.

The ground water that -- there is ground water contamination present at this site. That's going to be addressed by a separate investigation, a separate study, and a separate decision. The remedy that we are proposing will be compatible with the ground water clean up. This remedy does not address the ground water.

I expect to be back, maybe in the same church in a year, bringing a proposal to you for the ground water clean up. This is a location map. (demonstrating) Since we're here at the church, I think most people are aware the site is a couple of blocks over this way.

The site property, the former Escambia Wood Treating Company, occupies about 26 acres. The neighborhoods that have been relocated, including the portions of the Clarinda neighborhood that are addressed in this remedy, constitute about another 80 acres we refer to as the offsite portion of the project.

Just to recap, the wood treater, the Escambia Wood Treating Company, operated for about 40 years. From 1942 to 1970, coal tar creosote was the preservative that was used by them.

Then, from 1970 to 1982, pentachlorophenol dissolved in Number 6 diesel fuel was the preservative. During the operation of the facility, there were waste water ponds and cooling ponds that were constructed at the site to -- as part of the process of wood treating, and these ponds are the primary sources of contamination for soil and ground water.

Airborne releases from the site produced a secondary source of contamination that we have located in some of the neighborhoods and surrounding sites.

The enforcement status of the site of the Escambia Treating Company had a long enforcement history with both the State of Florida and U.S. EPA. As you see there, there was a State consent order for closure. The site was working toward closure.

There were a number of violations, complaints, and other environmental regulatory activities in the period of 1983 to 1991 when the Escambia Treating Company filed for bankruptcy and abandoned the site.

In 1994, the EPA and the Florida Department of Environmental Protection agreed to list the site. It was placed on the national priorities list. That's what makes the site a Superfund site. And then, finally, in 2002, the Department of Justice reached a settlement, a final settlement, with the PRP, the potentially responsible parties.

The removal action that created the black tarp was performed in 1991 and 1992. The objective of that removal was to get all of the heavily contaminated on-site soils and other waste materials that were abandoned on the site out of the ground so they would stop, prevent ongoing impacts to groundwater, and to contain them in a way they wouldn't pose a threat to -- an immediate threat to people in the area while we developed a remedial strategy to address this material permanently.

During the removal, as we noted before, 255,000 cubic yards of soil was stockpiled, a very large stockpile. Most of the structures that remained on the site were demolished, the foundations were torn up, and the stockpile was designed to last ten years.

That was 13 years ago. It is almost 13 and a half now. And we do inspect the stockpile regularly.

Any tears or other nicks in it are repaired. And myself and the other members of the EPA were out at the site today and looked it over. It's performed very well. It has exceeded our expectations, but we're anxious to make a final decision and get this remedied.

The slide that is up there is an aerial photograph. You can't quite see the church in that view, but the large black sort of number nine-shaped area is the stockpile from the air, and this is what it looks like from the ground.

The National Relocation Pilot Project. In 1995, the EPA Region IV nominated the Escambia Treating Company as a National Relocation Pilot Project. The Agency agreed to move forward with that, and an interim Record of Decision was signed in 1997 that has resulted in the permanent relation of 358 households in this area.

That's the Rosewood Terrace, Oak Park, Escambia Arms, and Goulding neighborhoods. Part of that work included, after the relocations were completed, a demolition of the structure and applying institutional controls so we could effectuate or perform the remedy we're contemplating this evening.

The demolition activities are nearly complete now, and this interim action is almost done. The basis for the interim action was health risk reduction.

There was contamination in specific portions of these neighborhoods.

There were also other goals of the relocation that included community welfare, cost benefit and operational factors, the configuration of the land, and trying to develop a contiguous parcel that was consistent with community development goals as we understood them.

In 1998, EPA issued an explanation of a significant difference to allow for the maintenance of the site and the cover while pending the final decision for the site.

This is just an illustration of where the relocated neighborhoods are relative to the Escambia Treating Company site. I apologize for the lack of a pointer.

In 1994, EPA began the remedial investigation of the Escambia Treating Company Site. At that point in time, there was combined soil and ground water investigation. There were 250 soil samples, 55 ground water samples collected during that phase of the investigation, and it was completed in 1998.

At that point, we began a series of discussions with the Florida Department of Environmental Protection regarding the dioxin clean up standards and what would be an appropriate target for that. At the conclusion of those discussions, we agreed that additional sampling was necessary and an additional investigation was undertaken and another 107 soil samples were collected from different areas around the site.

This kind of busy drawing is what we refer to as a conceptual site model. What this drawing tries to communicate is what are the modes of exposure to the soil materials that potentially cause human harm. And the modes of exposure that we're concerned about are for the soil's volatilization and dust generation. If the soil is uncovered and can blow around, and someone would inhale it or ingest it from the air, that could be harmful.

Direct contact with the soil; if contaminated soil is in a place where you can have direct contact with it through your skin, there is a potential for harm.

Leaching of contaminants from the soil to ground water; those are the pathways that we're trying to address with this remedy. Those are the exposure pathways that we think are complete.

There is a series of drawings we're about to show you that are the results of the various investigative activities that have been performed both on and off.

I've been told to speak up.

These drawings are a series of drawings of results of the investigative activities that have been performed both on and off site, and the yellow dots on the aerial photographs are places where we have collected samples.

Tonya, can you go back?

Ms. L'Tonya Spencer is going to show you the shaded areas that are imbedded on these photos. They are outlined with the dark line, and these shaded areas are port areas where the soil contamination exceeds the clean up goals for this project. Okay?

Does anybody have any problem with that?

FEMALE IN AUDIENCE: This is an aerial photo --

MR. KEEFER: I'm sorry?

FEMALE IN AUDIENCE: This is an aerial photo. What streets or what area are you talking about?

MALE IN AUDIENCE: Can you read the street names, please?

FEMALE IN AUDIENCE: North Pace Boulevard --

MR. KEEFER: North Pace is on the left-hand side. Palafox Highway is the large --

FEMALE IN AUDIENCE: I know. I can see that. I was saying that we can't see the street names on it.

MR. KEEFER: Yes, ma'am.

We can provide additional information on this. This is the same information we went over in the last community meeting, so there are handouts that have been distributed. I can find some more of those and have them mailed to you.

MR. SUDWEEKS: It's pretty clear in the picture in the handout that you have got, page 16; did you pick up a copy of that?

MS. WADE: Page 16?

MR. KEEFER: 16.

MR. SUDWEEKS: Figure 7. It's a little clearer than what is on the --

MR. KEEFER: Does anyone need a copy of the proposed plan?

MR. SUDWEEKS: I can help, Dave. Let me get that.

(PAPERS ARE DISTRIBUTED TO AUDIENCE.)

MAN IN AUDIENCE: Do you have full addresses of these samples?

MR. KEEFER: We provided that at the last meeting. Maybe we can find that.

(MALE MAKES INAUDIBLE COMMENT.)

MR. KEEFER: I am sorry, sir. I couldn't hear you.

(MALE MAKES INAUDIBLE COMMENT.)

MR. KEEFER: Sir, if we could ask you to

hold your comments until the end of the meeting, we would like to get your comments down.

I believe what he was saying was there are areas that he feels like haven't been addressed; is that a fair summary?

MAN IN AUDIENCE: I don't know why we have to pay taxes on it for 25 years. Now you tell me to leave; it's not fair.

MR. KEEFER: We're going to move forward to the presentation. The next slide is the Pearl Street and Hermann Avenue area which is where we are now.

And, as you can see, there are a number of shaded grids where there is soil contamination that we're going to come remove and take care of.

FEMALE IN AUDIENCE: Does that correspond with something in the book, also?

MR. KEEFER: All of these illustrations are in the proposed plan handbook.

FEMALE IN AUDIENCE: Tell us what page. They are too small to read.

MR. CHAFFINS: That's figure 8 on page 15, ma'am. Page 15.

MR. KEEFER: Figure 8 on page 15.

This next illustration is for the Rosewood Terrace, Oak Park, and Escambia Arms neighborhood, which is over on the other side of the Escambia Treating Company site.

As you can see, there are areas of soil contamination on the property adjacent to the former treating company as well as an area of soil contamination in the area of the former Escambia Arms Apartments.

This is the area of soil contamination in the Palafox Industrial Park. There is a small strip of soil that we're going to remove on the north side of that industrial or commercial park.

This is an area that we refer to as the former "SWMU 10" area. This was part of the waste management operations at the Escambia Treating Company, and there is both surface and subsurface soil contamination present around what today is a detention basin, a small pond there.

And this is the Escambia Treating Company property. As you can see, the soil contamination is fairly widespread across that property. We have a lot of excavation to do on that site.

These are the chemicals of potential concern that were identified during the remedial investigation. The first one, the lower case c, cPAH, refers to carcinogenic polyaromatic hydrocarbons. Those are represented as benzo(a)pyrene equivalents.

Benzo(a)pyrene is a polyaromatic hydrocarbon, and it is the one with the highest known carcinogenity. My toxicologist is behind me.

Another compound that I'm sure you have heard talked about here is dioxin. Dioxin is also similar to the PAH compounds represented by one of the chemicals that makes up the dioxin group. That's the 2378 TCDD equivalents, and the reason that one was chosen is, once again, it has the highest carcinogen -- I can't even say the word now -- it has the highest cancer risk of the various dioxin compounds.

There are also a number of chemicals; naphthalene and these other derivatives, such as 2-methylnapthalene, dibenzofuran, and carbazole that are all related to the creosote timeframe or treating period at the site.

And then, pentachlorophenol is the other treating compound that was used at the site, and it is present in the soils.

In the offsite area, the only chemicals of potential concern we have identified are the carcinogenic PAHs and dioxin. We performed a couple of risk assessments at this site to try to determine what the risk is to the people that live or work in this area of the chemicals that are found in the soil.

We have divided that up into the soil stockpile, the materials that are actually contained inside the black tarp, the onsite soils; those are the soils that are out there today, and then, the soils that are present in the neighborhood areas.

The risk is divided into cancer risk and hazard, and it is just the mode of impact on you, you know, whether it is a hazard or a carcinogen. So it is just two different ways of measuring risk.

For hazard, a risk greater than -- yes?

MS. BENNETT: Do I understand you to say that you said that you took the different places and averaged them?

MR. KEEFER: That's not correct, ma'am.

MS. BENNETT: Okay.

MR. KEEFER: For hazards; if you have a hazard greater than one, that's considered too much hazard.

For cancer risk, it is a cancer risk exceeds one in a million, that's an excess risk. That's a statistical probability. Okay?

So, to move forward, where do we have problems with risk from these chemicals? In the soil stockpile, as a hazard, as a chemical hazard, there would be a risk under a residential use for that soil.

As a cancer agent, there would be a risk for residential workers or visitors. Okay? So the stockpiled soil has a significant amount of risk. The on-site soils pose risks for residential use. If there were a home -- if someone were to build a home on those soils on the site, there would be a risk and a hazard.

In the offsite areas, the excess risk for a hazard index was found in one grid back here, in the Pearl Street and Hermann Avenue area. And in three grids, there was an excess cancer risk up in the Rosewood Terrace, Oak Park, Escambia Arms neighborhoods.

Those three grids; 39, 40, and 41, are the grids that abut or are adjacent to the former Escambia Treating Company site.

Part of the process of investigating and assessing the risk from these problems has been trying to decide what to do about them. We have performed or we developed a document called a "Feasibility study." One of the first steps in the feasibility study is to try to understand what is the expected future use -- the end use of the site is going to be.

For this site, the Escambia Treating Company was designated as a community redevelopment area in 1995. EPA provided a redevelopment grant to the local government and the Palafox Commerce Park master plan was developed, which envisions a mix of commercial retail, light manufacturing use, with some 600 to 650,000 square feet of development on the combined, approximately, 100 acres of impacted property from this area.

This is an architectural rendering of what the Palafox Commerce Park might look like, and this is the end use that the remedy is designed to support.

The next step in a feasibility study is to define what the objectives of the remedial action are. For the soils at the Escambia Treating Company site, we have defined remedial action objectives as;

"One, "Preventing ingestion, inhalation, or direct contact with contaminated soils."

"Two: to control the migration and leaching of contaminants from the soils to ground water."

"Three; prevent the ingestion or inhalation of soil particulates."

"Four; control any future releases of contaminants to protect human health and the environment."

During the feasibility study, we looked at the chemicals that we had identified before and determined what appropriate clean up standards could be applied. These are the clean up goals that were developed in the feasibility study.

For the benzo(a)pyrene equivalent; that's 400 ppb, (parts per billion.) That's a risk base number that is consistent with commercial standards. For dioxin, it's .030 ppb (parts per billion) or 30 ppt (parts per trillion) which is also a risk based standard.

For protection of ground water, we conducted modeling using a model known as the "Summers Model," to back calculate a protective concentration for the chemicals, and the other chemicals that are present at the site in the subsurface to insure that any contamination that might remain in the subsurface would not be available to leach the ground water and create problems.

I am not going to read all of those numbers, but, as you can see, it is a calculated value that varies from 5 ppb to 3800 for -- and that's based on the leachability and geochemistry of those chemicals.

Then we identify alternatives that can address the problem at the site, and these are the alternatives that were identified for the Escambia Treating Company site.

The first one is no action. Every EPA feasibility study considers no action as a baseline to compare the other alternatives against.

The second alternative; onsite containment and capping.

The third alternative; thermal treatment with on-site disposal.

The fourth alternative is ex-situ bioremediation with on-site disposal.

The fifth alternative is ex-situ chemical oxidation with on-site disposal.

The sixth alternative is solidification and stabilization of on-site disposal.

And the seventh alternative was to dig it all up and ship it offsite.

The evaluation of those alternatives; there is a basis for evaluation that we use. Before we move onto that, I think it's important to understand that whatever alternative or what remedy is selected will have to address 566,000 and some odd cubic yards of contaminated soil.

And that is a large amount of soil to address through any mechanism, containment, or treatment, and defining that volume was part of this process.

So we looked at these nine criteria or we are looking at these nine criteria to select the remedy. The first two criteria refer to as threshold criteria. Any remedy that EPA selects will have to meet the standard of overall protection of human health and the environment and will have to comply with the applicable laws and standards.

The next five criteria are referred to as balancing criteria. These are long-term effectiveness and permanence, short-term effectiveness, reduction of toxicity, mobility in volume through treatment, the implementability of the remedy, and the cost.

And, finally, the modifying criteria that we consider after all of the engineering criteria have been gone through are State acceptance, which, in this case, is represented by the Florida Department of Environmental Protection and community acceptance, of which this public meeting is part of.

In order to try to evaluate how the different alternatives stack up relative to each other, the engineers put together these tables that qualitatively compare short-term effectiveness, long-term effectiveness, and assign a number one through five, one being the lowest -- one being the worse; five being the best, and provide this information to us so that we can balance these criteria to select the remedy. This table is in the proposed plan.

Well, we will move on. Okay. The alternate that EPA has identified as the preferred remedy for the Escambia Treating Company site is on-site containment and capping. What that remedy would consist of is excavation of the contaminated soil from the surrounding offsite properties, bringing that soil back into a staging area on-site and constructing a containment that would be laid down and designed to be consistent with the future use of the site.

The excavation would be lined with a geomembrane. The contaminated soil would be placed in there and compacted. And the soil, the containment would be built so that all the contaminated soil would be below the existing surface grade and then a multi-layer cap system would be placed over the top and contoured over the site, and the expectation is that the area that will -- that the containment will occupy will be 15 to 20 acres.

The cap will be distributed over something closer to 30 acres, so there will be no perceptible rise; This won't look like a landfill cap, which is one of the concerns that we have had people bring up. It will be contoured in so that the selected end use can be supported.

After the remedy is constructed, there will be operation and maintenance activities that are required. These are to maintain the integrity of the cap. That would be through inspection, repair of erosion, maintaining the grass cover in areas that are vegetative, and insuring that the drainage controls work.

There will also be monitoring. The monitoring will make sure that if the cap were to be compromised we have a second line of defense to catch any water that might leak into the waste materials.

The next thing would be institutional controls. Those would be a series of steps that would be taken to insure that only compatible use is made of the site -- that anybody who were to build at the site would know that they have a limitation on how much weight they can place on it or how deep they can dig before they would compromise the remedy.

And then, finally, EPA and FDEP will monitor the performance of this remedy. You know, these reports of these inspections, monitoring reports will be sent to EPA, and FDEP will monitor the performance of the remedy. If there is ever any question that it is working right, we will come in and find out what is going on.

Every five years, we will do a five-year review that will assess the protectiveness of it. And we were asked earlier by some representatives of local government, "What would happen if, even after all of that, if the remedy were to fail?"

Well, EPA is the steward of this remedy. If there were a failure, which we don't believe is even possible, but, you know, just to conceive of it, if there were a failure, you know, we would repair it. So that's the remedy that we're proposing.

This is a schematic that tries to illustrate what the containment system would look like. This is just a generic schematic. The soil waste is the diagonally striped material in the center. It would be contained in a liner.

Above that will be two feet of compacted clay that would have a very low permeability, and above the clay would be another liner. Okay? The purpose of the liners is to keep water out of the waste material. Okay? This waste is in soil, and while it is in the soil, it's not going to move.

The only problem that could occur would be if water were to be -- were to leak into the waste, and that's why we build it above the water table, and we put this cap system above it that keeps the water out of it.

Over the liner is a soil fill layer that will be at least 18 inches thick. That's called a cushion layer, and there will be top soil or if, you know, part of the redevelopment is a parking lot, then there may be asphalt instead of grass, but an impervious surface or a grass surface will exist over all of the capped areas.

This is the rationale that EPA used to select this alternative from among the other alternatives that were considered. This alternative meets the threshold criteria. It provides for the protection of human health and the environment, and it complies with all of the applicable laws and statutes.

The balancing criteria; this remedy is effective in minimizing impacts to the community during construction. In conjunction with the operation, maintenance, and monitoring, it will afford good long-term protectiveness and permanence.

This remedy does not reduce the volume of toxicity of the waste through treatment. It is a highly implementable remedy using proven technology that is used throughout the country, and it also provides the lowest cost for all goals that we have.

We have discussed this remedy with the Florida Department of Environmental Protection. They support our remedy selection.

As I said, we're here tonight to meet with the community. We are seeking your input, your comments, throughout the public comment period on this remedy. This remedy meets our remedial action objectives.

Now, if you recall, our remedial action objectives are to prevent direct contact with the soil waste. This waste will be isolated. No one will be able to have contact with it.

Another goal was to prevent dust generation or vapor generation. Once, again, when the waste is contained and isolated, that won't be an issue. Another one of the remedial action objectives is to prevent leaching of contaminants in the soil waste to ground water. This remedy accomplishes that.

And the fourth objective is the long-term permanence, long-term protection of human health and the environment. This remedy meets that objective through the O and M, the monitoring, the five-year review process, and the ongoing stewardship by EPA.

This remedy addresses all on and offsite soil contamination. It's one of the objectives of the community. We feel we have gotten that. This remedy will be the final remedy for soil. It is compatible with ground water remedy, which will be separate. Okay?

This remedy will in no way impair our ability to address the ground water. And it's also compatible with the reuse plan that the community has provided to us.

The public comment period for this remedy has been open for a couple of weeks, and we have received some comments from the community. And, essentially, our comments have fallen into two general concerns; one is regarding the long-term permanence of the containment and cap system.

As I said, the containment will be placed above the high water table at the site. The only issue with this waste would be if water were to move through it.

The geomembrane and liner materials are extremely durable.

On behalf of this community, I have spoken to people at EPA who have assured us that this is their responsibility -- is the technology of liner material. They assure me that they last for many hundreds and thousands of years, as long as the testing period is able to measure.

The active operation and maintenance of this remedy will ensure both that the cap does its job and a compatible reuse -- or only compatible reuse activities are made at the site. The monitoring will make sure that all of that works, and then, the institutional controls and five-year reviews will maintain the administrative oversight and control on this remedy by EPA.

The other concern was about the future use of the site property. I know there were concerns that the cap would be an eye sore or the cap would be too tall; the site would look like a landfill site and that we would not be able to build, you know, everything that we would like to build on it.

As we move forward through the remedy selection process, the next step is remedial design. The remedial design for this remedy will be performed in consultation with local government. That's to insure that it meets the needs of the community for reuse.

The location of the containment system and the configuration of it will be determined, at least in part, by the future use and redevelopment needs of this community. The cap system that we envision is referred to as a low profile.

It has low slopes and grades. And, as I have indicated before, the containment may have a footprint of 15 to 20 acres, and then, over a 30-acre area will be the contoured end cap cover system.

The bearing capacity of this cap will be sufficient to insure its long-term protectiveness and that will be compatible with light commercial use. We can work with the community to talk about ways to upgrade the bearing load, the bearing capacity of the cap, if that is the desire of the community.

And then, there will be use restrictions and O and M requirements, but they will be built in on the front end of this remedy so they should not impair the future use of the site.

And that concludes our description of the preferred remedy. Does anybody -- do we need to take a break? Or are we ready to start with some public comments and questions?

PUBLIC COMMENTS

(AUDIENCE MEMBER MAKES COMMENT THAT IS UNINTELLIGIBLE.)

MR. KEEFER: If you could please stand and speak up, our stenographer has to be able to --

MS. WALBER: Yes. My name is Kathryn Walber (phonetic). I was wondering how deep will the greatest depth be?

(AUDIENCE MAKING INAUDIBLE COMMENTS.)

MR. KEEFER: Randall reminded me, I would like to address any comments from the Clarinda residents first.

To answer your question, you know, we're estimating about 20 feet, which should be right now, as we understand it, about eight feet above the high water table. The final depth will be determined during design, and we are going to make sure that we understand the water table depth.

Did any of the -- are any of the Clarinda residents here tonight?

(AUDIENCE MEMBER MAKES INAUDIBLE COMMENT.)

AUDIENCE MEMBER: What you were talking earlier about the site -- that site over there -- what are y'all going to do about that? Are y'all going to address that before y'all take care of the residents?

MR. KEEFER: No, ma'am.

AUDIENCE MEMBER: Before you disturb the land is what I are saying.

MR. KEEFER: The clean up in the offsite areas will be done first.

That's what I want to know. Are you going to clean up first before the relocation?

MR. KEEFER: No. The temporary and permanent relocation aspect of this remedy; there won't be clean up taking place until, you know, y'all, the relocation, has been worked out.

AUDIENCE MEMBER: Okay. That's what I was concerned about. Because y'all are going to address that first. Do you know what I am saying?

MR. KEEFER: We are going to address that first but during the design phase.

AUDIENCE MEMBER: I understand you will address it separately, but what I am saying you are addressing the clean up first. But, you know, the residents are my concern.

MR. KEEFER: We're addressing the residents first. I'm sorry I was not clear about that.

AUDIENCE MEMBER: You are going to address the residents first?

MR. KEEFER: Yes. We're going start on the relocation.

AUDIENCE MEMBER: That's what I am saying.

MR. KEEFER: That comes first.

AUDIENCE MEMBER: Okay. That's my question.

MR. KEEFER: Did anybody else from the neighborhood have anything?

(MS. WADE IS RECOGNIZED FROM THE AUDIENCE.)

Yes, ma'am?

MS. WADE: Good evening. My name is Katherine Wade. I was concerned also, as the young lady stated, about making sure that the citizens of Clarinda Triangle are treated fairly, that we are moved expeditiously, and we're treated with respect.

We do understand the value of our property. We have lived in the area for many years, made many friends, and we are concerned with being treated fairly, you know, as opposed to what the relocation process will be and being compensated for being exposed and, also, for the property of our -- the value of our property.

MR. KEEFER: Yes, ma'am.

MS. WADE: We're very concerned about that because we need to make sure that we're confident that everybody is playing fair and is going to do right by the individuals that live in the community, and I have a big concern about that.

We would appreciate your comments.

MR. KEEFER: Regarding the relocation, the soil contamination in the Clarinda Triangle neighborhood area will require that we move folks out so we can do the clean up. Okay?

There's two ways that relocation can take place. One is temporary location, and we will find an apartment or someplace; we'll move you out of your home, do the clean up to the residential standards, and then allow -- and then move you back.

The other is permanent relocation, where we pay you for the value of your home and then identify another property or properties that are comparable and go through a whole process to try to get you into a new home that is, at least, equivalent to where you lived before.

The gentleman with the Army Corp of Engineers that was going to be here tonight; he is based in Mobile, and because of the storm in New Orleans, he is unable to make it here tonight. And so, I am not able to answer the kinds of questions I know you have about the details of relocation.

But I can tell you that we're fortunate, if you will, that we're able to offer -- this is the full range of relocation options that are available to the Government. It's all going to be done in accordance with the Uniform Relocation Act, the law that governs this process.

(MS. WADE IS RECOGNIZED FROM THE AUDIENCE.)

MR. KEEFER: Yes, ma'am?

AUDIENCE MEMBER: Okay. Once again, my question and concern is -- I understand what you are saying as far as being relocated. I want to ask you specifically, and this is a concern of why we are here.

My concern for myself and my neighbors in my community in Clarinda Triangle Circle; we appreciate being moved. We have a problem there. We don't need to live there. We have lived there -- many of us have lived there years before I lived there, and it's a shame what has happened, you know, the codes, and the fact that this was allowed to happen by ETC or to have that company there.

My concern is that we are relocated fairly, expeditiously, and I am concerned about being given us what the value of our property is. It's not just a matter of our home. We are sitting on C-2 commercial; you can verify it online. It's a very expensive property. I know what the value is. I had my property appraised. I know what my property is on the market for. I am not interested being relocated at a fair market residential because I can sell it as commercial.

Everyone in Clarinda Triangle is in a commercial zone. My question and concern is that we're treated fairly. Yes, we appreciate the clean up. We need it for Escambia County. You know, this is a tragedy here.

You know, we need to clean the area. No matter what area we live in, we're concerned about that. I want to make sure we're not overstepped, overlooked, that they are not going to take our property from us.

My property is worth $300,000. Don't come and tell me, "Well, Ms. Wade, you bought your home for $60,000 in 1970." I know the value of my property. I am going to lay it on the line; that's what I am concerned about. We concerned that we're not going to be treated fairly, and no one is going to represent us. We're not going to represent ourselves.

MR. KEEFER: That's right. I can't answer that question. I know the Corp of Engineers performed that work on the part of EPA. I can answer the part that will be done fairly. Let me tell you a couple of things I do know. Okay?

They will use national appraisal standards. Okay? I will make those available to everyone in the community, you know, the book that they are using, okay, so you will know, and I just don't know how they apply that. Okay. I just honestly don't know.

MR. CHAFFINS: I would like to add something. The process that we follow is a Uniform Relocation Act, and this is a law that was passed through Congress, and it is used all over the country in any type of relocation, whether it is a dam being built or a Superfund site. These are the rules that we have to follow and will follow. And, you know, we will follow them to the full extent of what they allow.

And if, you know, they say that in this case, "Your property has been rezoned commercial," and that's what we are supposed to follow is commercial appraisals, then that's what we will do. It's not that we're going to somehow give you less of an option because we want to. We're going to follow the Relocation Act.

MS. WADE: And, you know, I am not trying to be difficult.

MR. CHAFFINS: No. I understand.

MS. WADE: But someone has to represent the community. You know yourself, sir, I have been living here for over 40 years. It happened a lot in the South. They take land they claim is for something, and then, you know, they use it. I know myself what my realtor told me. That property is going to be very valuable in ten years.

That's the truth. So a lot of people are going to be making money. Why not the people in Clarinda Triangle? That's our property. So we just want to be treated fairly.

MR. KEEFER: Right. I can assure you that you will be treated fairly and because you have the full range of options under this relocation program, okay, you will be able, when you go through that, to make the choice that you find benefits or is the best for you and protects your interest. Okay? By having all the options available, you can do what is in your best interest.

MS. WADE: That's what they said the last time.

MR. KEEFER: I know, but I wasn't there. I know Ms. Williams was and, you know, I regret that there is that feeling in the community. I don't know the details.

MS. WADE: Absolutely. It's there. A lot of people are not going to say it, but I am going to speak up and say it. This is the way a lot of people feel. They probably should be recompensated.

MR. KEEFER: Well, the way this will work --

MS. WADE: That's another issue.

MR. KEEFER: -- is the Corp of Engineers will set up an office, a storefront here in the neighborhood and begin counseling with each of the families, you know, about what their options are, and, you know, what it means to them financially. They will help run the numbers.

And if, you know, all of that is going on, I think that's going to be both to address the needs of the community. I think it will be done with sensitivity and fairness. And I will be involved. If there is anybody that feels like, you know, they are not getting information they don't understand; they think they are not being treated fairly, let me know. I will get to the bottom of this. Okay?

MS. WADE: Okay.

MR. KEEFER: I mean, that's, sometimes, I mean, real estate is -- I am being honest with you -- I understand this stuff. I don't understand real estate. So, you know, it's complicated.

MS. WADE: It is.

MR. KEEFER: Okay? You know, making choices that have important implications, people need to be given the information in a way they can do that in their own interest, and we will make sure that will happen.

MS. WADE: Thank you.

MR. SUDWEEKS: Folks, there are yellow comment cards that are being circulated through the auditorium, and if you get a chance to fill one out when you came in or if some of you feel uncomfortable speaking this evening, or if you want to as well, I urge you, please, to complete one of those and hand them to us or mail them in later; okay?

Do we have more of those, L'Tonya? Any more of those comment cards available? If you didn't get one or want one, be sure that you pick one of those up.

MR. CHAFFIN: I just want to say one more thing on the relocation. The rules for relocation are not arbitrary; okay? We can't go into that law and say, "We're going to follow this rule and not that rule."

They are set. And, therefore, you know, there may be something that you want to bring up that you think that is not being implemented, but there may be a good reason why it's not. But I'm just saying that the rules are set, you know, and they are not set by EPA. We're going to charge the Corp of Engineers with implementing those regulations fully.

MS. WADE: So there are no new rules coming out?

MR. CHAFFINS: Yes.

MR. KEEFER: As we move forward and as we make decisions for what the remedy is going to be here, then I will be in -- I will proceed with the remedial design phase. Part of --

MS. WADE: I would like to get a report of it.

MR. KEEFER: I will get you my card. And part of the remedial design will also -- separately, I will set up an agreement between EPA and the Corp of Engineers, and they will undertake this. This takes time, you know, to talk to people, to do it in a way, you know, that nobody is going to be rushed out of their homes; okay? So that's -- and we're going to make time available for all of that.

(AUDIENCE MEMBER RAISES HAND.)

MR. KEEFER: Yes, sir?

MR. TOLKE: (phonetic) I have a question. My name is D.C. Tolke. Has EPA ever used this system in any other state that you reviewed here tonight for the following guidelines for the various things?

MR. KEEFER: I'm sorry, sir. I didn't follow you.

MR. TOLKE: I want to know that the system you represented here tonight about the various hazard wastes; has that technology been used in any other state in the United States?

MR. KEEFER: Yes, sir. This is standard technology. This is not atypical.

MR. CHAFFINS: We have had many successes. It has been used in many places with success.

MR. KEEFER: Is that -- has everyone from the Clarinda neighborhood had an opportunity?

MS. DUNHAM: I have a comment, please. Do you think that you could use that microphone and take the other one, the mobile microphone, to the people so they can hear you? We can't hear each other. It's very important for us to be able to hear the comments that are being made.

I am Frances Dunham. I will have comments on the remedy shortly, but as far as how the comments are received, I was hoping that you could turn that podium around and let people come up to the mike.

We are just not able to hear the comments that our fellow citizens are making. Would that be possible if you took this mike and turned the other one around; is that acceptable?

MR. KEEFER: Yes. I have no problem with that if that is acceptable to everybody here. That's fine.

Yes, sir?

(AUDIENCE MEMBER RECOGNIZED.)

MR. STAPLES: I would like to make a comment.

MR. KEEFER: All right.

MS. SPENCER: Actually, if there is anyone that doesn't want to come to the mike, just let me know, and I will come bring you a microphone if you feel uncomfortable coming up here.

MR. STAPLES: My name is Tom Staples. I live over on Bayou Texar. I want to make some comments. I don't agree with what is being proposed. I think what we are doing here is the proverbial "Putting the lipstick on the pig," except I think what we're doing here is we're putting lipstick on a wild boar that's going to come blowing out of there one of these days, and all you are doing is covering up a problem that you are going to continue to live with in this community.

I do not agree with what they are proposing here whatsoever. I have lived here all my life. I want to tell you that I'm an attorney. I also sat as a class representative in the Conoco case, and I sat in on a lot of the settlement discussions.

One thing we learned from that class action lawsuit was a lot of us -- and I think a lot of these folks that are here were talking about, "Well, what about the contamination? How do we clean that up? How do we make Conoco clean that up?"

And the legal answer to that is you couldn't do it in the Conoco case because EPA has the sole Federal jurisdiction to do this. Okay? So I want everybody to know that what you are doing here tonight, talking to these folks is very important, and what the outcome of this is is very important because this may be your only remedy.

Now, in dealing with EPA, I want to mention a couple of things. There are three options in dealing with EPA. One is to convince these people through your comments tonight to do the right thing and what the right thing is, in my opinion, is not what is being proposed here tonight. They need to get rid of this stuff out of this community.

It amazes me that in a nation where we can spend $200 billion on a war that a lot of us are beginning to feel like we should have never been involved in, we have got to sit here and nickel and dime EPA for 15 years to try to clean this mess up out of our community. It's just absolutely absurd.

The second option is put political pressure on EPA. Okay? It is a political animal, just like everything else in Government is. This gentleman back here needs to go back and tell Jeff Miller that I don't think he is doing a very good job with EPA in helping Pensacola with their problem. Neither do I think the rest of Congress is doing a very good job.

And your third option is you can sue EPA, and those are your remedies. Now, the problem with suing EPA is you have to sue them for abusing their authority or not following some of the laws that set them up. They were set up, I believe, back in the Kennedy administration. They have been emasculated over the years by the Reagan administration, and now, the coup de grace is about to be delivered by the President Bush administration.

They are emasculated. They are not very

effective. Their funding has been cut. That's why they are nickel and diming you on trying to clean up this mess over here. And so, back again to the options. One is to try to make the outcome of what we're doing here tonight positive and what it ought to be, to be the right thing.

The second option is political pressure, and the third option is you can sue EPA. So I just want you to know where you stand here tonight, and I want you to know where I stand on this thing. Thank you.

MS. SPENCER: We want to make sure we have got all the residents of Clarinda Triangle's comments or questions. If there is anyone else from Clarinda Triangle that has a comment or question before we move on to the questions and comments for the remedy?

MS. COLES: The only thing I want to know. My name is Regina Coles (phonetic) and I was trying to find out about the timeframe they are talking about moving us from Clarinda Triangle. If you are saying that it is contaminated over in this area; are we're going to just have to sit and wait, and it continues to be contaminated? Or are you going to move us out?

So we won't continue -- we're still drinking the water. We're still being contaminated. How long will it be to help us to get out of the contaminated area?

MR. KEEFER: As we move forward with the

decision process, what I would anticipate, if we are able to move forward with the decision process, this fall, I will be able to task the Army Corp of Engineers to start the process.

I can get that started in a few months. .I don't know from the day they start to the day the last, you know, person that wants to be relocated is moved how long that will take. Okay? I don't, but I can start it as soon as I can.

MR. SUDWEEKS: There was, perhaps, a concern that the drinking water source has been impacted for the community.

MR. KEEFER: We have no reason to believe that this affects your drinking water in any way, ma'am. Your drinking water is provided through the Escambia Utilities.

MS. COLES: We don't know that.

MS. WADE: Have you studied our water?

MR. KEEFER: The local municipal water supply? No, ma'am. I have not.

MS. WADE: Maybe, you don't know. That's the problem we are having. We would like to be expeditiously relocated. We all have agreed in our community that we want to be relocated.

We want -- I am kind of interested in this gentleman's comments. I think I will be speaking more with him. I am kind of interested in some of his comments.

I do agree that we are in a grave situation here. We know it's contaminated. We know we're exposed, and that was my other concern and since no one else is speaking I am speaking again, Kathryn Wade, about the health concerns, you know, a lot of birth defects in the community, a lot of people with shingles and Parkinson's disease that is attributed to living in the area.

So that's another concern that I have, separate from being fairly relocated from our property and our homes is the health concern. And we need to do this soon for our community.

I kind of agree; why are we going to bury our problem if we know we have to live here. This is a big problem in Escambia County. The rules and regulations are just absolutely ridiculous for some of these companies, you know, that were allowed to pollute our families like this.

One way would be to accept nothing. No attempt, you know, just we all just want to be relocated. We want it to be done as soon as possible and make this a priority. This is a priority. You know, many families -- all families on Clarinda have children or grandchildren living in that area.

So this is something that we really need to work on and move soon, and I agree with him that that will not solve the problem.

MR. KEEFER: On the health studies, my understanding is that the health studies are continuing; is that correct, Ms. Williams? The health studies through the University of West Florida -- that is ongoing?

MS. WILLIAMS: Yes.

MR. CHAFFINS: I would just like to address the comment that you made. I think that what we're proposing here for the residents of Clarinda Triangle; it's obvious that EPA does care about you and the residents of Clarinda Triangle. That's why we're moving forward with this relocation.

So we are committed to moving forward with it as expeditiously as possible. So I care. I think EPA cares as a whole, and I think that's demonstrated by the plan that we are proposing, so I hope you understand.

MS. WADE: Thank you.

MR. SUDWEEKS: May I ask a little bit more about the gentleman's comment? My name is Scott Sudweeks. I didn't understand why you thought the proposed remedy was not sufficient.

I heard you say that it was tantamount to putting lipstick on a pig. I wasn't sure specifically what you are concerned about. Would you mind sharing with us why you don't think it is adequate?

MR. STAPLES: Because it's still here in this community. My name is Tom Staples. The reason is because it's still here in our community. This is one of the biggest Superfund sites in the United States, and nothing is being done about it. Period.

What needs to happen is this stuff needs to be burned or dissipated some other way and gotten rid of. It's going to cost a lot of money, but you need to spend a lot of money to do this.

My reasoning for that is what if some terrorist comes over there and puts a big bomb in that stuff and blows it up. All of a sudden, you've got half of Pensacola contaminated. What if you have a tornado or something that hits that thing and spreads that mess all over the community out here? What are you going to do then?

You've got dioxin everywhere. We had Katrina. Katrina would have done a nice job on this, possibly. But those are the things that concern me a lot because I live here. I have lived here all of my life, and I am real concerned about this. I didn't come here from Tallahassee or Washington. I live here. That's what my concerns are. Thank you.

MS. SPENCER: Are we finished with the

residents? Any other questions before we move on to the remedy?

(MRS. WILLIAMS IS RECOGNIZED.)

MS. WILLIAMS: Is the Corp of Engineers the only agency who can be responsible for relocating people? The Corp of Engineers? You know, they made all kinds of promises to the first relocation.

We were the pilot program, and there were so many things that should have been taken into consideration that were ignored. They came to a meeting just like this and made promises on top of promises, but when it came down to the final analysis, people were made to feel intimidated, were made to feel that if you don't accept this, you are not going to get anything, or if you don't do this, we're going to condemn your property.

I mean, these are the kinds of things we have experienced, and I hope no other community will have to experience the same kind of things that we went through for relocation. So if they are the only persons -- they brought in appraisers from Arkansas and all over the place rather than use the ones in this area, and they came up with appraisals that were ridiculous.

And I am telling you a lot of people moved into homes that were not properly inspected. They had problems after problems after relocating. And I do hope that somewhere along the line you have come up with a relocation policy. I know several communities have been relocated, but when it came to our area, I was told that they did not have a relocation policy.

They are using their old method of relocation that was used by the Department of Transportation years and years ago that has not been updated since the 80s. And these were the things that we were exposed to as a community for the relocation.

I do know that other relocations have been done successfully. People have received ample appraisal values for their homes, and some got into pretty decent homes, but not everybody here in this area.

And if it is left up to the Corp of Engineers, I am afraid that the Clarinda Triangle group will experience the same thing. You will get a lot of promises beforehand, but when it comes down to reality, you are going to be shoved aside and not treated fairly.

MS. ANDERSON: My name is Debra Anderson, and whatever you decide this evening, there should be a contract made. And then, you know, if you don't go through with what you have proposed to us, we would have a contract to make you -- to hold you to it.

MS. SPENCER: Any other comments from the community concerning the relocation from Clarinda Triangle?

MR. CHAFFINS: I just wanted to address Ms. Williams' comment. The Corp of Engineers, we hire the Corp of Engineers to work for us. Okay?

They implement the Uniform Relocation Act, which is what we have to follow. That's the law, and they have to follow that. And I'm sorry if that process didn't go as smoothly as it should have.

And we can commit to you that EPA will stay more involved with this relocation. We have heard you. We have been aware of your concerns throughout the process, and we can try to be more involved with the Corp of Engineers in making decisions one on one with the residents if that's what it takes to make this process run more smoothly and fairly.

So we are willing to do that. If that process was not followed, according to the law, then, you know, we need to know about it, and I can commit to you that we will be involved and try to make that happen.

MS. WILLIAMS: I can appreciate that, but I am telling you there seems to be a lack of communication between the regional Corp of Engineers, the State and the Federal. When we would confront the Corp of Engineers about their activities and what they were doing, they were saying, "Well, the EPA is my boss, and I have to do everything that EPA tells me to do."

When we would call EPA to talk about what was happening in the area, what we received from them was, "We hire the Corp of Engineers, and all decisions are left up to them." So the buck kept being passed from one person to the other, and we never got a clear answer.

Since you are committing yourself to do this thing right, as that lady said, maybe you need to provide a contract and say, "This is what we're going to do," and live up to it. Because, as I said earlier, there is a lack of communication somewhere. And we -- this was the first time for us, and we just got ripped.

That's exactly what happened. We got ripped. And if they are going to use that area for an industrial area and build a complex; they had the mind to use the Rosewood Terrace area and do the same thing, and it was commercial property. I think those people should have been compensated fairly.

I mean, that Uniform Relocation Act is old. I don't know whether it has been updated since the 80s or whatever, but that's what was used to relocate people even though they ignored -- ignored the value, the property value that was here in this area.

You know, I mean, the people that were relocated were relocated in homes at the rate of $35 to $40 a square foot, you know. And you know that wasn't right.

And some of them were just forced to live -- move rather, in certain areas that weren't too much better than where they left. And even that old act states that you are not supposed to be made worse off than you were where you were relocated.

You were supposed to have equal to or better than. The money was there for that. I don't know whether it's there now or not since elected officials have decided that the polluters don't even need to pay that tax money; it's not going into the Superfund site like it used to go into, and I think we need to bind, join our forces together to make sure that polluters pay for what they do and not leave it up to the community and the taxpayers to pay for what you have done in a particular community.

Whatever happens here, it happens throughout the United States of America. The polluters get off and the community pays. Whenever they come into a community, they ought to be forced to give you that method of how they are going to eliminate their waste so it won't be hazardous to the health of people in this area.

You know, just saying we are going to put a cap on it isn't enough. We're talking about chemicals in here that are dangerous to our people here in this area. We're talking about Escambia County, where out of 3300 -- 3350 communities throughout the United States of America, we rank "Number 19."

Now, I think it's Number 11. Are we clamoring for Number 1 position as the most polluted county? I hope not.

Toxic relief inventory here; our rating is the highest group. Our cancer death outranks the national average and the State average in Escambia County.

Recently, when we had a health study, and our people that were studied and looked at, the results and the diseases like diabetes in Escambia; the State percentage was 21 percent; nationwide was 7.2; Florida, 8.5. Hypertension; the percentage, 58.4; nationwide, it's 33; Florida, it's 26.

Hepatitis -- I mean, and we just outrank people everywhere with diseases and things. We can buy bottled water. We are trying to save the soil. But we have no control over the air we have to breathe, so we're asking for a clean up.

That's all we're asking for, you know, and before you make a final decision about how you are going to clean up this place, ask yourself a question: "Is it clean enough for me to live in? Is it clean enough for my grandchildren?"

Because dioxin is one that will stay in your system for years. And the children who play in this area, their children are the ones who are going to be suffering. And what does dioxin do? It break down your immune system; your endocrine system. It affects your reproductive system.

I mean, you will problems from now on with birth defects, young girls not being able to bear children because of being exposed to chemicals; children with behavior problems; learning disabilities.

Is this the type of legacy we want to leave our children? I hope not. I hope not. We may not make it to Number 1, but I do hope we will stay at a standstill and try to clean up this area.

And Pensacola is a beautiful place, a beautiful place. But I imagine if the visitors knew exactly how contaminated it is in this area, they would refrain from coming here. And those who are living here, once they find out how contaminated it is, they might want to leave.

So we can do something about it. We don't want that soil placed in an area where it can leach through and the contaminants go into the ground water. I don't know whether there will be any circles or not or whatever, but that clean up that was placed at Agrico, what happened? It escaped. Both went together and went on into the bayou, and people, all people southeast of that plant have been affected by it.

So think carefully before you make a decision that is going to ruin people's lives for a long long time. You don't live here, so it may not affect you, I am sure. But I'll bet if you lived anywhere near a contaminated site, you yourself would want to make sure that the cheapest way is not always the best way; that a person's life is more valuable than the dollars that you save, and do something to help people in this area.

MR. JONES: First of all, my name is Sammy Jones, and I am a living witness that the thing you are about to do is a mistake. You made it twice. A whole community is dead. My wife died nine or ten months ago.

Once you get it in your system -- and it's in mine -- she was not sick. She walked around the neighborhood, got sick, and now, she ain't going to wake up. Now, this proposed cover up that you done in Escambia County -- by the way, I was out there for 40 years.

And I think God must have kept me here because I am concerned about the peoples here. You don't see those blacks that were relocated; you don't see them here. You see those over there from Clarinda Lane which were not moved. All of them are dead. There's a few alive.

It's in my system. And I guess God is

keeping me here to tell you, "Don't put money above life, because it won't do you no good." If it costs you money to clean that water out of there -- clean up that water in the soil, so be it.

I fought World War II. My next birthday is a couple months from now, and I will be 80 years old, but God is keeping me here to tell you something. Let's come together and do the right thing. Let's do no less and clean that thing up the very best that technology can allow you to do it.

Because all of these contaminants is going to cost you, you and you, because it's death, and death is all right. It's coming to us. But you just stay dead too long.

MS. SPENCER: Any other questions from Clarinda Triangle before we move on? Okay.

MS. STARLING: Hi. My name is Sherry Starling. (phonetic) I have actually worked as an environmental professional. I have been in the field of health and safety for over 20 years.

I have worked as a hazardous waste compliance inspector in California. I have worked as an air conditioner inspector in California. I worked in Florida for DEP many years ago, and I saw some things go on when I worked there that were kind of interesting. I saw some things here that kind of trigger my concern.

I am concerned -- just comparing what is going on here, I am not that familiar with what you are doing, but I kind of want to get a feel for this. I think what you are doing comes under what is called a "Brown field." Is that what this is called? Creating a brown field, essentially?

It's using the land for a different use, designating it for a different use; right?

MR. KEEFER: This clean up we're proposing is not part of EPA's brown fields program. I believe it's a State brown field.

MS. ZOKOVITCH: It's both. Both with the State and Federal program.

MR. HARRIS: It's also with the Florida DEP.

MS. STARLING: This is about the brown fields pilot program?

MR. HARRIS: With EPA, it is a pilot program.

MS. ZOKOVITCH: It is a State program.

MR. HARRIS: The clean up itself is not associated with the brown fields program. The brown fields program is different in that it's been working with the City and the County to have this property converted into a brown fields program.

They are really two separate issues that kind of merge into each other, but I am not really sure.

MS. STARLING: I just want to know if it was. It sounds similar to what I understand the brown fields are. Basically, you are converting property from, you know, since they can't clean it all up, they say, then, they use it for some other use that is not going to allow people to live there, essentially.

Okay. Let's go on. Just to begin with, okay, the contamination there, is that actually a RCRA hazardous waste? That doesn't meet the criteria to be RCRA hazardous waste? The contaminated soil; is that a RCRA hazardous waste?

MR. KEEFER: Yes.

MS. STARLING: It is? Okay. I have taught RCRA classes for ten years, and I always thought that a RCRA hazardous waste had to go to an approved treatment facility.

MR. KEEFER: That is managed under a CAMEN (phonetic) rule.

MS. STARLING: Is that an approved treatment facility you are creating over there, a RCRA treatment facility?

MR. KEEFER: I can bring an attorney if you are going to -- I can't answer all of the legal questions.

MS. STARLING: Well, no. but is it not a RCRA hazardous waste?

MR. KEEFER: It's not a RCRA facility up there, no.

MS. STARLING: Okay. So from my understanding from teaching these RCRA classes for ten years is that RCRA hazardous waste has to go to a RCRA approved treatment storage for permanent treatment or disposal facility for disposal.

I don't think that site is one of those. So I am wondering why is this being allowed in lieu of disposal to an approved treatment storage disposal facility?

MR. HARRIS: This is a CERCLA action that is not associated with RCRA.

MS. STARLING: But it is a RCRA hazardous waste; right? It meets the criteria to be a RCRA hazardous waste?

MR. HARRIS: It falls under separate category under the EPA Superfund's site, being dealt with as a Superfund site.

MS. STARLING: Okay. But if it was any -- if it was a typical industry, and it was a contaminated area, and you had the RCRA, it would be disposed of as

RCRA hazardous waste in an approved treatment storage disposal facility; right?

MR. KEEFER: It would look very much like this.

AUDIENCE MEMBER: Excuse me, if we could have the people speaking to go to the mikes and the other people that are answering can use the hand mike so we can all hear what is being said?

MS. STARLING: Okay. So we determine whether it's regulated under CERCLA or whatever it is. It originally was a RCRA hazardous waste that was illegally disposed of, right, into the ground?

And now, they're proposing, instead of cleaning it up as it should be, since it meets the criteria for being RCRA hazardous waste, they are proposing just leaving it there and capping it instead of disposing of it at a permitted RCRA treatment site.

That's just from teaching the classes. I always told people that they had to dispose of their waste properly, but maybe I have been teaching them the wrong stuff.

Another question; is the capping that you propose; is that the least expensive option that you can do? Of all of the options I saw you put that chart up; was that the least expensive?

MR. KEEFER: It's the lowest cost alternative.

MS. STARLING: That's what I thought. Okay. Is capping generally the choice for comparable sites versus other options?

Let's take all of the Superfund sites we have that we have addressed, and I guess this one has been here ten years already and hasn't been addressed yet. But is that generally what you are doing with all of these Superfund sites? Are they just being capped? I mean, like, what percentage are being capped versus what percentage are being handled another way?

MR. CHAFFINS: This is consistent with other Superfund sites. I don't have percentages for you, but, yes, it is consistent.

MS. STARLING: It is consistent. But, I mean, capping occurs how often versus some of the other options like cleaning it all up and disposing of it properly in a RCRA permitted treatment facility?

MR. CHAFFINS: I don't have those statistics for you, but I am saying they are consistent with what we do at Superfund sites.

MS. STARLING: Okay. Is there any way we can find out what the statistics are? And what percentage is capped, and what percentage is this, you know, for comparable sites? Is there data like that that we can look at?

MR. CHAFFINS: I think we can, as I mentioned before, the response of this summary is designed to address your questions that we can't answer here tonight. We will go back and find out what that is and that will be in response to the summary.

MS. STARLING: Okay. Just, for example, in California; you know, I don't know if you people have dealt with California, but how often is capping allowed in California versus some of these other options for a similar type of site like this?

MR. CHAFFINS: When we proposed this remedy in Region IV, we have what is called a "National Remedy Review Board," for EPA. This is a headquarters ran organization.

We bring in people from all ten regions of the EPA. Those are all over the country. And this remedy went before those ten regions; these represent everyone across the country in EPA.

And one of the purposes of that is to make sure it is consistent with how they handle things in their states. So that process is something that we have already gone through and, therefore, I am comfortable, you know, in having gone through the process that it is consistent with how they would handle the site -- or similar.

MR. KEEFER: So, in California, it would probably be capped the same way as it would be here; is that right? We're not getting special treatment or anything? Or less than special treatment? So that would be typical across the country, not just in our area?

MR. CHAFFINS: Yes.

MS. STARLING: Okay. Monitoring; if a leak -- well, first of all, what is the thickness of that liner that you are going to line this whole pseudo-landfill with? How thick is it?

MR. KEEFER: We're designed around 60 mil. We're going to redesign the geomembrane for durability.

(AUDIENCE SAYS THAT THEY CAN'T HEAR SPEAKER.)

MR. KEEFER: The basis for the design is a 60 mil geomembrane. The remedial design phase is to be the exact manufacturer's specifications for that geomembrane, so I can't answer specifically what geomembrane is going to be used and the size.

MS. STARLING: Okay. Well, the last question, though, from monitoring; if a leak was detected, how, you know, with your monitoring, if you detected a leak, how quickly would you know it had happened? And how quickly would it be corrected before it gets to the ground water, which is only eight feet below that?

MR. KEEFER: The way the monitoring network would work is if there were to be a leaching generation within the soil waste --

MS. STARLING: Uh-huh.

MR. KEEFER: -- because of the cap failure --

MS. STARLING: Right.

MR. KEEFER: Okay? It would deflect with the sun, it would not be moving down to the ground water. And we would notice this later. We would know we had a problem with the cap, okay? So we could remove the leaching and rectify the problem with the cap before it reaches the ground water. Thank you.

AUDIENCE MEMBER: Can you say that again how you know if there was a problem? I missed some. How would you know there was a problem?

MR. CHAFFIN: With the monitoring?

AUDIENCE MEMBER: Yes, please. How would you know? I just couldn't hear.

MR. KEEFER: The monitoring will be through a series of observation points that will be over a low point in the contour of the bottom of the containment system. And that would allow, if the liquids were to enter the containment system, which the whole design is based on preventing, but in the event of a failure, then they would collect in this low area and through these monitor points we would be able to observe that liquids exist in the landfill or in the containment system.

And then, we could remove those liquids; okay, and that would be part of it. Then, we would also know we had a problem with the containment, and we would take action to repair it. Presumably, it would mean that the cap was not functioning properly in some portion.

MS. STARLING: Or the liner had ruptured or something like that -- the liner ruptured, so how would you contain that?

MR. KEEFER: The containment is above the water table, so there wouldn't be, you know, a rupture issue. You are talking about ground water coming into --

MR. SUDWEEKS: It's over the land; correct? It's actually almost like it would collect fluid. It's confusing about this thing, how they are thinking about building this. And the way it's being described -- I am a toxicologist, not an engineer. I had some questions, too, about how this was going to be designed.

And the whole point is to see if there is any liquid actually getting into this system before it even gets to the liner. And so, the point is not to find out, "Oh, my God, we have got a hole in the liner," before we even do anything about it.

The point is that this is something -- the way they built this -- the fluid, even if it gets into this cap, this cap, they will know and can fix the cap so no more liquid can get in and can be removed.

And so, the point is to solve the problem, identify the problem, before it could even possibly get through the liner.

There are redundant fail safe over engineering methods that are going to be applied here, so there are different ways of back up systems.

We call them, "Back up systems, pump backup systems," that are designed to prevent any kind of material getting into the ground water. That's how I understand it as a sort of a non-technical engineering point.

MS. SPENCER: Excuse me for a second. If there is anybody that's driving a red Jeep, would you please move your car so this gentleman can get out, please?

MS. BENNETT: Actually, I have quite a number of questions. However, on topic, I don't understand if you are putting in one layer of plastic how that makes multiple backups. But I am also wondering, has anybody looked at the effect of these chemicals on the plastic?

MR. KEEFER: Our engineers did. During the feasibility studies, the engineers looked at both the chemicals and the concentrations that exist within the stockpile; that would be where the highest concentrations are, and it's not incompatible with the liner materials.

MS. BENNETT: Okay. The second thing is making the assumption that with your landscaping, that you have grass in lieu of cement, making the assumption that some water gets into your contaminated soil, and this water goes down to your low point in your plastic liner, and you are going to pull this out with your monitoring system. How do you know that your plastic liner has not got a hole in it, also?

MR. SUDWEEKS: We will also monitor ground water.

MS. BENNETT: From where? Will you have to have holes all through your site or what?

MR. SUDWEEKS: They would be outside the area.

MS. BENNETT: So you would be outside the area. So if this stuff comes out and goes straight down, your monitors won't pick it up; is that correct?

MR. KEEFER: I believe that you can construct a scenario where you can think that may happen; we don't think that's a credible possibility.

MS. BENNETT: In our sand and gravel aquifer, please explain to me why it is not possible or probable that the water would go straight down?

MR. KEEFER: We don't think that you would have a combination of a cap failure, a liner failure, and heat detection or a monitor failure simultaneously. That's three extremely improbable things that have to happen altogether.

Monitoring the ground water; the ground water in the sand and gravel aquifer, as you know, moves. Okay? It's an aquifer. If the water were to become contaminated, this is speaking after the ground water remedy is in place, it would move out from under the cap, and we would be able to defect contamination, new contamination, was entering the aquifer.

MS. BENNETT: Then you would be having it completely surrounded?

MR. SUDWEEKS: Upgrading and downgrading, yes, ma'am.

MS. ZOKOVITCH: Can I say something, since ground water contamination already exists?

MR. KEEFER: We're going to address that, too. That's why I predicated that statement. We're confident that the system that we're proposing to build has redundant safeguards built into it.

But the ground water monitoring would be included after the ground water clean up is completed.

MS. BENNETT: Okay. Well, I am not sure I understand what all of your fail safes are if you are talking about the one plastic liner.

The other thing I wanted to ask you, please, is that if you have a number of these similar remedies that you have done elsewhere, how old are they? What is your duration of experience with these things?

MR. KEEFER: As Mr. Chaffin indicated, you know, we will go back and collect information to answer those kind of questions. I can't answer that off the cuff. But the agency has been building both through the RCRA program and talking about the CERCLA program containment systems based on geomembrane liner technology for over 20 years, so there is a great deal of experience.

MS. BENNETT: Okay. All right. Thank you. I do have more questions. If you don't mind, I will come back, please, on other topics?

MR. KEEFER: No, ma'am. That's what we're here for.

DR. ROWE: My name is Dr. Patrick Rowe. I live in East Hill in Pensacola, and there are a number of things that concern me.

First, just the arrogance of engineers is mind-boggling sometime. When you are telling me of this plan, basically, to put this terrible material in a plastic bag, it's scares me to death.

What comes to mind is Three Mile Island, where the engineers, I am sure, guaranteed redundancy. "Everything's fine." Space shuttles blowing up; what kind of guarantees were given them?

I mean to think that this crazy scheme is foolproof is insane. You are already saying, "We can't put too much pressure on this or we're going to have problems." That, by itself, is a major concern.

"We can't develop it that much." You develop this area; you have problems; how are you going to get down to it? Are you going to dig up all of these buildings and try to find where the problem is? I think this has to do more than anything with saving money, saving money.

You don't want to pay the money to do the real clean up, and the developers are waiting to get in there and develop the property. It's money.

Spend the money. Do the right thing. This scheme is wrong. We should do either plan four -- we should do both plan four and plan six. It's more expensive. It's the right thing. It will give us a long-term solution not a short-term solution.

I mean, don't give us these guarantees. History teaches us that these things oftentimes do not work. They might work for our lifetime, but not for our children, not for the future generations. Spend the money. Do the right thing. Both plan four and plan six.

Also, the idea of separating the water problem from this problem is wrong. They are connected. You have to think that this is going to impact the water as well.

Last thing I want to say is I don't live in this area. I am over in East Hill, but I certainly support my fellow citizens that they should be compensated fairly for the problem. I don't know if they can be compensated fairly for the way their lives have been disrupted.

Do the right thing. Do the right thing. Pay the price or our children are going to pay the price down the road. That's what is going to happen. Thank you.

MR. CHAFFINS: I would like to address the characterization of this remedy as a plastic bag. And I would like to make a point for you -- that you did not hear that from me. That is a total mischaracterization of what we're doing here, and I think it's intended to mislead people, and I don't appreciate it.

DR. ROWE: Well, that's your opinion.

MR. CHAFFINS: Well, I'm telling you the facts.

DR. ROWE: You are telling us your opinion.

MR. CHAFFINS: I am telling you the facts of what this remedy is.

DR. ROWE: If you think this is error free, you are arrogant beyond belief.

MR. STAPLES: The New Orleans engineers said that the levee would hold.

MS. SPENCER: Excuse me, please, let this gentleman speak who has not had an opportunity to speak. Thank you.

MR. BOLLING: Good evening. I am Eric Bolling. I am a civil engineer, and I resent the fact that you told this man that he was a liar and that the plastic bag theory was debunked.

You don't need to offend anybody for their opinion. That's not your job. Your job is to come here tonight and to lay out your plan of action and to allow us to comment and to see where we stand as citizens and residents of this county and this city.

So don't hold it on your shoulders. It's not for your shoulders. Your shoulders are not big enough.

First of all, when you consider the geography of Escambia County, the soil levels, and the geography of the soil, you have a big problem because this is not like the rest of the country. It's not a clay base;

it's a sand base. And it's permeable. Things go right straight through it.

Hard pan is less than 45 feet. And when you go and put a cap on top of something in a tropical zone or a subtropical zone, you get thermal energy created within the plastic liner, which creates more what? Moisture.

When the moisture becomes too heavy, what does it cause the liner to do? It causes it to sag. When it sags under moving water, which is our aquifer, it what? It creates friction, another thermal energy.

Now, what do you have when you have two frictions meeting together? A whole lot of kinetic energy; right? Don't come here and assume that everyone who sits out in this audience doesn't know what science is.

There's plenty of engineers. There's plenty of chemists. There's plenty of doctors out here. We're not just a community of people you can just come and push over. We proved that one time before. How long does it take before you get it? Don't insult our people.

I sat back there as long as I could, but I thought you were really here to do a job, your job, what you were really assigned to do; what you signed on your evaluation that you would do, to come and serve and protect. Because that's what you are; you are a servant of the people. Be that.

Now, all of this stuff you are talking about capping; we're not satisfied with the capping. Go back, rethink this thing because, apparently, somebody hasn't.

Once I render this, you can say anything you want, but, at this moment, I want to make it clear that when you are going to do the science on remediation for this site that you take into consideration all of the things that come into play.

The highest and best use of the land has already been determined by somebody, because we determined that it's now becoming an industrial park. Well, if the highest and best use has already been determined to be an industrial park, the highest and best use prices needed to have been paid to the people who lived there before. And that's already established.

The City Council claimed that they wanted Clarinda Lane Triangle because they had a highest and best use of it to be part of their Gateway Community, which means that you couldn't give them less than commercial value for their property.

So, please, go back and do your homework because it's apparent that you came up here this afternoon, and you haven't got your ducks in order, and you are not prepared for this audience.

Go back to Region 3. Let them know that you haven't done your homework, and you need to study a little bit more and come back with something satisfactory.

You have wasted our time. This is something -- we could have done other things this evening with our family members rather than be here and being subjected to you getting upset.

Try living in our shoes. We have been here for 12 or 13 years breathing this mess, living on this mess, dying under this mess, and you haven't done anything yet.

And yet, when you come up with the very solution to solving the problem, you get upset because we are not agreeing with it. That's not professional.

Now, if it takes us to write into your boss personally name by name, man by man, and to tell him that you were not professional here, we'll do that, but we would rather work with you knowing that you are going to be truthful enough, man enough, to go back and tell them that we're not satisfied, and we need a remedy that will solve the problem. Thank you.

MS. WILLIAMS: I wanted to know if you can identify any site that you have cleaned up using this method and how successful was that method at that particular site. Can you identify any? We would like to know where they are.

And while I have the mike, I am going to ask one more thing. The comment period, we are in the middle of it right now, and there's only about two more weeks left. We don't have our TAG advisor yet.

And I wanted to know can you extend that comment period at least 30 days? And that will give us time to get with our TAG advisor and see if she can comment also on Operational Unit One.

MR. CHAFFINS: We are going to take your comments back to our office and think about it. I need to check with the folks who administer that TAG grant. They are not here tonight, so I need to get back and talk to them first, and we will get back to you.

As you heard earlier that we have already -- we have already talked about extending this for one week right now based on your comments and discussion with the City and the County. So we have already agreed to that, so I'm going to go back and find out the specifics of the TAG grant and find out what the status of that is, and we will get back to you on that.

MS. BARBER: My name is Kathy Barber. I am representing the League of Women Voters, Pensacola Bay area. The League of Women Voters has consistently supported a complete and permanent clean up of the Escambia Treating Site to the highest levels.

We believe that Government action should provide for the long-term sustainability of the community by meeting the needs of the present without endangering the ability of future generations to meet their own needs.

The League of Women Voters finds the current remediation plan unacceptable. The EPA's preferred plan of capping and containment, alternative number two, does not provide for a complete clean up or a permanent clean up. Therefore, it does not, in any way, address the long-term sustainability of our community or the needs of our future generations. Thank you.

MS. SPENCER: Okay. How many more people have a comment? Okay. If all of you would like to make a comment tonight, we're going to have to continue to limit the minutes so that we can get everybody in.

Time is of the essence, actually. So if everyone who would like to make a comment, if you could come stand right here so we can do a cutoff, if at all possible, and limit your comments to two minutes so everybody can get in. You can come first.

MS. DEAN: My name is Addy Dean, and my husband and I and family live -- didn't live on Clarinda Lane, but I think that we were sort of in the neighborhood off of it because Clarinda Lane is east of Pace Boulevard, and Clay Street where we lived for 20 years is just north of Pace Boulevard, and I feel that that soil over there should be tested because there are so many people over there that have died.

Some of them have sickness right now, and before -- after we moved, my daughter and her family live there, and her children has allergies, and I had a severe sinus problem when we were living there. That's why we moved. And I still have it. I am taking medication.

My husband has a breathing problem, and he has to sleep under a humidifier, and I am wondering if that soil can be tested. It's right -- it's just north of Pace Boulevard -- I mean, just west. Clarinda Lane is just east.

MR. CHAFFINS: We are planning to do some additional testing in the areas around the Clarinda Lane Triangle and the roads that make that up with the intent that if the problem is more widespread that it can be included in the scope of this remedy.

So sampling will be done and the current plan will be done during the remedial design phase. I think that's what -- I think you have heard it referred to as cutline sampling in the past. So that we get additional sampling in that area.

And if you could get with L'Tonya and let us know the address of the property you are talking about. I am not sure exactly where you are, but we're going to address that concern.

MS. DEAN: Okay. Like I said, it's just across Pace Boulevard. It's next to -- well, in fact, it's across west and east, and we live west.

AUDIENCE MEMBER: Excuse me, this is not working having all of us stand here like this.

MS. SPENCER; Well, the reason I was doing this is I was asking everybody to have two minutes and because everybody was scattered out, it is hard for me to have a cutoff with knowing who is in line.

AUDIENCE MEMBER: Do we have a time limit? Do you have a bus to catch?

MS. SPENCER: No. We don't have a bus to catch, but it is late, and I do realize that some of these people, like the gentleman stated earlier, have other things to do, but we want the opportunity to hear --

AUDIENCE MEMBER: Well, we can still sit down. This is not working. We can't hear.

MS. SPENCER: Okay. If you want to have a seat, that's fine, but I have to have some point of cut-off. It's not fair to stay here until midnight.

If you would like to have a seat; that's fine. But I still need to have a point of cutoff.

MS. ROWAN: Hi. My name is Robin Rowan,

and my daughter went to Brown Barge Middle School, which is across the street from the Agrico Superfund site and 3000 feet from Escambia Treating.

Everybody here knows that our city and our county is badly polluted. We know that toxic plumes of chemicals are seeping through the ground water to our bayous, bays, and even into our drinking water.

We have 160 sites in Escambia County contaminated with dry cleaning chemicals and more sites than that containing chemicals from leaking underground gas tanks. The soil near our railroad tracks is drenched with arsenic used as a weedkiller in a bygone era.

Many of our schools expose our children to toxic chemicals from nearby industrial sites, busy highways, and toxins left behind in the soil from bankrupt industries.

Escambia County releases more toxins into the ground, water, and air than 19 other states combined, including New Jersey. So, yes, we know we have an almost insurmountable problem here.

But we have to make a start and, today, that's what we're trying to do. To have the EPA propose the least expensive and least protective plan possible is unacceptable to the residents of the city and the county.

Because Pensacola is already so polluted, it's easy for you to propose this plan and be done with Mt. Dioxin and Pensacola.

You would be correct to assume that most residents don't know what is going on and probably don't care because they are down at the outdoor concert tonight. But there are those of us who want to stay, and we want to see a clean up.

We have deep roots here. We don't want to leave. So we're asking the Environmental Protection Agency to do its job of protecting human health and the environment by helping us clean up Mt. Dioxin and contaminants in the surrounding area to the highest standards possible with the most sophisticated technology available.

We're asking you, pleading with you, to begin the clean up of our town by starting in the heart of it. And, yes, it is costly, but it is the right thing to do.

Please, EPA, do the right thing in Pensacola. Thank you.

MR. TURNER: My name is Hugh Ed Turner. I live up 9th Avenue by PJC. My main interest in this is that I drink the local water, and I am concerned about that. I can remember -- I have lived here over twenty years -- I can remember when several of the well-pumping sites in town received large filter tanks that were used to filter the dry cleaning fluids that had percolated down through the water table.

And so, I am concerned that your geomembrane liner has got potential flaws in it, that -- I'd like to know where it's been used in very similar situations, both geologically and temporally. And I would like to know how it's going to be used for 1000 years. I think that was the figure on the slide. 1000 years is a long time for a piece of plastic. Thank you.

MS. BENNETT: Ann Bennett. And I have a number of questions. First, I would like to tell you that my neighbor was a geologist working on one of the Superfund clean up sites. And he told me something that I found very difficult to believe. I personally called both the DEP and the EPA. Both of them verified to me personally that Pensacola area has been home to 13 of the nation's top 20 Superfund clean up sites.

Guess what, folks? We have got a lot of contamination, and we need to be looking at what is left in terms of low level exposure over a long period even if you clean up all of these things. And my concern is that if we accept the lowest level of clean up on this site, what precedent is that going to set for the American Treating Creosote place down at Barrancas and M -- no, L -- I think it is L; Barrancas and L -- and any of the other 13 sites?

Can you tell me what that will do to the precedent?

MR. CHAFFINS: We handle each site separately. I mean, each site has different conditions and just because we select it here doesn't mean it is going to be appropriate for there.

MS. BENNETT: Well, so far, that's all they are proposing for there.

AUDIENCE MEMBER: The first creosote site was the Barrancas site.

MR. SUDWEEKS: Part of the process when we do the risk assessment -- part of the process is a requirement that you consider cumulative risks. It's not just risk in total.

There is also a concern about mixtures, combination of effects, combination of sorts of exposure; that is partially why some of the clean up values are so low and so protective.

In the case of the remedy that we're proposing, there will be no exposure. There is no contact with the material. It's underneath the cap. There can be no health effect if there can be no exposure contamination within the containment unit. Okay?

Did that answer your question?

MS. BENNETT: Well, I understand what you are saying. I am not sure I have a 1000 percent agreement with it, particularly in view of the fact that I think quite a number of us here are concerned about the plastic liner.

My understanding is that this is not even actually a plastic bag. This is half a bag. This is like a bowl, a bowl that could conceivably have leaks. I am not sure that I have confidence that your monitoring system would pick up any leaks that might exist in your plastic.

MR. SUDWEEKS: It sounds like what might be helpful, perhaps, to the community would be a better description or more discussion about how this thing might be constructed. Because it sounds like a lot of concern, and that might be due in part, perhaps, to our failure to more clearly communicate how this might be constructed and how it has been applied in other places with success.

I think we are obligated and owe it to your community to make sure that that's clearly indicated. That's part of the purpose of this meeting, and I think what is of real value here is we're seeing where we might be deficient in our communications with the community.

MS. BENNETT: Yes.

MR. SUDWEEKS: And I want to thank you for being candid and honest about this and asking questions.

MS. BENNETT: And may I point out here, please, that what you are telling us is that you don't really know what this thickness is going to be.

"Well, it depends on the design phase." Well, that's kind of like asking us to accept the pig in a poke. I don't know if you are familiar with that terminology.

MR. SUDWEEKS: I am familiar.

MS. SPENCER: How many more questions do you have?

MS. BENNETT: I have a couple if that is okay.

MS. SPENCER: We have got some other people.

MS. BENNETT: Oh, I'm sure there are. I'm would like to ask is there some reason that we have to leave? Is there not some reason that everyone here can't find out what they need?

MS. SPENCER: It is not a question of rushing you. It's a question of making sure everyone has the opportunity to speak.

MS. BENNETT: Okay.

MS. SPENCER: And people are leaving, so we want to be able to hear what everyone is saying.

MS. BENNETT: All right. I do have some more questions. I will go back to the end of the line again.

Thank you.

AUDIENCE MEMBER: I didn't hear the answer to the other questions.

MS. SPENCER: My answer was it's not a matter of rushing anyone to do anything.

It's just that when people are leaving, everyone is not having the opportunity to hear what everyone else is asking or what everyone else is saying. So when we have another meeting, we will get these same questions again.

So I try to have everyone the opportunity to speak while the majority of the people are still here. That's what this comment was.

MR. REFERMAT: Thank you. Good evening. My name is James Refermat. I am a senior environmental scientist. I have got over 26 years in analytical and environmental chemistry so I am somewhat familiar with dioxin, bioaccumulation, baseline risk assessment, et cetera.

My first question is what obligation does EPA have here? I mean, if you don't like all of the comments, can EPA just simply take their money and go someplace else? Is there an obligation?

MR. KEEFER: We are committed to the clean up of this site.

MR. REFERMAT: Okay. My second question is how did EPA arrive at the dollar figure for this? I am working on several sites, one in Arizona that is $400 million, seven miles outside of town, and it's -- I am familiar, basically, with the proposed remedy.

It appears to be a Subtitle RCRA type containment cell, which we have designed many of. However, the location doesn't seem to be the best in the community's interest.

And, certainly, you know, one of my concerns is that the comments will impede the clean up process. That needs to happen. I am glad EPA is here. We need this to happen because it's a real problem.

My other question was what is -- has EPA or FDEP considering giving the Clarinda Triangle people legal representation in order to insure their needs are met in terms of real estate value?

And, then, basically, my last comment is -- ah, geez, I just lost my train of thought. I guess my biggest concern is that this just seems to be the wrong location for a RCRA type containment cell.

I am very familiar with the various types of geomembrane. We've used them all over the country. They are an applicable remedy, and they are chemically inert, but it just seems to be the wrong place, being that we are in a tropical zone, as the gentleman back here mentioned.

We do have the heat. We do have the tornadic. We have hurricanes episodes. Hopefully, no more, but those are real possibilities, and then, of course, there is the whole issue of future land use. Thank you.

MS. PETERSON: Hi. My name is Kate Peterson, and I actually live in Santa Rosa County in Gulf Breeze City. And the reason I am here tonight is I feel like the decisions made here affect every resident in every county that's anywhere near us, here, particularly, and everywhere around us.

I would like to address three things, and the first and foremost is the relocation for the residents of Clarinda Triangle. High levels of contaminants have spread into their yards on the west side of Palafox opposite the site making it incredibly unsafe for them to live there.

The method of soil clean up is the second thing. Capping does not work due to the soil being immersed into the upper portion of the drinking aquifer. Leaking from plastic bags, which I realize is not really -- that's the reality of what we believe it is.

Although it may be a different containment system, it feels that way to the residents here and being compromised from day one and a 30-year life expectancy. Also, the end result of that is no access for the repairs to the tanks in the future, if there is a problem.

What would work -- and there are three items, the first three steps; I should say. The first is detoxify the organics using bioremediation or chemical oxidation, stabilize the organics using solidification, and bury the detoxified waste onto the site on top of a plastic liner.

The third item that I wanted to address is the level of dioxin clean up. The EPA should choose the most protective standard for this site -- Environmental Protection Agency.

The residential standard of two to seven parts per trillion of dioxin is endorsed by a number of the citizen's groups in this area and also myself and my family. And I think you just have to look at these children to understand what is really important.

There's no cost on these children's lives, really. They are beautiful, and they need to be taken care of. Anyway, the end result is we really want you to do the right thing. It's really important. Thank you.

MS. GARY: Hi. My name is Denise Gary. I've lived here since third grade. I have five children.

They have gone to school here. I have had two that have gone to school at Brown Barge.

And as this meeting and other meetings have shown, it's a very charged issue that we're talking about here. And I realize that it's a complex issue when you have a mixture of contaminants on a site. But I really feel that it's unrealistic to have the containment that you're proposing because of the area that we live in.

First, it's just 50 feet, really less than 50 feet, above the sand and gravel aquifer where the majority of our drinking water comes from for a large portion of Escambia County. And due to the nature of our area, to say that things can change pretty quickly, and you don't know what the effect would be, it would really be risking the future of our water supply to have the contaminants in that containment system without being treated.

I feel that, clearly, a combination of clean up methods need to be employed, and there are dechlorinization methods that exist now that have been developed since 2000 that actually remove 99 plus percent of dioxin. Bioremediational aspects would clearly be a good thing to apply to this site.

The solidification of using clay materials on the inorganics would really be great, too. And I just want to encourage the EPA to reexamine the choice. I know it is a huge, huge problem, and I will say again, it's very complex, but we're talking about the future of a lot of people.

And I just had my first grandbaby born a couple of weeks ago, and I want you to know with what I have known -- and my daughter did a lot of outside activities at Brown Barge and everything -- it was not fun going through her pregnancy. And I really had to keep my lip buttoned because of what I know. And, currently, I am an environmental studies student at UWF.

So, please, reconsider your stand. I really believe that a solution can be arrived at that will meet the needs of the community and that will let EPA feel like they really have done a good job in the community that really needs your help. Thank you.

MS. TOLBERT: Good afternoon. My name is Alberta Tolbert, and I live in number two in the front of where you are talking about. My father died with cancer. My mother, she passed with a bad thyroid condition, and my brother, he just deceased last year, and he had a bad breathing problem. And my niece, she just passed with cancer. Just all of my peoples that lived on this street; they had passed with something.

And my sister and I and my companion; she has arthritis; she can't walk. I have it, and I have a nerve condition. And we just want to be relocated. And after we gone, then you can clean it up. But I would like that yesterday here, if it's possible. And I would just like to get away from this street where all of my people have passed.

It's a hurting and a bad feeling when I walk up and down the street where my peoples lived and they gone on from all of this toxic waste. I would like for you to please consider this for all of us because we need to get out of there. We are all dying.

Everybody on that street is dying of cancer, mostly, and it's time for us to leave, to go, please. Get us out of there. Pay us off. I would thank you.

MS. DUNHAM: Since 1995, CATE has been trying to get the soil tested in the Clarinda Triangle area, and we appreciate that EPA --

MS. SPENCER: Say your name.

MS. DUNHAM: Oh, I'm sorry. I am Frances Dunham. I am a long-term member of CATE. We have been trying to get the soil tested since 1995, and we appreciate that EPA along with the State has agreed to do that. Of course, what we found there was not good news.

And so, I want to reiterate what so many people have said. The residents in Clarinda Triangle need to be relocated permanently. I hope you won't fight with them over the values that you place on their homes. And I hope you will do this expeditiously so they are not there when the soil is being moved around in some way and be exposed again. Remember, most of the people that are there lived through that excavation in '91 and '92 and were exposed.

Now, as far as what is going to happen with the soil; EPA has proposed capping. To me, like to many people, this is a plastic bag. And into it goes soil that has in no way been detoxified or cleaned up in any way.

A clean up involves making something clean, and this is not what we're discussing here, I am sorry to say. The plastic liner will have imperfections. Where it has seams, there will be gaps. It's not a question of when it will leak. It will start leaking immediately. There's no doubt about it.

As a matter of fact, I was hearing earlier some discussions about a RCRA containment system. This is not a RCRA containment system. That was one of the alternatives that was considered and set aside. That's a way to make a landfill, but make it a little more secure than what you have here.

We wouldn't like that, but that would be better than what is being proposed with the capping. So I don't think those two things should be confused.

We want to see the soil detoxified, particularly the organics that can be treated with either chemical oxidation or bioremediation; then, solidification to contain the arsenic, which can't be removed in that manner, and, finally, a plastic liner under that when it goes on the site.

I have heard a surprising amount tonight, I think, about how it's going to look. I am not too concerned about how it is going to look. The question is how is it going to be? How protective is it going to be for everyone that lives in the community?

And especially for the people that live in the community that have already been exposed; remember that they will still be drinking the water. They will be eating the seafood. They may take the jobs that involves putting in the utilities under this new industrial park.

We don't want to see any additional pathways of exposure for anyone, especially people that are already exposed. The 30 parts per trillion industrial standard is just not adequate for dioxin. It's based only on the cancer risk. It doesn't take into account the immune system, reproductive, neurological, and brain damage potential.

We know that under the Superfund rules,

where there are multiple contaminants or multiple pathways of exposure, the Superfund rules urge EPA to use the most protective, that is the residential, 10 to the minus 6 standard.

And, finally, I want to remind you how many people there are that have endorsed a two to seven parts per trillion, not only Citizens Against Toxic Exposure has been working on this site for 13 years, but the Bayou Texar Foundation, the Pensacola Gulf Coast Keepers, the Gulf Coast Environmental Defense, the League of Voters of the Pensacola Bay area, the Bethel AME Church, Cedar Grove Baptist Church, Ebenezer Baptist, Morningstar Church, Mt. Lily Baptist Church, and the New Hope Missionary Baptist Church where we are here this evening.

I understand that EPA is tired of this site, and you would like to get out of here with a free pass to never come back again, and we would like you to be able to do that. And the only way to do that is a permanent clean up that makes the soil as clean as it can be. So please reconsider. Thank you.

MS. ZOKOVITCH: My name is Jeanne Zokovitch, and I am a staff attorney with WildLaw, which is a nonprofit public interest environmental law firm in Tallahassee. I have been advising CATE on environmental and health issues for more than five years. And they asked me to come here this evening to support them in their concerns with this proposed plan.

Because we have a limited amount of time, I want to put on the record that I do echo many of the concerns that people have given here tonight. And frequently during the comment period and the response period, comments are dismissed from the public because only one or two persons made those comments.

And I would encourage you to take the view that if one person said it, there's probably 50, 100, if not 1000 more people in this community that feel those comments are valid.

And so that you take every comment valid and recognize that in the shortness of time that that's probably part of the reason why people are not being redundant, although they have similar concerns.

I do think that you need to relocate the Clarinda Triangle residents as soon as possible. I think that that needs to be done in a better way than was done with the original residents of the site, and I also think that that actually opens the case as to, if mistakes are acknowledged, further compensation of the previously relocated residents.

And this is something that's been kind of tossed around and discussed on and off for quite some time for additional accommodations to put people in safe places that didn't end up in safe places. But no one has ever tackled it head on. So if you are going to take on another relocation, I would encourage you to include those issues of the prior relocation in with that as well.

With respect to the clean-up, unfortunately, I don't think your proposed plan constitutes a clean up at this point. As many people have dictated, this is just trying to limit the exposure to the contamination.

It's not actually cleaning up the contamination, and your own scientist explained it best himself when he said that one of the ways to prevent harm is to prevent exposure, and that doesn't have to be achieved through actually cleaning up the soil. That can be achieved through other ways.

This is part of a movement for about 10 or 15 years now to use risk-based corrective action, and, obviously, Superfund has had this for quite some time, and they finally convinced the State after the bill failed three years in a row that they should pass it, too. And that whole policy has fundamental problems.

You are approaching something by saying that, "While we could clean it up and assure that nobody will be ever exposed to it again, we're going to choose to put it in a little box and just hope that everything we put in place, make sure no people or at least not many people are exposed in the future."

If we have the technology; if we have the ability to treat the contamination now, we must do it now. Every time we make one of these decisions, we come back and scratch our heads and say, "What the hell were people thinking?" And we're going to be in that situation if we do this with this site.

Those clean up ideas, too, are largely reliant on institutional and engineering controls. And they have been used mostly in the Superfund context but now are being used by states, including the State of Florida, on top of the great water qualities standards that we used to have in the State of Florida.

And they were relying on these institutional and engineering controls, although time and time again, institutional and engineering controls have proven faulty, even here in the community.

Natural attenuation was used at the Agrico site, and everybody said, "Don't worry. We put slurry walls in. Slurry walls will keep the ground water from moving."

We all know it didn't work. Not only did it not work in the long term, it didn't even work in the short term. So you have to forgive people if they feel like these engineering controls are not necessarily going to pass muster, but we have seen that time and time again.

In 2000/2001, the Environmental Law Institute did a report on institutional and engineering controls and using EPA's own documentation of a review of Superfund sites, they found by and large extensive amounts of problems with engineering and institutional controls.

Failure of engineering controls and then mass chaos in the way that institutional controls were managed -- you have talked about institutional controls in this instance. You say future property owners or users are going to know that there's a problem with the site, and they can't do X, Y, Z.

But even in the limited time that institutional and engineering controls have been used in the Superfund context, that report dictated that there were people drilling on sites that were supposed to have well restrictions. There were people that were using the property for uses which were not supposed to be acceptable.

So unless you can assure that those institutional and engineering controls are not going to fail, you are not giving a method that it is really not going to prevent exposure in this community.

The other thing that that all kind of brings up is that we have never heard that EPA has accepted DEP's

Global RBCA standards as ARARs. So I am assuming there is some agreement in place that you guys have changed your mind on that. I would like to see that issue addressed. And what standards DEP is relying on? Whether they were clean up pre-RBCA or if there were relying on RBCA standards at this point.

And the last thing I want to say is that I think that it's really critical that you really take to heart the public involvement in this process. What we have seen over the years as this site has been addressed is that different agency officials meet with different layers of government associated with the site without the inconclusion of the public. And that has built the mistrust that you hear in this room.

And while all of you three may not have been involved with this site from the get-go, you have to know that your predecessors created a lot of this mistrust, and that's because they came to town, and they met with the City or they met with the County or they met with the brown fields people. And they didn't even tell the community they were coming to town.

All of these meetings need to include everyone. When CATE has a meeting, they never exclude any party. They invite every level of government to come to every meeting. And I implore EPA that you do the same with

CATE, that you include them in every meeting that you are having because that's the only way that you are going to overcome the distrust that is in this community that has been earned by the elected officials and the agencies on this issue.

Also, with respect to that, I encourage you to turn over more documentation. We have both the State and the Federal public records access, but, frankly, people shouldn't have to resort to a lawyer writing them a letter to get these documents.

They need to have more access to everything, even the thought processes that went into these things, so it's only by taking that information that they can help you come up with better solutions. Thank you.

MS. PEARSOL: Hi, my name is Julia Pearsol, and I am a citizen of Pensacola, and I will not speak long, and I will not speak to science. I will not speak to engineering. I don't know those things.

I have listened to your plan, and I know there is still going to be something in there that I don't like, but that's fine. I am going to assume the science is fine. I am going to assume the engineering is fine, and I am going to consider human nature, and I am going to consider the future land use and just what was alluded to that.

Number one, you can't control the future. And, number two, it's not written in what is in this document that there really is a strong way of assuring that there wouldn't be a break in the liner by the future land use.

My husband works in construction. He has worked in the long-time maintenance of buildings. Have you ever been around when people start changing things, and when you have lost the history of what was where, and people start, all of a sudden, "Well, there was a parking lot there, but we need to put something else up."

And, suddenly, well, if you think you are going to remind people everyday, "This is hazardous. This is hazardous. This is hazardous." Which people are not going to want to come there and use it. Or, you know, people are going to get sloppy; somebody is going to forget. Someone is going to put in a sprinkler system.

18 inches down is not deep. It's real easy to put something in the side of a envelope; it's not a bag, it's an envelope. Whatever it is, that can be punctured. It's not metal. It's plastic.

That can be gone through by a very careless worker who doesn't have a clue. You know, he was hired at minimum wage. He was told to go do something. He didn't work here ten years ago. He didn't live in this community, and so, he digs. Well, you are not going to see anything in the top or the bottom, but you are going to have a problem.

I also am real concerned about the deed restrictions in the future. Then we're going to have State and local agencies who will be responsible for implementation and enforcement of these restrictions.

Now, you are going to tell me -- and it even goes down to say, "An appropriate ground water monitoring program will be designed for at least 30 years." So, after 30 years, we don't worry.

And then, it's very vague. Now, you may have something much more specific than this. But it says, "EPA would perform a statutory review not less than every five years after the remedy construction starts to insure the remedy remains protected." That makes me feel real safe.

You know, maybe there is something more in here that is not in your summary, but I am not at all convinced that there is one clear way to know who didn't monitor, how often were they supposed to monitor. How are we sure that nobody was going to go out there and puncture a hole in it inadvertently? I mean, I see how people work; I know what they do.

And so, you have to also consider that

factor. You are not going to be around, you know, and who are we going to point at? Well, the City should have been doing it. Well, the State should have been doing it. Well, EPA should have." It doesn't make any difference. If my ground water is contaminated, my water is contaminated. I don't care whose fault it is. I want to drink it.

And I am just curious about one other thing. There is a sentence in here that says, "With the use of subsurface liners," blah, blah, blah, "Ground water aquifer contaminants' impact to the ground water aquifer can be eliminated."

I think you need to change that to say "Minimized." You are not eliminating. You can't eliminate the risk. You might minimize it. You know, it's like saying it doesn't exist. It does exist. Potential does exist. Again, I am not a scientist, but I do drink the water. Thank you.

MR. PETERSON: Thank you. My name is Allen Peterson, and I am here speaking as a board member of CATE, Citizens Against Toxic Exposure, a group whose concern for area residents has been well demonstrated for the past 13 years, and they have had to fight for every inch that they have made. They have had to fight for recognition, for relocation, and now, they are having to fight for detoxification.

I am here to speak against your proposal to cap. Capping is not a clean up. We know what clean up means. It means, "Clean it up."

This is another word for "Put it in the plastic bag and bury it." And you may take offense, it may be thicker; it may be a different color; you may call it "Geomembrane." Geomembrane sounds good, but it's a plastic bag. And that's not a clean up, and that's almost no better than doing nothing.

The citizens of Pensacola asked for and expected clean up and clean up to us must be protective of public health. To us, that means detoxify, solidify, and then bury the waste in a plastic liner. It seems to me that your proposal fails to meet your own feasibility goals of containment. Plastic liners leak. All of them leak.

And the contaminants that you would put in this will outlive the liner's life. I am astounded that you would come here and say that plastic liners last for hundreds or thousands of years. My understanding is that the manufacturer says 30.

And if the soil is not detoxified, which is the most important thing, it will effect the ground water for years to come and in effect will preclude ground water clean up when the rush to construction of the industrial park on the site is achieved. I can hardly believe that should you detect a leak later, you will somehow dismantle the industrial park in order to solve that problem.

The residents of Clarinda Lane are living on soil which is more contaminated than some of the people that have already been relocated. And I would also like to ask a secondary question of how you would prevent the spread of contaminants while you are filling this cap? Thank you.

MR. WILKINS: Hi. Keith Wilkins. I am director of Escambia County's Neighborhood and Environmental Services Program. And, first off, I would just like to say I know this has been very difficult. It's very difficult to sit there and listen to comments that you may take offense at or sensationalize or just that someone doesn't have all of the information.

But I have been there, too, but that is our job. But I would like to emphasize that this community and the Board of County Commissioners appreciate your involvement. It feels like Escambia County is going to be a better place because of your involvement and because of your engagement in this process, and we appreciate it and look forward to that continuing.

In that light, you know that the County staff has some serious concerns with the plan. Tonight, the Board of County Commissioners -- but we also feel like with the discussions that are taking place since your proposed plan came out that progress has been made, information has been transferred in both directions.

And, in that light, the County Commissioners tonight withheld the resolution until their meeting on September 15th pending the continuance of that information exchange to kind of see where we are at that time.

Thank you.

MR. REFERMAT: Yeah. I have regathered my thoughts. James Refermat. A couple of things. One, I think that it is important that the EPA disseminate as much information as they can through the community, be it through the local News Journal or news stations.

One, of course, of the big concerns is the drinking water. It's my understanding that the potable water we use in this area doesn't come from the local aquifer beneath the contamination of concern.

I think EPA has expressed that. They need to also educate the community, what is a part per billion, what is a part per trillion. One second in 32 years; one second in 32,000 years. Okay.

So a soil target clean up level of seven or 340 is negligible. We are talking -- we are really cutting frog hairs there, so I think the EPA needs to really define what is an acceptable risk.

Third, I am somewhat disappointed at the meeting. It doesn't seem like it has been real organized. It doesn't seem like we have had a very big turnout as a community. You know, I expected this place to be full. So will there be another meeting, a public meeting on this issue?

MS. ZOKOVITCH: This comment is during the comment period.

MR. REFERMAT: Okay. And the last question I had concerns --

MR. CHAFFINS: Again, we have to go back and find out from our office about the grant that I mentioned earlier, and as part of that, that decision will be made at that time.

As of right now, we have extended it for one week, and that's giving us some additional time for the County to consider what they need to do. But, again, we need to go back and consider, and we will make a notification of that meeting to the community.

MR. REFERMAT: Again, I'd like to offer up the suggestion as I don't know if EPA or the FDEP has a contract mechanism for obtaining legal counsel to represent the people of Clarinda Triangle. It would be, I think, in the agency's best interest and the community's best interest to make sure people are adequately represented. I think that would show a good stewardship approach on behalf of the agency.

And, last, the record of decision which has been reached on this site; is there any wiggle room on that? My experience is "No." I mean, we have come up with a remedy. Do we have any wiggle room here?

MR. KEEFER: We take this public comment period seriously.

MR. REFERMAT: Okay.

MR. KEEFER: And we are going to go back and take all that has been provided to us and go through it then. It's a modifying criteria, as I have said before, so I am not sure what you are looking for as wiggle room.

MR. REFERMAT: Well, my experience with Records of Decision is pretty much EPA makes the rod, and that is the standard by which everything is measured by and all work is conducted.

It appears that the people in this area are not particularly happy with, I think, primarily, the location and the remedy in particular. I think, possibly, a subtitle C RCRA facility ten miles north in the County, not in a populated area, not in an area destined to be commercial, light commercial, or some type of shopping or something like that.

We're trying to develop the Palafox corridor area in order to bring up this whole area in the community. And with the Escambia Treating, the American Creosote, the Arco facilities, it doesn't lend towards people really wanting to be associated with that, to have an on-site disposal cell.

So I am familiar with the cost of moving and transporting these type of materials. It is more expensive, but I think you will probably gain more public support if the facility, the reception facility, was not located in the middle of this community. I think that's probably -- what I am hearing tonight is the biggest concern.

And, again, I think what really needs to be addressed by the agency is impacted ground water, impacted drinking water, because that is the exposure scenario that we are trying to avoid. Risk is toxicity times exposure. Toxicity can be a billion but if exposure is zero, risk is zero.

And what we need as an agency, we need to express that, get it so people can understand it and minimize their concerns. Thank you.

MR. DONOVAN: Good evening, folks. I'm Marty Donovan. I'm a City Councilman here in Pensacola. I represent District IV, which is the area that pretty much surrounds the Bayou Texar area here in Pensacola.

It should be pretty clear to you by now that the consensus of the community is one that does not accept your proposal for the clean up of the Escambia Treating site.

And, you know, the City officials, our environmental coordinator is here, and he is very knowledgeable; he worked for the DEP. He doesn't think that the clean up that you are proposing is in the best interest of the City.

Kevin Calper, (phonetic) another City employee, has reviewed it. He has been following this very closely. He has been open in that he doesn't believe that it is in the best interest of the community. I think you are going to be getting a resolution very soon from the City Council that was generated out of our Citizen's Environmental Advisory Board indicating that we don't think the proposed clean up is in the best interest of the community long-term, so that should be clear to you.

I would encourage you to go back to Atlanta and rethink this. And not only in terms of the cost, but in terms of what is the long-term effect on the community. I would encourage you the first thing you need to do is to relocate the folks that live across the street from the plant.

It's unfortunate that there wasn't soil testing done over there even though you were urged to do it for many years. It was done just recently. But now you know that area is contaminated.

You know the soil on the surface in that neighborhood is not healthy for habitation, so I would encourage you to make that your first priority and relocate those folks as expeditiously as possible. And, of course, at a fair settlement; that goes without saying.

But after that's done, we're stuck with the problem here. And the whole problem that the community has with what you are proposing is that you are not removing the contaminants from the community.

As the previous speaker said, you are leaving them located right here in the heart of an urbanized area where people live everyday. And the other thing is you are not doing anything to detoxify the contaminants, and that's the major disappointment that the community has.

The remedy that you are proposing is very similar to the Agrico remedy. And it's generally accepted in this community that that remediation method was a mistake, and Conoco admitted by writing a check for $96 million very recently that that remediation -- a lot of people are being harmed daily by that site, and there was no real clean up that occurred there. There was no clean up of the ground water.

And our community is different. We're not an arid community out west where you can bury these things, and they stay encapsulated. As many people have said, we are a tropical community. We have high heat. We have high humidity, high moisture, high ground water, you know, 60 inches of rain a year. And so, what might work out west to contain contaminants doesn't necessarily work here.

This community is not going to be satisfied unless you remove the contaminants from their current location or you detoxify them and solidify them in their current location and then put them in a lined pit. Then we will feel more comfortable.

And those are your own alternatives; alternative number four and alternative number five combined with alternative number six. I think if you would implement those, then the community would be satisfied. Anything short of that, the community is not going to be satisfied.

And be careful when you talk to, you know, possibly, some bureaucrat associated with the City or the County or somebody with the Chamber of Commerce, and what they tell you might not actually be reflective of how the community really feels.

That's why these meetings are important. You need to get out and talk to the folks and find out what they really think. Because, after all, you are the responsible party now. You know, you are the equivalent of Conoco Oil Company on the Agrico site. You are the responsible party.

The true responsible party, through shenanigans, transferred title to their employees, and then, they, you know, put the problem off on their employees that bought the company, and then, they filed bankruptcy and all of that.

But, at this point, the Federal Environmental Protection Agency is the responsible party, and we expect you to do the right thing just as we would expect an owner/polluter to do the right thing. And just because you are the Federal Government, we are not going to let you bury these contaminants while they are still toxic in our community and say, "You have got to trust that that liner is going to last for 1000 years."

That might be a quick and dirty solution, but it's not one that is going to be acceptable. If you will do the right thing and detoxify the soil and then solidify what is left there, the community would accept that, and they would feel good about it, and then, we will have a solution.

But if you continue to promote and push no detoxification and no solidification, and you just bury the contaminated soil on site, this community is not going to accept that. So I think this exercise this morning has shown that very clearly, and I hope you would reconsider your decision at the highest level.

I am disappointed, too, that the Department of Environmental Protection for the State of Florida has signed off on this proposed remedy without holding one public meeting in the community to see how the people in this community feel about it.

I don't understand that at all. They are supposed to be the State agency that represents us. Yet they didn't hold this meeting. Obviously, y'all had private talks out of the Sunshine and came to a conclusion that the DEP would sign off on this. But they never came to the community and got our opinion about this as you are doing. So I wouldn't put much faith in that.

So I would encourage you to do the right thing, and then, we can accept it, if you will, in fact, detoxify the contaminants and solidify them, even if you do leave them on-site. Thank you.

MS. STEVENSON: Good evening. My name is Blair Stevenson. I am a Pensacola resident on Bayou Texar. I am a member of the City Environmental Advisory Board. I am President of the Bayou Texar Foundation. I was involved in the Conoco suit.

And as I sat here tonight, when I got here after the meeting started, I noticed that there were public concerns that were shown on some of the slides, and I was thinking, "Well, where did you get those?" And I knew that a lot of the folks that were here would speak, and I knew that I wanted to speak as well.

Because I have such a heavy involvement in local politics, and I pay lots of attention to what is going on and because of the environmental problems that we have had, the active folks in our community share information. And we all keep up and we try to be very educated, and I think you can see that, perhaps, they are more educated than you expected tonight.

This may not be a very large group here, but we do indeed represent many, many people as evidenced by previous speakers you mentioned; the League of Women Voters, the Bayou Texar Foundation, the Gulf Coast Keepers, and many of the churches in this area, not to mention CATE, who has worked in an unprecedented fashion in this community to relocate these folks, the third largest in this nation.

I have been very concerned about the fact that the folks in this community have not been included in many of the conversations that have been had, and I feel that an injustice has been done in that I don't think you've had a true understanding of just exactly what the community feels like here.

I have lived here my whole life. I don't know if I said that before -- but -- and I want to keep living here, and I have a vested interest, just as all of the folks in this room do. I want the Clarinda people relocated as fairly and justly as possible, as quickly as possible. I just have to say that even though it's redundant.

And then, I want to say that what you are responsible for is a final remedy. You made that perfectly clear; it will be final. So when I am thinking about the fact that it's a final remedy, and you have indicated they are going to be monitoring wells, and this has been mentioned before, what if those monitoring wells show an issue. Then what? We have got the buildings on top. How are you going to get to it? It just don't make any sense to me at all.

The life blood of this community is our ground water, and it's nothing to take a chance with. If there is a leak in the landfill liner, and according to our environmental experts like Keith Wilkins, there isn't a landfill that doesn't leak. There isn't a landfill that doesn't leak. We need a completely foolproof method that involves eliminating the toxicity. Period.

I encourage you to go back, put together a remedy like Mr. Donovan mentioned that includes four, five, and six that detoxifies the material so that we do not ever have a concern with the future of our city and of this toxic material ever again.

I appreciate so much the remarks that you made because you said everything that I wanted to say but so eloquently.

And I hope that you gentlemen will take these comments back and do something better, something that is desired here.

Now, my question, just as the gentleman about two speakers ahead of me asked is: Is there any room? Can you make a decision that is different? Could you consider a decision that is different? I just want a "Yes," or "No," on that.

MR. KEEFER: Yes.

MS. STEVENSON: Yes. That's what I heard. Okay. All right. Then, we will be expecting that soon, and we will hope to see more notices in the paper and more invitations for the public to come and hear more things, rather than you speaking to just the City and County officials and the Chamber of Commerce.

Thank you.

MS. HAMILTON: My name is Sandy Hamilton. I live in the Gulf Breeze part of the time and part of the time in Colorado, which is where my job is.

In addition to sharing concerns that have already been expressed, there were just a couple of other things I wanted to add, and one of them is it's been a long time since I have looked at the Uniform Relocation Act, but I'm wondering if there's a provision in there and if EPA will take responsibility for looking to see if there was a provision in there that would allow the people who want to go away from this contaminated area right now to have some temporary relocation into a rental until the long-term relocation can be handled by the Corp so that they are not just stuck there for that interim.

So that's the first question or request. Can somebody take responsibility for looking at that statute and seeing if that is a possibility for these people who want to do that?

And the second thing is if I understood your slide correctly, it was hundreds or thousands of years until the liner is expected to have a failure; is that right?

MR. KEEFER: Degredation.

MS. HAMILTON: Pardon?

MR. KEEFER: Degredation.

MS. HAMILTON: Degredation. Yes. Not hundreds of thousands, but hundreds or thousands.

And I know policy often now is to take the short term, most-economical-for-now approach to things, and it's probably beyond any of us here to make big policy changes right now, but we're all part of the citizenry that does make those big policy changes over the long term with our elected leaders.

And I just would like to say civilization has gone on for thousands of years, and I think it's a pretty poor legacy for us to be considering leaving for the next people that are coming after us in hundreds or thousands of years to leave them toxic material in a containment that is going to be degraded at that point when they are getting it.

So I would just like to encourage a longer term look here. If we have the technology, I hope we have have the political will to implement it, to really clean it up.

Thank you.

MS. BENNETT: Well, if there is nobody else, I am back. Ann Bennett. I had a number of questions. One of them was that these property owners were bankrupt, and I was wondering; does EPA now actually own the property or who does own it?

MR. KEEFER: We don't own the property. EPA doesn't own the property in that sense of, like, holding a title to it. We are in control of the property until we finish the clean up at which point we transfer our interest to the State. That's how the law is set up. The State will become the owner.

MS. BENNETT: Who is the current owner?

MR. KEEFER: We are in control of the property. I would have to have the lawyers answer. I can't give you an answer.

MS. BENNETT: But when you get finished with it, it will be State-owned property?

You mind as well keep that. I have got a lot of questions.

MR. KEEFER: That's who it would transfer to.

MS. BENNETT: Okay. I had a whole bunch of questions, and I am afraid they were not all in concise logical order, so please bear with me.

When you were doing your testing, it's my understanding that you have never actually tested far enough around to delineate the borders of contamination.

And I would like to know why you have a bazillion tests within the area and not gone deliberately to find where are your borders?

MR. KEEFER: We think we have delineated the borders. The only place we have any question about that is some of the properties adjacent to the last testing area around Clarinda Triangle that we are going to address during the coming weeks.

MS. BENNETT: I am going to have to take your word for it. I can't see anything that is indicative of that. I mean, you just have all of these little clusters. I don't see you going, you know, three blocks over here to see what you get, and then, how far in before you start picking up stuff.

The other thing that I wanted to ask, then, is when you were doing this testing, particularly offsite, what were you testing for beside your dioxin?

MR. KEEFER: The benzo(a)pyrene.

MS. BENNETT: That's all just the cancer ones.

MR. KEEFER: It was the PAH family of chemicals.

MS. BENNETT: Okay. So it was just your carcinogens?

MR. SUDWEEKS: No. There's a standard lab, a range of different chemicals. When there is standard testing required in environmental samples, you do a number of metals and as well as a number of organics.

So there's a full range so you won't miss things. We have an idea of what we might find when we do the analysis in the laboratory. There are standard methods that look at a broad range of chemicals.

MS. BENNETT: So you are looking for those in a broad range, you will find what you are looking for, but if you are not looking for a specific thing, you are not apt to find it; is that correct?

MR. SUDWEEKS: That's right. That's why you have a broad range of possible chemicals.

MS. BENNETT: You include them in the samples you are looking for if you suspect it's going to be there by probabilities, by association?

MR. SUDWEEKS: No. There's a prescribed method to capture a wide range of things that you may be counting on being there. You know, for things that are there, there was a certain kind of waste that was deposited for PAHs and dioxin.

You design your test to capture what you expect to find, but they also might pick up some other things that you hadn't counted on finding.

MS. BENNETT: All right. In your evaluation chart that is in the book but was not legible, for the screen with your range of the various options,

there was no discussion about how this capping plan relates
to four, five, and six or a combination of four, five, and
six.

MR. SUDWEEKS: That combination was not
evaluated. The combination was not evaluated separately.
That will be part of -- that's been made clear to us that
we need to look into that.

MS. BENNETT: How did it stack up to it
individually? Four, five, and six?

MR. CHAFFIN: Would it help to put it back
on the screen?

MS. BENNETT: I am assuming in part it is
being measured as a lot of money. it's very different
based on cost and form?

MR. CHAFFIN: Yes.

MS. BENNETT: Okay.

MR. SUDWEEKS: But it's only one of several
different kind of considerations made selecting
alternatives. It's not only cost.

MS. BENNETT: I understand. I looked at
your things, but my understanding is that the
administrations, past and present, have been allowing the
corporations to cease and desist paying into the Superfund
clean up site fund, and therefore, there is no money; is
that accurate?

MR. KEEFER: The access is no longer. Clean up with the money that we get for Superfund clean up comes out of general revenue as appropriated by Congress. It will be headquartered and distributed to the regions. Various clean ups based upon risks and the factors and other factors that -- so, yes.

MS. BENNETT: Okay. Well, I am sorry. Let me finish. It occurred to me that the EPA agency that is permitting those corporations at least currently to be dropping pollution on us in other Superfund sites --

EPA is the organization that comes in and says, "Well, we're going to put in an environment, put a cap, but not clean it up."

And we do not have money? Somehow, that seems a little ironic. I will be back at this point.

MS. SPENCER: If you come back, your comments will not be on public record because the stenographer has run out of tape.

(COURT REPORTER CHANGES TAPE.)

MS. SPENCER: Okay. We're going to resume the meeting. We are going to let Ann finish her comments; then, Frances has a comment. If everybody could comment, I would appreciate it. Thanks.

MS. BENNETT: Okay. This is still Ann Bennett. I wanted to say it has taken a very long time, too. I am wondering how much longer it is going to take to get the water. It occurred to me once it's contaminated, our prior exposure, how long will we have to wait?

MR. KEEFER: Our plan at this time is to move toward fall starting the feasibility study. It would take about a year to perform the feasibility study to get us to the point where we have a proposed clean up plan. And I guess this time next year. Okay.

I have no idea what clean up will be necessary for the ground water, what it will be at that point, so I can't speculate how long it will take to clean it up.

MS. BENNETT: Well, I would like to remind you that we have a water table that rises and falls, as the gentleman said. Well, folks, global warming is real. I am concerned that your bowl that doesn't leak is still awfully close to our water. I think a five-year review is too long in between.

In terms of deporting this stuff out of the city to some other location, it occurs to me you have a real good opportunity to contaminate the water in two locations. I don't think it's a particularly good plan. I think the best way is to get rid of the toxins is to detoxify them.

It seems to me that the corporations are getting off and the public is paying for the clean up and that represents a major crisis in ethics. Why, it seems to me this is the kind of injustice for all.

Thank you.

I have one more, because I am speaking for another group.

MS. DUNHAM: I want to point out even though EPA feels they have done adequate testing, I have been with other entities -- and has gone somewhat outside of this area and found a significant amount of contamination very clearly from the site.

This is the same contaminate, then. Is a lesser amount radiating out from the site in particular?

I am thinking of the Brown Barge School area recently torn up by DOT, to everybody's lament, the intersection of Fairfield and Palafox, just one street back over here. I am also thinking of an area, a storm area around that was put, put on the right-of-way for I-10.

And I wanted to point out that the testing that was done in the Clarinda Lane area found hot spots running up to the borders. There's every argument to go out farther from that triangle.

We don't know if the residents across the street have these high levels. There's every reason to believe --

MR. KEEFER: That's the initial simulation that I was talking about.

MS. DUNHAM: Okay. That's good. We welcome that. We don't want to leave anybody else out. It's a shame that the Clarinda Triangle residents were not relocated. That's water under the bridge.

I want to be sure that the seven protected -- I just want to reiterate that she lives in Louisiana, you know, we're a little impaired around here, certainly, there is no way for her to get here. That was an impossible task.

We certainly hope that you will extend the comment period, ideally more than a week. I would urge you to have another public meeting.

As you know, the County Commissioners meet tonight in their -- a lot of people expected that this might have been called off because of the hurricane, and we want to be sure that the community has a chance to be completely involved.

I also want to request that when you begin to meet with the community, as I understand, as you have the last day or so, let's have these big meetings.

For technical issues, let's have a big meeting. Don't meet separately. Let's have it open. People can come in if they want to.

Please, please, stop meeting with everyone at a different location and different times. We all want to come to the table together.

Thank you.

MR. KEEFER: Would it be possible to get a copy of the presentation CATE provided earlier? I think it's solid information. I think it would reinforce for me some of the perspectives, some of the concerns on the part of CATE and others in the community. Would that be possible?

MS. WILLIAMS: Yes.

MR. KEEFER: Would that be possible that that be channeled through L'Tonya so we can take a look at that information?

MS. DUNHAM: Anything that is routinely sent in with the TAG report, it normally goes to Denise. It certainly can be sent to Dianne.

MR. KEEFER: Thank you.

MS. BENNETT: Okay. Ann Bennett again. I want to thank the people of the DEP, the rank and file of the EPA. I think really and truly it strives to do the best it can.

Generally, if the public has interest, I realize that it is at the upper levels of bureaucracy that your work frequently becomes politicized. And the people here are seeing the results from that far more than we see the work that all of you do on the ground level, day in and day out.

I think that is part of the reason that there is so much disparity between your view of what has been going on and the community's view.

I want you to know that at least some of us recognize and appreciate your effort, but we also recognize that there are those henchmen up there that can ruin it, so we would like you to come back and answer our questions in a meeting.

Don't send us a book that we have to wade through. Don't tell us to spend the day going down to the library. Come to the meeting and talk to us. Thank you. Thank you.

MS. SPENCER: On behalf of the EPA, I would like to thank everybody for coming out, those of you who have endured. Of course, we're taking those comments back to EPA. We'll get back to you as well as get some of the answers to your question.

MS. ZOKOVITCH: I have literally one sentence. Jeanne Zokovitch. On the extension of the comment period, I want to put on the record that I do feel more people in the community would have come out to the meeting.

One of the failures to get community members is a direct reflection associated with the TAG Grant. While we discussed that in private, I don't think we said that. I want that to be on the record that CATE had the TAG Grant.

It was supposed to be at this critical time. They could have done more to get more of the community out to the meeting. I urge you to extend the comment period.

MS. SPENCER; With that being said, this ends the EPA proposed public meeting.

Thank you for all coming.

MS. WILLIAMS: I want to say we thank EPA for meeting with the community and coming out, hearing what we have to say. I think that means a lot when it comes to making a decision of what type of clean up they are going to do.

And about the relocation; we're not blaming you for this. Your predecessors have set the stage for how we feel about EPA coming in here in this community, you know. The first meeting we had with them was with Escambia County. We were totally ignored with Agrico when they met with us with Escambia County.

They staffed an emergency clean up. We hear the word, "Clean up." We expect it to be just that; a clean up. Now, we're hearing "Clean up," again. This clean up was dredging soil, filling it up, putting it under a cover, and that was clean up.

You know, that's why we're sick about what this clean up thing is all about. I hope you would take all of these comments and questions, and even though you are looking at it from an engineering standpoint, look at it from a human standpoint. We live here.

It's not an easy thing to see your loved ones pass. We have taken death for granted. And now that we know that some of those contaminants could have caused early death -- we recognize a lot of things that have happened to people here, you know.

We want this to be a clean place, and we hope that you will take all of those things, and once you go back and make your decision, ask yourself this question: "Is this where I would want to live? Would I want to leave this for my children?"

Do unto other people. We're taxpayers. We're registered voters. Our tax money pays for your salary, and we don't need to pay people to come in and destroy us.

Live up to your name, Environmental Protection Agency, and not destroy us. We're so glad that you could come and hear these comments. We do hope that you take them seriously, because we're serious about what we feel, how we think, and what we want.

Thank you so much for coming.

MS. SPENCER: Thank y'all for coming.

WHEREUPON, the public meeting of the Environmental Protection Agency concluded at 9:49.

E-R-R-A-T-A S-H-E-E-T

I, ______________________________________do hereby certify that I have read the foregoing pages and that they are correct, with the following exceptions:

PAGE LINE COMMENT

_______ ______________________________

Date Signature:

Sworn to and subscribed before me this

___________day of _________________, 2005.

____

Notary Public

CERTIFICATE OF REPORTER

STATE OF FLORIDA

COUNTY OF ESCAMBIA

I, DEBORAH G. KHARUF, Court Reporter and Notary Public, State of Florida at Large, hereby certify that I was authorized to and did stenographically report the foregoing public meeting and that this transcript is a true record of said meeting.

I further certify that I am not a relative, employee, attorney or counsel of any of the parties, nor am I a relative or employee of any attorney or counsel connected with this action; nor am I financially interested in this proceeding or its outcome.

Dated this 1st day of September, 2005.

____

DEBORAH G. KHARUF
Court Reporter and Notary Public,
State of Florida at Large.
My commission expires ----------.

Public Comments Received by EPA

Written Letters and Comments

Introduction - In an effort to preserve the integrity of the following comments, and accurately convey the voices of the writers, all transcriptions are faithful to the original handwritten or typed copies. All names have been replaced by XXXX to preserve their anonymity. Indecipherable words or phrases are represented by question marks. Words with spellings requiring interpretation have also been flagged with question marks, with the transcriber's interpretation italicized within parentheses directly after.

Aiken Rd., Pensacola, FL
September 10, 2005

As a retired scientist with 42 years in research and development experience with two large chemical companies, I have lived in Pensacola 40 years near the airport about 2 miles from the ETC site. During my career I either work with, or was exposed to about 80 of EPA's long list of the most toxic chemicals.

For the past 15 years I've kept myself evergreen on all the events at Superfund Sites in Escambia County. The ETC Site has been a mismanaged fiasco since the day the EPA decided to escavate the site.

For scientific reasons too numerous to mention, and devoid of the current emotional rancor by the Pensacola News Journal, CATE and local government agencies, I support Alternative 3.2.1, No action with monitoring as the sensible solution. It is urged that the EPA delay any action until they have evaluated the medical tests in progress on those residents and workers who worked or lived near the site. Thank You

After thought:
I'm the holder of somewhere between 20 and 30 U.S. Patents (forgotten the actual number) for my inventions.

XXXXX

Response – See EPA's response to Comment 3.2.6.

41st Lane Pensacola FL 32505
September 1, 2005

I now live on 41st lane, I lived in Escambia Arms at one time, I lived on pearl Street at one time well most of my life, with my Mother and Brother, we moved away but later my mother died from a lot of complications, I moved with my step Mother on 41 Lane I thought this side was safe but I was wrong now I know better and we are asking to be moved and that Cleanup be done at the sight so that no one continues to suffer.

Response – See EPA's response to Comment 3.2.1.

41st Lane Pensacola FL 32505
September 1, 2005

I Live on 41st Lane and my comment is this since I moved here six years ago my and my family's health has ?deterated? *(deteriorated)* because I planted and the family ate from the garden my arms are becoming almost unusable. We the XXXXX and XXXXX family are asking along with the rest of the citizens to be moved permanently and we are asking for cleanup of the site and not cover up enough damage has been done, stop the devastation. Thank you for doing Right by us!

Response – See EPA's response to Comments 3.2.1, 3.2.2, and 3.2.3.

41st Lane Pensacola FL 32505
September 1, 2005

I XXXX & XXXX XXXX Live on 41st Lane and along with my mother we are asking for clean-up of the site not just a cover-up and also that we be treated fair and right for our property and that we are moved permanenty. We are having many health problems, and so are others this has gone on long enough please do the right thing by us.

Response – See EPA's response to Comments 3.2.1, 3.2.2, and 3.2.3.

W. Blount Street Pensacola FL 32505
August 31, 2005

I write this letter in reference to my father, XXXXX, that use to work at Escambia Treating Company. I filed for my father when we first started CATE, I was the recording secretary at the time. I was there when we chose the name of the group. I did the paperwork then on my father, at that time he was still alive. My father died on October 6th, 2004 from a pulmonary disorder. I can obtain the records from Sacred Heart Hospital if I need to. What I am trying to say is that my father was never compensated for all the time he spent on the site. Every employee that ever worked at Escambia Treating Co. all had yellow/red color tone eyes and they all had some type of skin disorder and breathing discomforts.

We was in this environment as well because my mother, XXXXX, use to take us to the plant to pick up and drop daddy off for work. Also, the company use to have fish fries for the employees and their families, so we was expose to it as well.

Well, my father has three children that could use this compensation. Our names are XXXXX, 34 yrs. old – XXXXX, 48 yrs and XXXX (me) 51 yrs old. We would appreciate our father time, effort at work, pain and suffering be compensated for. We thank you in advance for any and all kindness and consideration that can be shown to us in this matter.

Respectfully submitted,

XXXXX

Response – See EPA's response to Comment 3.2.1.

E. Cross Street Pensacola FL 32503
No Date

The bury-and-cap solution proposed this week is an unacceptable solution to the contaminant problems that have spread far beyond the boundaries of the site. It is the equivalent of putting this incredibly toxic contamination into a plastic bag and burying it. It does nothing to stop the leaching of toxins into the groundwater. CATE is having a very hard time trying to get its TAG Grant reinstated; why should this process be so complicated? The only remedies that would be truly protective of human health and the environment are options 4, 5 and 6. The EPA is doing its best to scrape by with spending the least amount of money by using the least protective option and believing the citizens of Escambia County are too uninformed to know better. The plan to ???? this outrageous proposal in every possible ???? to get a thorough and permanent cleanup of both soil and groundwater.

Response – See EPA's response to Comments 3.2.3, 3.2.4, 3.2.6, and 3.2.9.

Garfield Drive
No Date

My mother XXXXX have ?alltimer? *(Alzheimer's)* & my Father die with ?concle? *(cancer)* at the Bones. Die 1989.

I am the Daughter of them.

I am XXXXX.

Do not Build Superfund site.

Response – See EPA's response to Comments 3.2.1 and 3.2.3.

West Wright Street Pensacola FL 32501
No Date

yes i Think There Should A ProPosed on Escambia Treating Company Superfund Site, Its Because I had two uncles that Died From Cancer one Lived In Rosewood terrace the other one Work At Escambia Treating Company. I Also Lived In Rosewood terrace And work At Escambia Treating company. During Summer Months OF ????. I Also under went ?surgare? *(surgery)* for ?ColLiN cancel? *(colon cancer)* In May 2005.

Response – See EPA's response to Comment 3.2.1.

Valencia Street Gulf Breeze FL 32561
September 1, 2005

the containment of non-treated toxic material with a geomembrane & capping which will degrade in "hundreds or thousands" of years (best case scenario & less likely to last in the FL & climate & weather patterns) is short-sighted and leaves the problem for future generations to deal with. A permanent solution is needed now. Please re-consider detoxifying the soil now. It's worth the extra money!

Thank you for the opportunity to comment.

Response – See EPA's response to Comments 3.2.3, 3.2.4, and 3.2.10.

E. Fairfield Drive Pen. Florida 32503
No Date

This is a problem that needs to be clean up but we know that it can't be So it's best that the family in the Clarinda area be relocated

Response – See EPA's response to Comment 3.2.2.

Clarinda Lane Pensacola FL 32505
No Date

I'm Pleased with the process of EP A & all the official clean up plan for the sake of The clean up in our beloved Community. We would like to be relocated without question swiftly—(ASAP). We would like to be compensated for our Commercial Property (only)--Not Residential Value. Our Property is very valuable & precious. We would like to Also be ?cimpinsated? *(compensated)* For being ?expised? *(exposed)* to this contamination. We have been wronged!!--Also let's Get rid of this contamination, We don't want to Put a Bandaid on it, For our community sake!

Response – See EPA's response to Comments 3.2.2 and 3.2.3.

Clarinda Lane Pensacola FL 32505
No Date

Our community is suffering, there are alot of illness and birth defects. My WIFE has had heart problems & respiratory issues, and Myself have had a variety of medical set backs! Who's responsible for this Tragedy in our community!? We Want OUT, Now! We would like for our community to be Treated Fairly, DO NOT Take our Property without Giving us a Fair Commercial Price For our HOME & LAND!! We need to be Freed so we can Live in Peace.

Response – See EPA's response to Comments 3.2.1 and 3.2.2.

Clarinda Lane Pensacola FL 32505
No Date

We have a big Problem her in the Clarinda Triangle Circle, you have allowed us to live in unsafe sometimes for a Period of Time, The regulations & Guidelines Stink. They do Not respect the communities health. The majority of the People here are black, could this be a reason? DO NOT TAKE from us, without compensating us fairly our land and home is valuable. The EPA-county there going to make money off of us, our setback and tragedy, Were dying while the big boys Get rich off of us!!

Response – See EPA's response to Comment 3.2.2.

N. Magnolia Pensacola FL 32503
September 1, 2005

the Property New Hope ownrs will it be ?intile? *(entitled)* to some type or clean up,

Response – See EPA's response to Comments 3.2.2 and 3.2.3.

Millstream Drive Pensacola FL 32514
September 1, 2005

Reading your data, Escambia is the highest on all pages. Why? Although it is known that people Property was bought and that they were sent to another ?era? *(area)*, why? When the pollution is still high. All I can see is that EPA is doing is Putting a $1.00 in People hand moving them around, the Escambia is still contaminate..

Response – See EPA's response to Comment 3.2.2.

W. Mallory Street Pensacola FL 32501
September 1, 2005

Request ?S/? property sample

W. Clay Street is where my husband & I and children lived for 20ty years, we do have serious health problems. My daughter have lived there for 15 years. She and her family has problems. Our neighbors has problems, some have die! so We begg of you to test the soil in our area. As I said in the meeting is that Clarinda Lane is east of Pace blvd. and Clay st. Neighbors is west of Pace.

Thanks.

Response – See EPA's response to Comment 3.2.2.

N. Palafox Street
No Date

I HAVE COMPELTE TRUST IN EPA DECISIONS. I FEEL THE CHEAPEST WAY IS THE BEST WAY OUT (AS LONG AS IT IS SAFE). IF THERE IS ANY WAY WE CAN WORK WITH LOCAL AUTHORITIES, FEEL FREE TO CALL ON US.

N. Guillemard St. Pensacola FL 32503
September 1, 2005

I attend the meeting at New Hope M.B. Church. The conference was well presented & we go some answer to some questions. I oppose the proposed <u>clean-up</u> precedure it is still too risky to our health. A plan was set up years ago, it didn't work. As a result our water-way, soil & air has become far too ?contanited? *(contaminated)* with toxic chemicals. We need a <u>Clean-Up</u>. We have waited for years & years for our Protection

Agencies would have workable plan in motion. Where I stand, there is "Do Nothing" or Wait & See" in action. The Local, State & Federal agencies could & should work hand in hand for the solution. This is a huge task that is long 'overdue". The Branch of Operations & Maintenance should have active involvement persons ?frour? *(for or from)* each agency on site, at all times. Some activities may require specialists some may not. Monitoring testing; inspection observing and reporting data could or should be done on site. More frequently & timely Meetings and Conference are important. Concerned Citizens could pass Palafox ???? and observe overgrown weeds & grass, ditches, gates, fences & signs are unkept.

We do so appreciate our "Community Relation Service" as well as service from City, County, Ecua, School & Churches. I am also concern for the health of my family, friends churches, schools. I have personal experienced of risky Health issues for many years. Now at this late date we can plan better for our future. We have the funds and Knowledge to do Much better with our environment with ???? *(our)* lives & health.

Response – See EPA's response to Comments 3.2.1 and 3.2.3.

Clarinda Lane
No Date

I, XXXXX, go forth against the cap and bury proposal offers by EPA. My concern are the health and safety of the community.

As we face increasing complex environmental issues, we need to view the earth as a sacred trust from God's hands, for which He will hold us accountable.

Concern,

Response – See EPA's response to Comment 3.2.3.

No Address
Sept. 19/05

I've read *Read line*, *Pensacola News Journal* "what do you think about Superfund Cleanup Plan?" and I wish to comment.

(1) I say excavate soil from the site equal to size of so called Mount Dioxin. (2) place mount dioxin in the excavation. (3) Place dry cement over mount dioxin. Mix cement into Mount Dioxin, add water & tamp tight and make soil cement. (4) Place or plastic cover the area and replace the excavated soil back. and let industry move in.

Detoxifying mount Dioxin is too expensive and not necessary to satisfy extreme enviormentalish.

sincerely,

XXXXX

No Address
September 22, 2005

I am writing to comment on the proposed plan for the Escambia Treating Company in Pensacola, FL. As a resident of the City of Pensacola and the County of Escambia, I am disappointed in the response from the EPA to this Superfund Site. Citizens as well as several groups (City, County, Chamber of Commerce, etc) made concessions and were willing to accept the commercial level of cleanup for the site instead of the previously requested residential level. In good faith, these local governments passed resolutions and asked for public backing of the change, feeling certain that EPA would "do the right thing" and provide some level of protection for this property. A redevelopment plan for a commerce park was also part of the resolution, providing the EPA with the knowledge that we intended to make something good out of this problematic site.

The proposed plan to simply excavate nearly 600,000 cubic yards of contaminated soil and cap it on site is unacceptable to the citizens of this area. We deserve better from our federal governmental agency, assigned to protect our environment as your name implies. If you were a private business owner, would you choose to locate your site on a pile of contaminated soil, even if the City/County provided some great incentives? Would you want your children to attend school across the street, both during the excavation process and after the capping? Would feel good long term about the chances of success given our hurricane record of late? (The current cap has exceeded its life span of 10 years, and we've sustained 5 hurricanes in the last year.) No one in the area feels comfortable that the current cap is "protective of human health".

Please reconsider your decision and include some level of cleanup in your plan. We all realize the money is a huge issue but shouldn't human health be of utmost importance? It seems to me that your agency could find a way to fund a proper cleanup. We appreciate the extended comment period, and can only hope that someone will truly listen to our opinions. The token support by our state Department of Environmental Protection provides us with little confidence in the plan, and we put little faith in their endorsement. Thank you for you consideration.

Sincerely
XXXX
Pensacola resident

Response – See EPA's response to Comments 3.2.3, 3.2.4, and 3.2.10.

October 5, 2005

L'Tonya Spencer
Public Relations; Superfund Remedial and Technical Services Branch
U.S. EPA Region 4
61 Forsyth St., SW
Atlanta, GA 30303

Ms. Spencer:

I am a registered nurse currently enrolled in the RN-BSN program at the University of West Florida in Pensacola, Florida. I am writing to add my voice to the many in opposition to the currently proposed action regarding the Escambia Treating Company Superfund site. The Environmental Protection Agency's plan to bury the contaminated soil in a plastic liner, capped with two feet of clay is opposed by every local official and environmental group.

The EPA's plan is not a satisfactory solution. The devastating health effects of contamination have been evident in the area for decades. 358 families have already been relocated with the relocation of another 50 being proposed. How many more lives must be destroyed before something permanent is done? Burying the soil without any type of decontamination procedure may be the least expensive plan at this time, but there will be increased costs in the future. Environmental experts believe that the toxins will inevitably leak out of the liner, contaminating the aquifer beneath. The Pensacola News Journal reported that David Keefer, EPA's site remedial project manager, stated that there was a separate plan under development to address the issue of groundwater contamination, and he expected "to be back...in a year". The contaminated soil has already sat on the site for over a decade. It is time to take measures that will decontaminate the soil, preferably reducing the dioxin levels to 2 parts per trillion. Unless the soil is thoroughly detoxified, there will be continued contamination of groundwater, affecting the entire population of Pensacola and the surrounding area.

I hope that EPA will reevaluate their position on this issue, taking into consideration the multiple other factors involved. It is not logical to try to save a few dollars now at the risk of increase costs and endangerment of our community's health in the future.

Sincerely,

XXXXX
Summertree Lane
Gulf Breeze, Fl 32563

Response – See EPA's response to Comments 3.2.3, 3.2.4, 3.2.5, and 3.2.9.

No Address
November 14, 2005

My comments about proposed plan by the EPA is that the EPA is moving too slowly. I feel that they are not as concerned with human life or the quality of human life as they are with cleaning up a site which should not have happened in the first place. Relocation should be first and fore most on the EPA Plan.

Response – See EPA's response to Comment 3.2.2.

Clarinda Lane Pensacola FL 32505
November 14, 2005

(1) PLEASE CLEARLY IDENTIYFY PROPERTY ON NORTH CLARINDA LAND AS PART of THE RELOCATION
   (a) please be specific
   (b) USE ADDRESS if Nesassary
   (exam. 2CLARINDA LANE etc.)

(2) Your EDA PROPOSED PLAN UPDATE DOSE NOT Clearly IDENTIfY PROPERTY LOCATION

Response – See EPA's response to Comment 3.2.2.

Clarinda Lane
November 14, 2005

I think the people in the Clarinda triangle Should Be Relocated First And then talk about the Clean Up Because there Some Peoples are Suffering Please Put Peoples Health First

Response – See EPA's response to Comment 3.2.2.

Pensacola FL 32516
November 14, 2005

Clean it up. Don't leave it for future problems for future innocent generations to pay for our KNOWN misdeeds. "Sweeping it under the rug" is NO clean up! The money EPA has spent fighting a Real clean up would have paid for it. **SHAME!** End The Shame.

Response – See EPA's response to Comments 3.2.3 and 3.2.4.

E. Gonzalez Street Pensacola FL 32501
November 14, 2005

1) We must begin relocation as soon as possible as a separate ROD. The work has been done establishing the plan to ?relo? *(relocate)* the people, so per David this separation would be simply administrative. He indicated when I asked how long it could take about 90 days.

2) Unless detoxification of the poisonous material takes place, we will be stuck with property that will remain largely undeveloped except for the most undesirable sort. Hence the currently proposed remedy is completely unacceptable.

Response – See EPA's response to Comment 3.2.2, 3.2.3, and 3.2.6.

Royce Street Pensacola FL 32503
November 14, 2005

Dioxin is known to cause cancer, even in small amounts, over a period of time. Dioxin was found in the soil in Pensacola, and the people in the contaminated areas need to be relocated as soon as possible, and the issue of relocation shouldn't be tied to the issue of cleanup.

There are many different types of clean-up of dioxin to detoxify dioxin like bioremediation or chemical oxidation. Please don't consider just solidification.

Response – See EPA's response to Comments 3.2.2 and 3.2.6.

E. Gonzalez Street Pensacola FL 32501
November 14, 2005

I have lived in Pensacola, FL. All my 59 years. I strongly oppose the proposed "solidification with concrete" process because it simply covers-up the problem and does not clean it up. It is too dangerous. We need to chemically reduce, then solidify, and then properly bury the soils. We do not want "lipstick put on a pig." Lastly, this problem and moving and compensating the people in the Clarinda area need to be separated. They need to be moved NOW.

Response – See EPA's response to Comments 3.2.2 and 3.2.3.

Flowe Road Pensacola FL 32514
November 19, 2005

I want detoxification of the organics at the superfund site.

RE: Escambia Wood Treating Co. Site

Response – See EPA's response to Comment 3.2.6.

Greenbrier Boulevard Pensacola FL 32514
November 19, 2005

RE: Escambia Wood Treating Co. Site

I am hereby respectfully requesting the detoxification of the potentially harmful organics found in the superfund sites in Escambia County, Florida.

Response – See EPA's response to Comment 3.2.6.

Woodbine Drive Pensacola FL 32503
November 19 2005

Please take actions to detoxify the organics at the Escambia County Superfund site off Palafox Street.

RE: Escambia Wood Treating Co. Site

Response – See EPA's response to Comment 3.2.6.

Moleno Road Molino FL 32577
November 19, 2005

Please detoxify the organics at the Escambia County Treatment Site.

Response – See EPA's response to Comment 3.2.6.

East Cross Street Pensacola FL 32503
November 22, 2005

I am absolutely opposed to any EPA proposal that does not detoxify the organic compounds at Escambia Treating. We do not, under any circumstances, want another "cap-and-bury" Agrico Chemical non-cleanup forced on us. The EPA has signed off on Agrico Chemical (right next to Escambia Treating), telling us this is now "clean". If the site its clean, why is there still a fence around the property? Why are there signs on the fences that say "Warning: Contaminated Soil and Water"? Every bit of contamination at this former industrial site is still there, directly across from a SCHOOL, and it is still toxic to human health. The contaminated groundwater has reached one of our bayous, and the Uranium 235 and 238 have gotten into the Floridan aquifer, our sole source of drinking water. Capping Escambia Treating removes none of the contamination; it only leaves it for future generations to deal with.

Lois Gibbs, the mom from Love Canal, told a packed house in Pensacola a few weeks ago that Escambia Treating is the most contaminated site in America. During any movement of this toxic soil, do you plan to ensure the health and safety of the public by temporarily to permanently relocating all residents, businesses and schools within one mile of this site? Please don't tell us, like you told the residents of Rosewood Terrace in 1991, that the digging at Escambia Treating is not harmful to our health.

We will accept nothing less than a thorough and permanent cleanup of Escambia Treating soil as well as OU-2, the contaminated plume of groundwater underneath the site which has spread for miles in all directions. The technology exists to remove ALL of the contaminants from this soil. If you detoxify the soil, there will never be a need to cap the site and future generations will be free to use this property as they see fit. Please, please step up to the plate and do the right thing in Pensacola.

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

Creek Bridge Circle Pensacola FL 32514
November 19, 2005

I want detoxification of the organics at the Escambia treating Fund site.

Response – See EPA's response to Comment 3.2.6.

Bakalane Avenue Pensacola FL 32504
November 19, 2005

I want detoxification of the contaminants, organics. Capping and solidification is not sufficient.

Response – See EPA's response to Comment 3.2.6.

Soundside Drive Gulf Breeze FL 32563
November 16, 2005

REVISED PLAN REMAINS UNSATISFACTORY BECAUWE IT DOES NOT DETOXIFY POLLUTANTS, OFFERING NO PROTECTION AGAINST FURTHER SPREAD OR LEACHING. ALL LINERS LEAK. THE STATEJENT THAT HE PLASTIC LINER WIL LAST 100 YEARS IS AN INSULT TO THE COMMUNITY'S INTELLIGENCE. SOLIDIFYING A MERE 13% OF 600,000 CU. YDS. IS A SOP TO CITY ENTITIES RIGHTLY CONCERNED THE PRESSURE FROM PROPOSED STRUCTURES WILL SPLIT PLASTIC BAG. EPA IS, AT EVERY TURN, TRYING TO GET AWAY WITH AS LITTLE, AND AS CHEAPLY, AS POSSIBLE.

FURTHERMORE, THE ATTEMPT TO HOLD HOSTAGE THE RESIDENTS OF THE CLARINDA TRIANGLE UNTIL THE SO-CALLED "CLEAN UP" REMEDY IS DECIDED IS UNFAIR. THOSE ISSUES SHLD. BE SEPARATED AND THOSE PEOPLE MOVED. THE TESTS HOW THAT MANY SAMPLES FROM THEIR AREA WERE HIGHER THAN THE ESCAMBIA SITE ITSELF.

Response – See EPA's response to Comments 3.2.2, 3.2.3, 3.2.4, and 3.2.10.

Hillview Drive Pensacola FL 32514
November 19, 2005

We want detoxification of the organics.

Response – See EPA's response to Comment 3.2.6.

Regato Drive Pensacola FL 32526
November 19, 2005

The EPA proposal is insufficient. There needs to be detoxification of all organic materials in the waste site.

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

University Street Pensacola FL 32504
November 19, 2005

I DRINK THE PIPED WATER, PUMPED FROM GROUND WATER, OF E.C.U.A.

CAN E.P.A. GUARANTEE – 100% – THAT E.P.A'S PROPOSED TREATMENT OF ESC. WOOD TREATING'S SITE WILL – 100% – CAUSE NO FURTHER DETERIORATION OF OUR CURRENT EXISTING WATER SUPPLY–?

Response – See EPA's response to Comment 3.2.9.

Panferio Drive Pensacola Beach FL 32506
November 20, 2005

We would like detoxification of the soil at the Pensacola superfund site Escambia Treating site.

Response – See EPA's response to Comment 3.2.6.

Dolphin Road Milfon FL 32583
November 19, 2005

I request that the necessary action to assure that there is a detoxification of organics properly occur.

Response – See EPA's response to Comment 3.2.6.

Madura Four Gulf Breeze FL 32563
November 19, 2005

The proposed cleanup is inadequate. The soil needs to be detoxified before it is solidified & capped. The organics need to be detoxified!

The health effects have also been underestimated. The studies need to be more comprehensive.

Response – See EPA's response to Comments 3.2.1, 3.2.3, and 3.2.6.

Deer Point Drive Gulf Breeze FL 32561
November 19, 2005

EPA capping & solidification is not adequate solution.

Detoxification of organics requested at the Escambia superfund site.

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

W. Jackson Street Pensacola FL 32501
November 19, 2005

I want detoxification of the organics. Not just solidify.

Response – See EPA's response to Comment 3.2.6.

Citation Drive Cantonment FL 32533
November 19, 2005

RE: Escambia Treating Co. Site

As a 35 yr. resident of Pensacola I ask that EPA take actions to detoxify the organics at the Escambia County Superfund site off Palafox Street.

Response – See EPA's response to Comment 3.2.6.

11-15-2005

Upon listen and the way I see and feel that the operable plan that I heard is unacceptable to me. The proposal is unacceptable.

XXXXX
Debby Ave.
Pensacola Fl 32501

Modifications to the Preferred Remedy
Pg 4 Paragraph 2

The inclusion of the "Sub-Cap" is being added to the plan. My question is this-
1) … What level/standard does this bring the site to? 30 ppb (commercial industrial) or 7 ppb (residential)

2) … What level did the original plan bring the level/standard to?

Pg 4 paragraph 4

Regarding the Statement that "Long term liability further achieved…"
My question is How long is Long Term?

Response – See EPA's response to Comments 3.2.3, 3.2.5, and 3.2.10.

No Date
L'Tonya Spencer
Community Relations, Superfund Remedial and Technical Services Branch
U.S. EPA Region 4
61 Forsyth St., SW
Atlanta, GA 30303

Dear Ms. Spencer,

I am writing regarding the Escambia Treating Company Superfund site in Pensacola, Florida. I am aware of the EPA's proposed plan to "cap and bury" the contaminated soil at this site and feel that this is not a sufficient solution. Lois Gibbs (Love Canal), director of the Center for Health, Environmental and Justice, visited Pensacola recently calling this area "the most toxic site in America." The fact that this is not Pensacola's only Superfund site only strengthens my argument.

I understand the cost of a more extensive cleanup. Because Congress allowed the polluter fees paid by industry to expire in 1995, there are fewer dollars for clean up. However, the legal ramifications of the public health crisis resulting form contaminated soil and water could be even more costly. I strongly disagree with the current plan for clean up and urge you and your counterparts to consider the health and well being of Pensacola residents.

Thank you,

XXXXX
Fleming Drive
Pensacola, Fl 32514

Response – See EPA's response to Comments 3.2.3 and 3.2.4.

Grande Pensacola FL 32504
November 19, 2005

I support the detoxification of the organic waste at the Escambia Wood Treating Company Site in Pensacola, FL.

Response – See EPA's response to Comment 3.2.6.

Email Correspondence
Introduction - All names have been replaced by XXXX to preserve their anonymity.

09/27/2005 12:34 PM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc: francesdunham@mchsi.com
Subject: MT DIOXIN Clean-up at the Escambia Treating Co_ Superfund Site

This plea for the welfare and safety of my fellow citizens of Pensacola, Florida affected by the so-called "MT DIOXIN" Superfund Site is forwarded for immediate and most serious consideration by our Environmental PROTECTION Agency:

MT DIOXIN Clean-up at the Escambia Treating Co_ Superfund Site
What would work to clean MT DIOXIN effectively:
1. Detoxify the organics (dioxin, PCP, PAHs, etc.) using Bioremediation or Chemical Oxidation
2. Stabilize the inorganics (arsenic and other metals) using Solidification
3. Bury the detoxified wastes over a plastic liner.

In addition to the above, and to bring about a long term and realistic solution for all concerned, the residential standard of 2 to 7 PARTS PER TRILLION is vital.

The danger of the MT DIOXIN site is critical, not only to the citizens directly affected, but to all the citizens living near and around the area who depend now and in the future on the aquifer water sources susceptible to the poisoning effects of MT DIOXIN site leakage if the best and proper methods are not used to solve OUR problem ! Thanks for your serious and timely consideration

Response – See EPA's response to Comments 3.2.5, 3.2.6, and 3.2.9.

09/22/2005 05:03 PM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject:

The concept of the U.S. Environmental Protection Agency's proposed $25 million cleanup plan for the Escambia Treating Company Superfund site is like sweeping dirt under a rug. Don't you dare recommend such a solution.
No, No, No.
!!

Sincerely, XXXXX

Response – See EPA's response to Comment 3.2.3.

Comments on U.S. Environmental Protection Agency
August 2005 Proposed Plan Operable Unit 1
Escambia Treating Company Superfund Site

Clarinda Triangle

Because elevated levels of contamination from Escambia Treating Company Superfund Site (ETC) are present in the yards of homes within the Clarinda Triangle, EPA has proposed either permanent or temporary relocation for these families. Some of the families lived near ETC during industrial operations and / or EPA's soil removal in 1991-92. WildLaw supports permanent relocation of the 55 Clarinda Triangle households as the most effective means for protecting the residents from future exposures during ETC remediation. Additionally, WildLaw implores the EPA to take a stronger role in the relocation of the Clarinda Triangle residents than it played in the original relocation of residents in the ETC area, to ensure that residents actually receive just compensation and proper assistance with obtaining replacement residents that are safe and comparable. Further, WildLaw requests that EPA use this relocation as an opportunity to revisit some of the problems associated with the original relocation that still plague former residents today.

Dioxin

EPA proposes to use the 30 parts per trillion Florida industrial standard as its remedial goal for dioxin, a major contaminant at ETC. The National Contingency Plan indicates that the one-in-one million cancer risk level for full-time exposure (the more protective residential standard) should be EPA's point of departure where the applicable or relevant and appropriate requirements are insufficiently protective due to multiple contaminants or multiple pathways of exposure. Both conditions clearly apply at ETC. In addition, health threats such as endocrine disruption and neurological, immune and reproductive effects are greatly understated when dioxin is evaluated solely as a carcinogen. For dioxin, the Florida industrial standard, with its eight-hour-per-day exposure scenario, is not adequately protective of human health. EPA should use the residential standard for ETC remediation.

EPA's Preferred Alternative

EPA has selected Capping/Containment (C/C) as its Preferred Alternative for ETC soils. This alternative is inconsistent with several of the nine criteria for remedy selection in the National Contingency Plan.

C/C does not protect human health and the environment in either the short or long-term since it is only a matter of time until the cap or liner will inevitably fail. The C/C system relies upon the integrity of the barrier rather than active treatment, and the integrity of the barrier in turn relies upon conditions over which EPA will have no control. C/C results in no reduction in the volume, toxicity, and propensity to bioaccumulate of the untreated hazardous wastes. At best, this alternative provides some temporary reduction in mobility.

C/C is neither adequate nor reliable as the sole method for protection of human health and the environment. The cap and liner are not impermeable even when new. Repair or replacement of technical components will be difficult if not impossible after site redevelopment. Institutional controls such as deed restrictions are notoriously unenforceable in the long term.

The vulnerability of the surficial aquifer, the only source of drinking water for Escambia County, makes C/C particularly unsuitable for ETC. The groundwater transports ETC contaminants into Bayou Texar, which is heavily used for recreation and fishing. Treatment should be employed to prevent ETC soils from continuing to serve as a source of groundwater contamination.

The Pensacola community is unanimous in its rejection of C/C for the ETC site. This includes entities who have rarely agreed on the issues related to environmental contamination in the community; this should be a strong statement that EPA is moving in the wrong direction.

Effective Combined Remedies

ETC contaminants include organic contaminants such as dioxin, polycyclic aromatic hydrocarbons, and pentachlorophenol, and metals such as arsenic. A combination of three of the alternatives evaluated in the ETC Feasibility Study is required for a permanent, protective, and effective remedy: Either Bioremediation (Alternative 4) or Chemical Oxidation (Alternative 5) could treat the organic contaminants effectively. Following this process, Solidification (Alternative 6) could stabilize the metals to prevent leaching and exposure. Then the residuals could be buried in lined pits onsite.

Response – See EPA's response to Comments 3.2.2, 3.2.3, 3.2.5, 3.2.6, 3.2.8, 3.2.9, and 3.2.10.

09/22/2005 11:27 AM

To:	LaTonya Spencer/R4/USEPA/US@EPA
Cc:	jeff.miller@mail.house.gov
Subject:	Escambia Wood Treating superfund site

Enid Sisskin, PhD

Gulf Coast Environmental Defense
PO Box 732
Gulf Breeze, FL 32563

September 22, 2005

L'Tonya Spencer, Community Relations
Superfund Remedial & Technical Services Branch
U. S. EPA, Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Ms Spencer:

Please accept these comments on EPA's soil remediation plan for Escambia Wood Treating superfund site on behalf of myself and the environmental group, Gulf Coast Environmental Defense.

The present plan is simply inadequate and unacceptable. Capping the untreated soil will do nothing to remove its toxicity and when it leaks (as it will eventually) our water will continue to be contaminated. This soil, and eventually the groundwater, will have to be detoxified. For this to be done, first the organics (dioxin, PCP, PAHs, etc.) must be detoxified using bioremediation or chemical oxidation, then the inorganics (arsenic and other metals) need to be stabilized using solidification, then the detoxified wastes should be buried onsite on top of a plastic liner. The dioxin levels after this treatment should then be to residential standards of 2 to 7 parts per trillion. Anything higher will not be protective of the public health. This recommendation is also endorsed by Citizens Against Toxic Exposure, the Bayou Texar Foundation, Pensacola Gulf CoastKeepers, the League of Women Voters of the Pensacola Bay Area, Bethel AME Church, Cedar Grove Baptist Church, Ebenezer Baptist, Morning Star Church,

In addition, the residents of Clarinda Triangle must be relocated. High levels of contaminants have spread into their yards on the west side of Palafox opposite the site, making it unsafe to live there. This information was not known when the other residents were relocated.

Thank you for the opportunity to comment on this plan.
Sincerely, Enid Sisskin, PhD

Response – See EPA's response to Comments 3.2.2, 3.2.3, 3.2.5, and 3.2.6.

09/22/2005 11:21 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:

Subject: Pensacola, FL Escambia Treating Site

EPA:

I am writing with my comments about the Escambia Treating Site. My remarks are below. I also spoke at the meeting when you were in town.

* The site should be cleaned up to residential standards.
* It will then be protective of our humans and the groundwater which we need.
* If it is not cleaned up to these proper standards then we have a time bomb underneath this area waiting until someone unwittingly does something to penetrate the cap and disturb the material underneath exposing humans and likely creating a way to further endanger our groundwater from contamination.
* The standard landfill procedure that has to date been extolled by the EPA as the method to handle this toxic mess is completely unacceptable as it is not even as protective as what was done by Conoco at the nearby Agrico site. And we know without a doubt that the contamination from the Agrico site and its plume has already moved more rapidly across our town and has reached the shores of Bayou Texar.
* We simply cannot have the risk of the contamination residing on the property.
* We must have proof of an improved method of treating this soil so that we are sure that the method that is used to DETOXIFY it is working. We must be shown that there are tests that have been conducted that prove that a detoxification method will work. This will likely involve a combination of a couple of the means outlined in the 7 presented. But NOT the one pitiful excuse of burying the untreated soil with a plastic liner underneath it. This is standard landfill treatment for standard refuse, not cancer causing highly dangerous deadly materials.
* We must have the means to test things over time to ensure that we have not got a problem later down the road.
* This method that has been suggested by you will not even let us redevelop the property as NO ONE would dream of putting anything near it.
* And last but not least, if this is not done there are attorneys chomping at the bit to represent us against the EPA.

XXXXX
E. Gonzalez St.
Pensacola, FL 32501

Response – See EPA's response to Comments 3.2.3, 3.2.5, 3.2.6, and 3.2.9.

09/22/2005 10:32 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Subject: ETC Public Comment

To all it may concern:

I am writing to express my opposition to the proposed plan for the Escambia Treating Company Superfund Site. We are completely dissatisfied with the cheap $25 million cover-up being offered at the expense of Pensacola resident's health and environment. We have waited long enough with these deadly carcinogens in our immediate environment and we want a long-term remedial response. What has been proposed is not protective of Escambia County's environment or public health in the long-term. Leaving the amount of dioxin present in the ground is dangerous, threatens future groundwater quality and diminishes future business opportunity along Palafox.

An April 9, 2000 Memorandum From J.I. Pamler, Jr., Regional Administrator for USEPA Region 4 regarding Region 4's Commitement to Environmental Justice states as follows:

"... this requires Region 4 to do the following : (a) adhere to the Agency's mission and Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", to protect the health of all people and the environment, particularly low-income and minority communities

(b) identify environmental issues and recommend remedies that take into consideration the desires of the attected communities;..."

The community surrounding Mt. Dioxin is a low-income and minority community, and this environmental justice has gone on too long to end in a shabby pseudo-solution of capping / containment. We would prefer to see alternative 3.2.3 or 3.2.4 implemented instead. I realize that cost is a big issue, obviously. Although the people of Pensacola deserve better than a cap. A cap was EPA's initial emergency removal response. It is time now for remediation of the contaminated soil.

I request a spreadsheet or list of all NPL Superfund Cleanup Projects completed by the EPA to date with their implementation costs as soon as feasibly possible, or a link to where I can access this information on the internet.

Also, could you direct me to the clause of CERCLA or SARA that addresses public/community approval?

XXXXX
Clematis St.
Pensacola, FL 32503

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

09/21/2005 05:01 PM

To: LaTonya Spencer/R4/USEPA/US@EPA
Subject: Controversial clean up.

Sept. 21, 2005

Dear Sir,

I strongly disagree with your plan to bury the toxiic waste on Palafox Street, here in Pensacola.

The GOVERNMENT is forever dictating to the citizens about cleaning old service station sites before a permit to build will be issued.

These sites have to be cleaned according to Government mandates.

So, why should you, the government do a half-way clean up procedure?? The toxic waste will still be in the ground to pollute the surrounding area.

The government gives billions of dollars to foreign countries every year. Pensacola is entitled to a few dollars.

XXXXX, Realtor

Response – See EPA's response to Comments 3.2.3 and 3.2.4.

09/21/2005 11:30 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: Superfund Cleanup in Pensacola, Florida

Ms. Spencer:

I am one of many in this community who find the latest offer of clean-up of the Escambia Treatment Plant site unacceptable. For the protection of citizens now and especially future generations, the clean-up must include detoxification of dioxin soils and solidification of inorganic materials. Ideally we would like to see the clean-up to a residential level of 2 to 7 ppb.

Realizing that the Superfunds are quickly dwindling with no plan for permanent ongoing replacement funds, this is a project that has been waiting much too long and funds need to be found now to get this job done.

Sincerely,
XXXXX

Wells Avenue
Navarre, Florida 32566

Response – See EPA's response to Comments 3.2.3, 3.2.4, and 3.2.5.

09/20/2005 11:41 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: Escambia Treating Co superfund site

Dear Ms. Spencer:

I am appalled that the EPA has proposed to cover this grossly contaminated site with plastic and bury it. This site has needed and should have a more comprehensive cleanup, as was previously proposed. Soil removal would serve to remove dioxins to prevent leeching into the groundwater aquifer. The health and safety of people who live and work in this area should be of the utmost concern. I urge you and your committee to reconsider the proposed cleanup plan, and initiate a more thorough cleanup of this Superfund site.

XXXXX
Pensacola, FL 32526

Response – See EPA's response to Comments 3.2.3 and 3.2.9.

09/20/2005 11:06 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: Escambia Treating Company Superfund site

I agree with local officials, that a "cleanup that is more protective of human health and the environment is needed at Escambia Treating Company Superfund site". I also concur with Representative Jeff Miller's statement that "permanent remedies for soil decontamination need to be made a priority". In our family, we have a saying which is: "when all else fails, lower your standards". I feel in this case, lowering standards is not an option. We must completely remove the problem soil, not cover it up.

Thank you,
XXXX XXXX

Response – See EPA's response to Comment 3.2.3.

09/20/2005 11:13 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: Pensacola, Florida Superfund Cleanup Plan

Dear Ms Spencer
There are two railroads that serve the Pensacola area. Both a located close to the superfund site. Run a short spur line to the site and ship the contamination to Nevada or Utah were there is a dump for such contaminants.

It's eventually going to cost the government more money trying to wrangle out of doing the cleanup, than actually doing it. Let's put bureaucratic mumbo jumbo aside and get on with it.

Sincerely,
XXXXX

Response – See EPA's response to Comments 3.2.4 and 3.2.7.

09/19/2005 03:21 PM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: Comment on Escambia Treating Company Superfund site

I am responding to the request for public comment in the Pensacola News Journal, 9/10/05. I feel that the EPA;s proposed $25 million cleanup of the Escambia site is adequate and should be done. I notice that the Florida Department of Environmental Protection also supports the plan. The opposition comes from politicians and local environmental activists who have scant training or education in this area. I have confidence in the professionals in the state and federal enviromental agencies and their proposals should be followed. I feel that I have some basis for offering this opinion based on a career of working with chemicals and having a PhD. in chemistry.

XXXXX

09/20/2005 08:27 AM

To: LaTonya Spencer/R4/USEPA/US@EPA

Cc:
Subject: Escambia Treating Co. Superfund Site

Dear EPA,

I am a resident of Pensacola who lives nowhere near the superfund site. I am in favor of SCRAPPING THE CURRENT PLAN TO CAP AND BURY proposal. Re-evaluate your alternatives and PLEASE remove the contaminated soil and detoxify the area. I can tell you right now if you continue with the present plan and Pensacola develops the area commercially, no one I know will go near it! I am also concerned about a breach in the "cap and bury plan" which would release toxins into our aquifer.

Please continue as if your mother were going to build a house in the middle of the site when you were finished. That is the right thing to do. Don't take shortcuts and mess with our health and lives!

Sincerely,
XXXXX
Greenbrier Blvd.
Pensacola, FL 32514

Response – See EPA's response to Comment 3.2.3.

09/20/2005 12:56 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:
Subject: pensacola superfund site

In regards to the Superfund site on Palafox St., I do not think the toxins should be reburied. Especially in plastic. Plastic molecules are almost as bad as the toxins. Frankly, since Pensacola is likely the most polluted city in the US, I think the whole town should be relocated and left to the military bases.

XXXXX, Pensacola, FL

Response – See EPA's response to Comment 3.2.3.

09/20/2005 12:21 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Cc:

Subject: proposed clean up plan for the Escambia Treating Co. Superfund site

I am writing regarding the proposed clean up plan for the Escambia Treating Co. Superfund site. While I am familiar with the many superfund sites in our area, it was only today that I gained any understanding of the current proposed clean-up plan from today's NewsJournal article:

http://www.pensacolanewsjournal.com/apps/pbcs.dll/article?AID=/20050919/NEWS01/509190320/1006

It sounds more like another prolongation of true clean-up by containing, burying and leaving for future people to deal with. This is a bad plan and the exact type of management that has gotten Escambia County Florida into the terrible sad, probably irrevocably polluted state it is in. It is past time to do some REAL clean-up in Escambia County and except nothing less from our local and federal government and above all agencies that exist for the very purpose of protecting our environment. Shame on the EPA. This plan will not protect our environment and they should know better than to suggest such a thing. Nothing less than a permanent clean-up of strictest standards should even be considered. This designation of "commercial" versus "residential" standards for clean up is, frankly, insane. Clean does not have degrees. Clean is clean, period! Otherwise it is NOT clean. We all drive past these local superfund sites. Our children are bused passed the sites and one school, ironically, Brown Barge Magnet School for our counties gifted students is right across the street from the site on Fairfield Drive. We all drink, cook and wash with the water that comes out of the ground here. How long, if not already until the toxins leach out into the local gulf and beyond. Do the individuals that propose this faulty plan live here and drink our water? Would they want their children to? Do they realize these toxins will eventually come to them wherever they live if clean-up plans like this are allowed anywhere? We cannot and must not quibble and debate with the clean-up of poison that is in our community, regardless of who did it, when, or who wants to do what with the particular piece of property as soon as this clean-up mess is taken care of. Is that the real issue here, let's literally bury the problem so we can get to the business of making money off of the land it is occupying? The one fact I know for sure is it has to be cleaned up. The other fact is this plan in unacceptable.

Response – See EPA's response to Comment 3.2.3.

09/20/2005 12:00 AM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc

Subject: clarinda lane

after reading an story in my local paper about the cleanup of the superfund site in Pensacola fl and the choices that the city thought that they would have i was thinking about the people that still live in the area that have not been relocated it looks like relocation should be first and the cleanup later people are still living in this area and they have been diyng all the time help us please

Response – See EPA's response to Comment 3.2.2.

09/19/2005 11:38 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc

Subject: Escambia Treating Company (Pensacola)

Dear Ms. Spencer,

Please allow me to add my voice and comments to those here in Pensacola who desparately want a "real" cleanup to the Escambia Treating Company Superfund site, locally known disparagingly as "Mount Dioxin."

I request, along with thousands of others, that the cleanup be accomplished to the Residental Standard. This site, badly contaminated with dioxin and other toxic "chemical soup" ingredients, is recognized to be one of the most toxic in the country, and a lesser "clean-up" would be a travesty. Leaving deadly toxins on-site in what amounts to a plastic bag - immersed in the upper level of our drinking water aquifer - is patently inadequate and WRONG to the point of being ludicrous.

I plead for the EPA to "do the right thing" and give us the proper environmental clean-up that we deserve. To do less should burden many consciences.

Resptectfully,
XXXXX, Pensacola

Response – See EPA's response to Comments 3.2.3 and 3.2.5.

09/19/2005 10:20 PM
To: LaTonya Spencer/R4/USEPA/US@EPA

Subject: Re: EPA - Pensacola - Escambia Treating Company

Ms. Spencer - regarding the Pensacola site, I am not a fanatic, but agree with the Escambia County Commission and City of Pensacola that the site should be treated and made fit (attractive) for commercial / business or clean industrial purposes.

It does NOT need to be remediated to the residential standard, but the EPAs proposed toping will not allow the community to recover from the 40 years of environmental abuse, regardless of whether it was intentional or not.

This community has been relegated to NO action for many years, while this elephant lies in our midst. I urge you to consider both the community and our economy as you evaluate an appropriate EPA response. The site is a highly visible blight on our population.

Thank you, XXXXX, Esplanade Drive, Pensacola 32506.

Response – See EPA's response to Comment 3.2.3.

09/19/2005 06:11 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc
Subject: Escambia Treating Company Superfund Site

Dear Ms Spencer,
It is my opinion that anything other than complete destruction of all contaminated soil at the Escambia Treating Comany Superfund site is not acceptable. Capping the site is a recipe for a future disaster. Do the right thing and get this site cleaned up properly. Have it done once correctly. Thank you, XXXXX in Pensacola

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

09/19/2005 06:40 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc
Subject: Pensacola - Escambia Treating Company

Ms. Spencer,

As a decades-long resident of Pensacola I respectfully request that the EPA not adopt its proposed clean-up plan for the Escambia Treating Company site and adopt a plan involving the detoxification of the affected soils.

Local officials, federal elected officials and the citizens of Pensacola are opposed to the plan and want the EPA to address this toxic neighbor fully while it has the chance. The people of Pensacola have lived too long with this disease-causing parcel and we respectfully request that the EPA use its resources to eliminate, not put a plastic cap on, the problem.

I appreciate your consideration.

XXXXX
Emerald Coast Parkway
Destin, FL 32541

Response – See EPA's response to Comment 3.2.3.

09/19/2005 08:04 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc
Subject: PENSACOLA,FL. SUPERFUND SITE

AS A FEDERAL, STATE, LOCAL TAXPAYER, I EXPECT NOTHING LESS THAN REMOVAL OF THIS CONTAMINATED SOIL FROM THIS SITE. THAT IS WHAT THE FEDERAL GOVERNMENT IS MANDATED TO DO TO SAFEGUARD ITS CITIZENS. ON A PERSONAL NOTE, IF YOU LIVED NEARBY, I'M SURE YOU WOULD BE CONCERNED FOR YOUR FAMILY, NEIGHBORS, AND FRIENDS. I DON'T KNOW WHAT HAS HAPPENED TO THE EPA DURING THIS ADMINISTRATION, BUT I'LL TELL YOU, ITS NOTHING LIKE IT WAS IN THE PAST WHEN IT WORKED. AS A CIVIL SERVANT MYSELF, I UNDERSTAND UPPER-LEVEL INTRUSION IN PERFORMING MY JOB. BUT THIS IS A NO-BRAINER, DO THE MAXIMUM NECESSARY TO KEEP U.S. CITIZENS SAFE.
THANK YOU,
XXXXXX

Response – See EPA's response to Comment 3.2.3.

09/19/2005 03:53 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
Subject: public comment Escambia Treating Company Superfund Site Operable Unit 1

public comment Escambia Treating Company Superfund Site Operable Unit 1

Sept. 19, 2005

Dear L'Tonya Spencer,

I believe the EPA must take the clean up the Escambia Treating Company Superfund Site to the highest degree possible. No short cuts are conscionable when residents' health and lives are in the balance. Please remember that the health and safety of generations of Pensacola families are at stake here. The superfund program was set up to clean up waste sites, not cover them up.

EPA's proposed "Capping" of the 600,000 cubic yards of poisonous soil at the Escambia Treating Company Superfund Site is unacceptable.

The EPA needs to firstly provide relocation for the residents of the Clarinda Triangle. High levels of contaminants have spread into their yards on the west side of Palafox opposite the site, making it unsafe to live there. When the previous relocations of 358 families were approved, EPA had not done enough soil testing to determine the risk to residents. CATE urges permanent relocation of Clarinda Triangle residents.

Secondly, Capping is not an acceptable method of soil cleanup. Toxic soil would be buried in a plastic bag onsite, immersed in the upper portion of the drinking water aquifer. The plastic is flawed when new and its seams have gaps, so there will be leakage from day one. And the plastic has only a 30-year life expectancy. If the site is redeveloped, there will be no access for repairing the inevitable leaks.

Instead, the EPA must engage in a 3-step process:
First, detoxify the organics (dioxin, PCP, PAHs, etc.) using Bioremediation or Chemical Oxidation.
Second, stabilize the inrganics (arsenic and other metals) using Solidification.
Third, bury the detoxified wastes onsite on top of a plastic liner.

Finally, the EPA should choose the most protective ("residential") standard for this site.

Sincerely,
XXXXX
Pontiac Rd
Pensacola, FL 32506

Response – See EPA's response to Comments 3.2.2, 3.2.3, 3.2.5, 3.2.6, and 3.2.10.

09/19/2005 04:52 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc
Subject: Escambia Treating Clean Up

I am appalled but not surprised at the level of clean up proposed by the EPA.
We already have the road map of what can happen with this type of clean up with Escambia Treating's superfund neighbor, Agrico. We have a very fragile aquifer in Northwest Florida. We have numerous superfund sites. We are in a period of time where we are the bull's eye (or extremely close to it) of major hurricanes (just look at our history

since 1995). Imagine the disaster when all of these factors come together. We can't say it won't happen or it is an acceptable risk - surely Katrina has taught us that much.

Regards;
Christine Fade
former Chair,
Escambia County
Citizens Environmental Committee

Response – See EPA's response to Comments 3.2.3 and 3.2.9.

09/19/2005 02:48 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc
Subject: epa claeaup plan for escambia treating site

Of all the options available, the EPA plan is the best. It keeps the toxins in one place and places a barrier to keep them from spreading further. To attempt to remove them will only result in contaminating other areas. It's better to leave it alone than to scatter it around. If it were possible to somehow wash all of it out of the soil (which it isn't) what would they do with it then? It has to be someplace so leave it alone. Once barriers are in place to contain it, it should do no further damage. We have to accept the fact that much of the damage we do to our environment simply cannot be undone. Our efforts and money would be better spent toward avoiding activities that cause such problems in the future.
Yours Truly'
XXXXXX
bell ridge drive
Pensacola, Fl 32526

09/19/2005 02:25 PM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc

Subject: Escambia Treating Company Superfund site

Ms. Spencer,

I wish to comment on the EPA's plan for cleaning up this site in Pensacola. The plan to "cap and bury" more than 560,000 cubic yards of contaminated soil is unacceptable. Pensacola is the superfund capital of this country. It is time that the EPA hear and take to heart the will of the public and that is that better, more permanent solutions must be found in order to protect this community from the sins of its past. This is a serious public health issue in this community. Please register my comments in the "opposed to the current plan" column.

Thank you,

XXXXX
Fleming Drive
Pensacola, FL 32514

Response – See EPA's response to Comment 3.2.3.

09/19/2005 11:59 AM
To: LaTonya Spencer/R4/USEPA/US@EPA
Subject: (no subject)

I totally agree with your decision to wait until the EPA gets it right!

My husband and I moved here from Pittsburgh six months ago and are familiar with toxic waste. We have part of Lake Erie and though it has been cleaned up over the years, there is still a long way to go.

Sometimes I wonder how much "protecting" the EPA does! A short range fix does not guarantee long range safety for Pensacola!

XXXXXX

Response – See EPA's response to Comment 3.2.3.

XXXXXX
E. Gonzalez Street
Pensacola, FL 32501

September 19, 2005

L. Tonya Spencer
Community Relations
Superfund Remedial
& Technical Services Branch
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Spencer.latonya@epa.gov

Re: Escambia Treating Company Superfund Site
Pensacola, Florida

Dear Ms. Spencer:

The purpose of this letter is to register my strong complaint against the EPA simply putting the contaminants at this site in a "plastic bag", capping it, and not treating the contaminants. This is one of the most dangerous Superfund Sites in the United States. The contaminants need to be either chemically treated or burned, so that they are reduced to an inert state. I urge EPA to change its position on this issue and dispose of the contaminants in a proper way.

Sincerely,
XXXXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

XXXXX
E. Gonzalez Street
Pensacola, FL 32501

September 19, 2005

L. Tonya Spencer
Community Relations
Superfund Remedial
& Technical Services Branch
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Spencer.latonya@epa.gov

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Pensacola, Florida

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Sincerely,
XXXXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

XXXXX
E. Gonzalez Street
Pensacola, FL 32501

September 19, 2005

L. Tonya Spencer
Community Relations
Superfund Remedial
& Technical Services Branch
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Spencer.latonya@epa.gov

Re: Escambia Treating Company Superfund Site
Pensacola, Florida

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Sincerely,
XXXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

XXXXX
E. Gonzalez Street
Pensacola, FL 32501

September 19, 2005

L. Tonya Spencer
Community Relations
Superfund Remedial
& Technical Services Branch
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Spencer.latonya@epa.gov

Re: Escambia Treating Company Superfund Site
Pensacola, Florida

Dear Ms. Spencer:

The purpose of this letter is to register my strong complaint against the EPA simply putting the contaminants at this site in a "plastic bag", capping it, and not treating the contaminants. This is one of the most dangerous Superfund Sites in the United States. The contaminants need to be either chemically treated or burned, so that they are reduced to an inert state. I urge EPA to change its position on this issue and dispose of the contaminants in a proper way.

Sincerely,

XXXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

09/19/2005 11:30 AM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc

Subject: Pensacola Superfund cleanup plan

I am requesting that you reconsider the cleanup alternatives before making your final decision. My elected officials want a cleanup that is more protctive of human health and the enviromen, which includes detoxifing the contaminated soil.

XXXXX

Response – See EPA's response to Comment 3.2.3.

09/19/2005 10:04 AM
To: LaTonya Spencer/R4/USEPA/US@EPA
cc

Subject: Superfund site in Pensacola

Dear Ms. Spencer:

I am writing this to let you know I support the efforts of Senator Nelson and our local officials in asking that EPA reconsider the clean-up alternatives for the Superfund site in Pensacola.

Respectfully,

XXXXX

Response – See EPA's response to Comment 3.2.3.

09/19/2005 10:46 AM
To: LaTonya Spencer/R4/USEPA/US@EPA

Subject: Pensacola Superfund cleanup plan

Please reconsider your proposed cleanup to allow Pensacola to put the long idled land to good use. Your proposed cleanup is inadequate and I plead with you to follow the requests of my city, county and state leaders.

This cleanup is long overdue.

XXXXX

Response – See EPA's response to Comment 3.2.3.

09/19/2005 10:41 AM
Subject: Escambia Treating Co. Superfund Site - Pensacola, FL

XXXXX
Waycross Avenue
Pensacola, FL 32507-2763
September 19, 2005

L. Tonya Spencer
Community Relations
Superfund Remedial
& Technical Services Branch
U. S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Re: Escambia Treating Company Superfund Site
Pensacola, Florida

Dear Ms. Spencer:

The purpose of this letter is to register my strong complaint against the EPA simply putting the contaminants at this site in a "plastic bag", capping it, and not treating the contaminants. This is one of the most dangerous Superfund Sites in the United States. The contaminants need to be either chemically treated or burned, so that they are reduced to an inert state. I urge EPA to change its position on this issue and dispose of the contaminants in a proper way.

Sincerely, XXXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

XXXXX
09/19/2005 10:14 AM
To: LaTonya Spencer/R4/USEPA/US@EPA

Subject: (no subject)

Dear Ms. Spenser,

I am a citizen of Escambia County Florida. I believe that the clean up of the Escambia Treating Company Superfund cite should be done by decontamination of the soil. The current proposal for burying the contamination on site is not enough. The toxic chemicals should be removed. My children went to school near that site and I am worried about their exposure and the possible exposure of others.

Sincerely,

XXXXX

Response – See EPA's response to Comments 3.2.1, 3.2.3, and 3.2.6.

09/19/2005 09:24 AM
To: LaTonya Spencer/R4/USEPA/US@EPA

Subject: Escambia Treating Company Clean-Up

L'Tonya Spencer
Community Relations
Superfund Remedial & Technical Services Branch
U.S. EPA Region 4

Dear Ms. Spencer,

The proposed solution of burying the contaminated soil at Escambia Treating Company in Pensacola, Florida is absolutely unacceptable. This ongoing, environmental tragedy needs to be properly remedied once and for all.

I was surprised at the attention given to the recent alarm over the contaminated water in the flooded New Orleans area. What about the people who have been living (and the children who have been going to school) on contaminated land here in Pensacola for decades?

Is it not the responsibility of the EPA to safeguard the public against these hazards?

The people of Pensacola have been patiently waiting for the government to step up and do the right thing for years. That time has come.

Sincerely,
XXXXX
Winderemere Circle
Pensacola, Florida

Response – See EPA's response to Comment 3.2.3.

10/30/2005 06:23 PM

To: L'Tonya Spencer, Community Relations

Subject: Escanmbia Treating Co. Superfund

LaTonya Spencer, Community Relations
Superfund Remedial & Technical Services Branch
U.S. EPA, Region 4

Dear Ms. Spencer:

I am writing from Pensacola, Florida in regard to Escambia Treating Co. Superfund Site and proposal for soil cleanup.

I am writing to urge the EPA to use the effective 3-step process to clean up this Superfund Site, that is:

To detoxify dioxin, PCPs and other carcinogenic organic contaminants;
To stabilize arsenics, metals and other inorganic contaminants;
And to bury detoxified wasts onsite on top of a plastic liner.

I oppose EPA's proposal of "capping" the poisonous soil as inadequate. This would not be a "solution"; it would be a short term cover-up. Being "cheap" now will lead to later catastrophe. Burying toxic soil in plastic that will last no longer than 30 years is unacceptable.

Citizens are sick of hearing "Who coulda known?" from the governmental agencies responsible for public safety and health.

XXXXXX
Pensacola, Florida
Concerned citizen and member of Pensacola Gulf CoastKeepers

Response – See EPA's response to Comments 3.2.3, 3.2.6, and 3.2.10.

10/30/2005 06:23 PM

To: L'Tonya Spencer, Community Relations

Subject: Escanmbia Treating Co. Superfund

To: LaTonya Spencer

Instead of active detoxification, it is not acceptable that EPA's proposal to solidify with cement about 13% of the 600,000 cubic yards of poisonous soil at the Escambia Treating

Company's Superfund Site before burying it in plastic lined pits onsite. IT NEEDS TO BE CHEMICALLY REDUCED AND NEUTRALIZED! This should once and for all be taken care of, not able to come back and haunt us in the future.

Please listen to the citizens of Escambia County, Florida, when we ask that this waste be eliminated, not just covered up and/or treated.

Thank you for your attention and assistance in this matter.

XXXXX
Waycross Avenue
Pensacola, FL 32507

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

To: L'Tonya Spencer, Community Relations

From: XXXXX
Soundside Drive
Gulf Breeze, FL 32563

Date: November 26, 2005

Subject: **Comments on the Updated Proposed Plan for the Escambia Treating Company Superfund Site (ETC) Operable Unit 1**

The proposal for permanent relocation of the Clarinda area residents is the most important element of the October Proposed Plan Update. I strongly urge EPA to proceed with this relocation with all possible speed, taking into account the need for adequate compensation of residents. It is essential that residents be moved into new homes before soil disturbance results in additional exposures to the ETC contaminants.

The proposed solidification of some 13.5% of the contaminated soil is a minor improvement over the capping-only plan in the August document. The solidification of 100% of the soil may be an effective mechanism for stabilization of the arsenic and other metals, but only after the organic contaminants have been removed by chemical oxidation or bioremediation.

Burial of ETC wastes without these two steps leaves the toxic materials vulnerable to leaks in the cap and liner and to damage due to onsite redevelopment construction.

In the absence of manufacturer lifetime guarantees or performance bonds, it is impossible to have confidence in assurance that the "containment" system is impervious and will remain so for hundreds of years.

The stakes are high: beneath this site is the vulnerable aquifer which serves as the soil source of drinking water for hundreds of thousand of county residents and which discharges into the Pensacola Bay System, an estuary of the Gulf of Mexico, which is heavily used for fishing and recreation.

I look forward to redevelopment of the site and surrounding areas, but ETC is one of the largest and most toxic Superfund sites. Worker must not be directly exposed to the wastes during redevelopment or subsequent operations. Access for repair of the "containment" system after redevelopment will be prohibitively difficult. In the long term, reliance on local authorities to monitor and enforce institutional controls is not likely to succeed.

This is a site at which the National Contingency Plan's preference for permanent reduction of toxicity must determine remedy selection in order to protect human health and the environment.
Finally, the Florida industrial dioxin soil standard (30 parts per trillion) is not sufficiently protective because of the multiple contaminants and multiple pathways of exposure. Furthermore, the standard is based on cancer threat only, with no consideration given to the even greater non-cancer threats, and for an 8-hour working day only, rather than full-time daily exposure. Therefore, the NCP's direction to se the 10-6 risk levels as the point of departure should result in the use of the residential standard of 7 ppt or less.

Thank you for this ooportunity to submit comments for the public record.

Response – See EPA's response to Comments 3.2.2, 3.2.3, 3.2.5, 3.2.6, 3.2.8, 3.2.9, and 3.2.10.

LaTonya Spencer, Community Involvement Coordinator
David Keefer, Remedial Project Manager
Superfund Remedial & Technical Services Branch
U.S. Environmental Protection Agency\line Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

November 25, 2005

Re: US EPA Escambia Treating Company Site Proposed Plan Update

Dear Ms. Spencer and Mr. Keefer:

I am a stakeholder in the cleanup of the Escambia Treating Company site. I was born on Marshall Lane, approximately half of a mile from the ETC site. The first eighteen years of my life I lived approx. 2 miles from the site along Carpenter's Creek, contaminated by ETC. This December I will graduate from the University of West Florida with a

Bachelor's degree focused on Environmental Studies. Further, I have been an active researcher of the ETC site for the past five years, and my experience includes working for the Escambia County Neighborhood & Environmental Services Dept.
My questions, comments, concerns, and opinions regarding the ETC Proposed Plan Update are as follows:

The extent of off-site contamination has not been established. Adequate sampling has yet to be conducted to determine the horizontal geographical extent of contamination from the ETC site. Soil sampling has only been conducted in the immediate vacinity of the site. How far the contamination extends remains unknown because it has not been investigated properly. Sampling of surface and sub-surface soils conducted by the FDEP in 2004 at the Brown Barge Middle School, located at 151 E. Fairfield Drive and .78 miles from the site, indicated the presence of contaminants associated with the ETC site above residential and even industrial standards in some samples. Dioxin was present in two surface soil samples at twice the residential standard. Also PAH's were detected above residential standards, and therefore the BBMS school site should be included in the off-site excavation.

Thousands of residents live within a 3-mile radius of the site, and soil sampling should continue horizontally until concentrations are found below the residential soil cleanup target levels and MCLs. As Mt. Dioxin is located at a higher elevation than surrounding areas, runoff for the past 50 years has moved contaminants off-site down-gradient. There are several public schools in the vacinity of the site where soil should be sampled to determine the concentrations of contaminants from ETC present including the following:

School	Street Address / Zip	Distance to ETC
Spencer Bibbs Elementary	2005 N. 6th Ave. 32503	2.15 miles
AA Dixon Elementary	1201 N. H St. 32501	2.74 miles
Brentwood Elementary	4820 N. Palafox St. 32505	7.1 miles
Pensacola High School	500 W Maxwell St. 32501	1.82 miles
O.J. Semmes Elementary	1250 E. Texar Dr. 32503	1.93 miles
Brownsville Middle	3700 W. Avery St. 32505	2.87 miles
Brentwood Middle	201 Hancock Ln. 32503	2.64 miles
Oakcrest Elementary	1820 Hollywood Ave. 32505	2.85 miles
Allie Yniestra Elementary	2315 W. Jackson St. 32505	2.84 miles
Petree Pre-K	916 E. Fairfield Dr. 32503	1.57 miles
C.A. Weis Elementary	2701 N. Q St. 32505	1.31 miles

The Proposed Plan Update states that "additional sampling will be performed during remedial design to establish 'cut-lines' for the excavation in both on- and off-site areas. These cut lines will be based on achieving remedial cleanup goals both horizontally and vertically using excavation equipment appropriate for this action. The final limits of excavation will be based on the results of verification samples collected during construction.

The plan does not address the methodology EPA will use to conduct additional sampling. To determine the horizontal extent of surface and subsurface soil contamination, samples should be taken of a three-mile radius, and further if results prove necessary, to reach a point where samples detect concentrations of contaminants below MCLs and SCTLs. EPA sssumptions may minimize the number of residents in need of relocation due to concentrations of toxicants from ETC site. The Clarina Lane residents, located only .18 miles from the site and basically at ground zero, surely should be relocated from their toxic neighborhood. The relocation of Clarinda Lane residents easily leads to a simple question: how was it decided that these residents should be relocated and those other also within a mile of the site should not? I am not aware that soil sampling has even been conducted on any of the following streets within a mile of the ETC site to determine concentrations of contaminants:

Street	Distance from ETC
Loretta St.	30 miles
Beggs Lane	.55 miles
Marshall Lane	.85 miles
Murphy Lane	.98 miles

The streets listed above are only four of many that ought to be considered and sampled for contamination from ETC at levels that would necessitate relocation. Please see the attached map with an illustrated one-mile radius from ETC. Soils on all residential streets within this one-mile boundry should be tested and analyzed. I suggest that soils are likely to be contaminated beyond .18 miles from the site. And as previously mentioned, horizontal samples should continue to the distance at which concentrations of all associated toxicants are detected below state residential standards.

Methods to protect human health during excavation of toxic contaminants at ETC are not addressed within the proposed plan. This is of great concern as an acute exposure is likely to occur as contaminants are excavated and dispersed into the air. (And the acute exposure will only add to the chronic exposure nearby residents have experienced throughout their lives). While the plan states that "...it is assumed that the cap will include the specific components discussed below. The remedial action goal for the cap is to meet the establised remedial actions objectives: prevent ingestion, inhalation, or direct contact with surface soil that contain concentrations of contaminants in excess of remedial goals..." it does not address how inhalation of toxic dusts will be avoided in the process. The public should be informed of the methods that will be used to ensure the protection of their health during the remediation process at ETC in order to evaluate the effectiveness of those methods.

Geomembrane intended for use is not specified in the plan. While plan specifies "(60-mil geotextile)", this does not provide the adequate information necessary to evaluate its appropriateness for ETC. These plastic liners typically degrade in as little as 30 years and this does not provide the "long-term" protection that EPA suggests in the proposed plan. The public should be informed of what specific geotextile is being proposed along with access to associated information about the membrane including what it is made out of and how long it is expected to last. The local group Citizens Against Toxic Exposure claims that "...The plastic is flawed when new and its seams have gaps, so there will be leakage from day one. And the plastic has only a 30-year life expectancy...," and EPA provides no information to suggest otherwise. 60 mil. of plastic is not protective of the groundwater.

Proposed cap will only delay the infiltration of contaminants into the groundwater and does not assure the protection of groundwater over the long-term. As the geomembranes will become ineffective after a period of time, the only proposed barrier between the precipation and the contaminants buried above the water table will be 18 inches of native soil and a 2 ft. clay layer. Native soil is sandy and has high permeability. Thus, this layer will not prevent infiltration of water through contaminated soils down into the drinking aquifer. This leaves only a 2 ft. clay layer, which will only delay infiltration and will not protect the groundwater in the long-term. Clay is not completely impermeable.

Once the remediation plan has been implemented and completed, it will be very difficult and expensive to remedy if monitoring indicates that the containment and cap system has failed to protect the aquifer. Also at that time, the ETC site will have become less a priority on the NPL list and have less opportunity for funding. The cleanup must be done effectively the first time. While the best plan of action would include detoxification of highly toxic soils, minimally a clay layer should be built not only above, but also below the contaminated soils on-site. Why is detoxification of the soil not part of EPA's preferred remedy for ETC?

I hope that you will take these concerns into consideration when updating the proposed plan. It is my opinion that the public has yet to be adequately informed of specifics necessary for informed evaluation, and that EPA has not adequately characterized the extent of the contamination, its sampling and excavation methodology, or scientific basis for the proposed cap and containment system as a long-term solution.

Respectfully submitted,

XXXX

Response – The RI provided sufficient data necessary so that a general estimate of the quantity of contaminated soil could be generated for the Feasibility Study. The extent of contamination will be further defined by a thorough investigation that will include both surface and subsurface soil sampling during the RD phase. All soil impacted by the ETC site, which contains contaminant concentrations above the site Cleanup Goals will be excavated and consolidated in the containment cell. Also, see EPA's response to Comments 3.2.2, 3.2.3, and 3.2.10.

11/25/2005 06:05 PM

Escambia Creosote Treatment Company

Dear Ms. Spencer:

In regards to recent meetings:

I object to proposed cleanup measures.

I suggest clean up of the 26 acre site with a combination of:

Phytoremedial plants and trees.
Bioremediation or Chemical Oxidation
Stabilize and Secure detoxified wastes

Thank You,
XXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

11/23/2005 11:07 AM
Hickory Shores Blvd. Gulf Breeze, FL. 32563

Objection to Industrial Standard of Dioxin Cleanup/Escambia Treating Co. Superfu

The industrial standard of Dioxin cleanup is not good enough!

EPA's proposal to "solidify" with cement about 13% of the 600,000 cubic yards of poisonous soil at the Escambia Treating Company Superfund Site before burying it in plastic-lined pits onsite, is totally INAPPROPRIATE AND UNACCEPTABLE!

What's wrong with EPA's plan?

1. Still-toxic soil would be buried in a plastic bag onsite, immersed in the upper portion of the drinking water aquifer. The plastic is flawed when new and its seams have gaps, so there will be leakage from day one. And the plastic has only a 30-year life expectancy.

2. The cement will not immobilize the organic contaminants such as Dioxin and carcinogenic PAHs.

3. Building new businesses on the site may break through the covering on the toxic waste.

4. If the site is redeveloped, there will be no access for repairing the

inevitable leaks.

5. The sole drinking water source for hundreds of thousands of residents is 40 feet of sand below the site.

What would work to clean up Mt. Dioxin effectively?

It would require a 3-step process:

First, detoxify the organics (Dioxin, PCP, PAHs, etc.) using Bioremediation or Chemical Oxidation.

Second, stabilize the inorganics (arsenic and other metals) using Solidification.
Third, bury the detoxified wastes onsite on top of a plastic liner.

Dioxin is extremely toxic. It is carcinogenic, and even smaller amounts damage the brain and neurological system, cause birth defects, and impair immune function. The disease rate in this area is extremely high. Could environmental factors be a major cause? I think possibly they are a main factor.

Since only the cancer threat is considered in setting cleanup levels, EPA should choose the most protective (residential) standard, not the least protective (industrial) standard, for this site.

XXXX & XXXX XXXX
Hickory Shores Blvd.
Gulf Breeze, FL. 32563

Response – See EPA's response to Comments 3.2.3, 3.2.5, 3.2.6, 3.2.8, 3.2.9, and 3.2.10.

11/23/2005 11:31 AM
Hickory Shores Blvd. Gulf Breeze, FL. 32563

Escambia Treating Co. Superfund Site Operable Unit 1 (Pensacola, FL)

To: LaTonya Spencer

Instead of active detoxification, it is not acceptable that EPA's proposal to solidify with cement about 13% of the 600,000 cubic yards of poisonous soil at the Escambia Treating Company's Superfund Site before burying it in plastic-lined pits onsite. IT NEEDS TO BE CHEMICALLY REDUCED AND NEUTRALIZED! This should once and for all be taken care of, not able to come back and haunt us in the future.

Please listen to the citizens of Escambia County, Florida, when we ask that this waste be eliminated, not just covered up and/or treated.

Thank you for your attention and assistance in this matter.

XXXX
Hickory Shores Blvd.
Gulf Breeze, FL. 32563

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

11/22/2005 03:05 PM

Mt. Dioxin cleanup

Dear Ms. Spencer,
It is disgraceful that the EPA would consider the proposed cleanup of Mt. Dioxin (Escambia Treating Company Superfund Site Operable Unit 1) adequate.

I know that it is more expensive to do it right, and the people in the local community are just "poor old black folks," most who have been relocated anyway. However, Mt. Dixon is located in one of the highest points in the county, over the sand and gravel aquifer. which is the drinking water source for all of Pensacola. It is "upstream" of the "rich folks." The leakage from the site will affect everyone in the county, causing problems that will far out weigh the cost of doing the cleanup correctly.

The underground plume from Mt. Dioxin has already combined with the plum from the Agrico super fund site. The Agrico plume contains lead, fluoride, and other nasty chemicals. Fluoride chemicals are highly reactive, increasing the toxicity of other chemicals. An example of this is Sarin nerve gas, which can be produced by combing orthophosphates (Dursban for example) with fluoride. Dursban is a toxic chemical, but not nearly as toxic as Serin. I am unaware of any research being done to see what is being created under the ground in these plums.

Please ask yourself if you would want your family and children living in a place where the drinking water is being polluted with dioxin, creosote, and all the other chemicals present at the Escambia Treating Co. site, in addition to the unknown compounds created by the mixing of the Mt. Dioxin and the Agrico plum.

The EPA needs to perform a cleanup that will remove the problem, not just burry it. The following steps are necessary:

First, detoxify the organics (Dioxin, PCP, PAHs, etc.) using Bioremediation or Chemical Oxidation.

Second, stabilize the inorganics (arsenic and other metals) using Solidification.
Third, bury the detoxified wastes onsite on top of a plastic liner.

If these steps are performed, then the citizens of Escambia county will not have to worry that their drinking water will be poisined by an inneffective cleanup.

Thank you,
XXXX

Response – See EPA's response to Comments 3.2.3, 3.2.4, 3.2.6, and 3.2.9.

11/22/2005 10:47 AM

Mt. Dioxin - Pensacola, FL

The proposed plan to clean up this "Superfund" site is insufficient and does not properly protect the health and safety of the residents of Escambia County.

The EPA needs to implement a plan that goes further and does more to clean up this horrible place.

XXXX XXXX
Pensacola, FL

Response – See EPA's response to Comment 3.2.3.

11/21/2005 10:23 PM

Re: Pensacola Superfund site

L'Tonya, I am a new resident of Pensacola. I do not have the lengthy knowledge of why the superfund site has been ignored for so long - or why the citizens living closeby have had to live through this tragedy.

I do not hold the company which operated legally years ago. I do hold public officials responsible who have known for over a decade and chosen to do nothing.

The most important thing for Pensacola is to do something now - the site should be remediated to 1) allow safe redevelopment for commercial usage and 2) make sure that the Pensacola water supply is not contaminated as a result of whatever course of action is taken.

This is an economically hurting area. While hurricane Ivan did not get the publicity afforded other areas this year, it was devastated - and it will take 3-5 years for significant recovery. It needs this site available for community redevelopment.

The community needs to get moving on the Mt.Dioxin site - please consider the impact of your decision on a devastated community - from hurricane Ivan and from many years of neglect. In addition, the most disadvantaged part of the community has had the most proximity to the site. It must be cleaned up - now. The people cannot wait any longer.

FYI, attached information I received from the community group that wants the site remediated to its natural state. I do not believe that is necessary - as long as my 2 objectives are met.

Thank you,
XXXX XXXX, Pensacola, Florida

11/21/2005 09:43 PM

Mt. Dioxin -- clean it up RIGHT

Please **DO THE RIGHT THING** - Clean the toxic soil up as if you would if your own child were going to be playing on the site or drinking the water!!!! Anything less is not satisfactory! Please include this request in the record of public input to be considered before EPA makes its decision re active detoxification of the Mt Dioxin site. Thank you!

XXXX

Response – See EPA's response to Comments 3.2.3 and 3.2.6.

Katherine D. Wade

PH: 850-432-5659
Cell: 850-291-8907

Clarinda Triangle Association

RE: Health Issues

We the residents of the Clarinda Triangle stand together and demand that we be compensated for the exposure that we have lived throughout the years and for most of our lives. We respect the fact that each and every neighbor might all face health issues and this current selective process will have long been extinguished. The opportunity presents itself now to ask for what is due to us currently. We did not ask to be exposed and only feel we should be compensated for the exposure as well as the buying out of our homes, also paying us for irrefutable damage that is continuing taking force and that has yet to come. The government is responsible for the lack of guidelines and the exposure. Our marketability has been compromised, our neighborhood has a stigma attached to it as a contamination area or zone. We have lost the ability to effectively sell our once viable properties in any way other than commercial.

All of our families have been affected. Our work, our children, our homes and church have been compromised. There has been disruption of our personal lives, we have lost friends and neighbors. Death is all around us.

Due to the fact that we are not aware of all of our rights and the contingencies involving this situation, we will be seeking legal advice regarding our options.

Thanks you so much for your time,
Respectfully,

Katherine D. Wade

Katherine D. Wade

PH: 850-432-5659
Cell: 850-291-8907

Clarinda Triangle Association

RE: Health Issues

We the residents of the Clarinda Triangle would like to make sure that not only the value of our homes and property but the *commercial* value be considered. We know that the value of commercial property will be estimated much higher than residential. We have to compensated fairly and with dignity. The sale of our property in the Clarinda Triangle is a matter far more complex than just simply buying us out of our homes. A realtor gave me the value of commercial property versus residential property and I know that this area is now designated commercial, therefore we expect to be paid on that basis.. We demand to be treated fairly and to be given our just due.

We all are joined together and support the best clean up effort available. Put human lives first, do not take short cuts. Relocate us expeditiously and with compassion with respect to all of the residents of this community and the county in general. We expect to be paid what is fair and will not move for any less than what is right.

Please do not take advantage of some of our individuals in the area who lack the understanding of some of these issues and are ignorant to all of the complexities that have come forth. I will stand firm to help them understand and not let or local government, EPA or any organization abuse their power or muscle and the truth. Let's work together so we can get back to normalcy and family life.

September 21, 2005

David Keefer, Project Manager
U.S. Environmental Protection Agency (EPA)
Region IV
61 Forsythe Street SW
Atlanta, Georgia 30303

Dear Mr. Keefer:

Enclosed you will find the comments on the EPA OU-1 proposed plan for the Escambia Treating Company Superfund Site prepared by Ms. Wilma Subra, our Technical Advisor. Please feel free to call Mrs. Margaret L. Williams, President Emeritus or Mrs. Francine Ishmael, President at (850) 478-5799 if you have any questions.

Sincerely,

Francine Ishmael, President
Citizens Against Toxic Exposure (CATE)

COMMENTS ON THE EPA OU-1 PROPOSED PLAN FOR THE ESCAMBIA TREATING COMPANY SUPERFUND SITE

Prepared by Wilma Surba
Technical Advisor to Citizens Against Toxic Exposure (CATE)
September 26, 2005

CLARINDA TRIANGLE

With the exception of the no action alternative, all of the alternatives presented in the Proposed Plan list two options for Clarinda Triangle.

Option A – Permanent Relocation of 55 Clarinda Triangle households

– Excavation of contaminated soils down to commercial cleanup levels

Option B – Temporary Relocation of 55 Clarinda Triangle Households

– Excavation of contaminated soil down to residential cleanup levels

– Return residents to their homes

The permanent relocation option will remove the Clarinda Triangle residential community from current ongoing exposure to the Escambia Treating Compound contaminants which are currently located in the soil in the Clarinda Triangle area and insure the Clarinda Triangle community is not exposed to contaminants associated with the Escambia Treating Company (ETC) site during remediation activities. The slightly higher cot of the permanent relocation option is justified based on the past and current ongoing exposure and potential for future exposure to chemicals associated with the ETC site.

In order to prevent further exposures to residents, relocation of the Clarinda Triangle must occur before implementation of the remedy at the ETC site is initiated.

DIOXIN REMEDIATION GOAL

The National Contingency Plan directs EPA to use the residential cleanup standard under certain conditions:

"The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure..."

EPA has based its remediation goals solely on current zoning and a redevelopment plan, apparently without considering the known human health risks of Dioxin or the physical conditions at the site.

EPA is recognizing the Florida standards as ARARs; however, for Dioxin, the 30 parts per trillion (ppt) Florida industrial standard is not sufficiently protective for several reasons:

- First, the Florida industrial / commercial standard is based on exposure for only eight hours per day, rather than the 24-hour per day exposure risk intended in the National Contingency Plan.
- Second, the 30 ppt industrial standard is based on the cancer threat *only*, ignoring other severe health threats, which include damage to brain and neurological, reproductive, and immune systems that may be caused by exposure to Dioxin levels lower than those that would cause cancer.
- Finally, there are multiple contaminants present at the ETC site and multiple pathways of exposure.

In order to conform to the National Contingency Plan, EPA should use either the Florida residential standard of 7 ppt or EPA's own 10^{-6} risk level of 2 ppt for Dioxin.

EVALUATION OF REMEDIAL ALTERNATIVES

EPA used the nine established criteria in the National Contingency plan to evaluate the Remedial Alternatives for Escambia Treating Company soils; however, CATE will show that EPA's evaluation is in error. Sections 4 and 5 of the Final Feasibility Study Report for Source Soils, Operable Unit 1, June 2005, and the Comparison of Alternatives of the Proposed Plan, August 2005, presented the evaluation of the alternatives based on these misinterpretations of the criteria.

Threshold Criteria – Protection of Human Health and the Environment

The EPA preferred remedy alternative, Capping/Containment, is rated as a 5 on a scale of 1 to 5 (5 = complete compliance) for the first threshold criteria, overall protection of human health and the environment. The evaluation states that capping and containment will eliminate exposure pathways, reduce the level of risk, isolate contamination and eliminate further migration. The use of a liner in the on site excavated areas to separate the contaminated soil from the ground water in the sand and gravel aquifer under the site does not result in elimination of exposure pathways, isolation of contamination and elimination of further migration. According to liner manufacturers, the liner material has a life expectancy of 30 years. Field data has demonstrated that the liner material has cracks and imperfections from the manufacturing process that allow waste to escape the liner and migrate into the groundwater. The seams and welds used to connect the liners have holes and flaws from the time the welding and testing process is performed and completed on the liner. These holes and flaws in the seams also allow waste to migrate through the liner and into the ground water sands. Thus the use of a liner to contain contamination does not eliminate exposure pathways, isolate contamination and eliminate future migration. The placement of the contaminated soil in excavations with only a liner to separate the contaminated waste from the ground water is not an acceptable alternative. The ranking number should be reduced to appropriately reflect lesser compliance with the criteria.

The ground water immediately below this is the source of drinking water for hundreds of thousands of local residents. It also discharges into the Pensacola Bay System, an estuary of the Gulf of Mexico. Prevention of contamination of this ground water is essential to protection of human health and the environment.

Threshold Criteria – Compliance with Applicable and Relevant and Appropriate Requirements

The second threshold criteria is compliance with applicable or relevant and appropriate requirements (ARARs). The Capping / Containment alternative was ranked as a 5 for compliance with ARARs. According to EPA the compliance was to be achieved by isolation of the contaminated soils (Section 5) and through excavation and on site treatment before on site disposal (Table 5-1). The flaws of the isolation of contamination of contaminated soils approach was presented in the previous paragraph. The statement in Table 5-1 is in error: this Capping / Containment alternative does not include onsite treatment of the waste. This error must be corrected in Table 5-1 and the ranking in Table 6-1 lowered to accurately reflect less compliance with the criteria.

Balancing Criteria – Long-Term Effectiveness and Permanence

The Capping /Containment alternative was ranked as a 4 for Long-Term Effectiveness and Permanence. EPA listed the long-term public health-threats as greatly reduced and the groundwater protected through isolation. The ground water protection through isolation is not effective over the long term. The problems with the liner have been presented in the discussion of the first criteria. The liner is not a long-term permanent isolation mechanism. The risks associated with direct contact with the waste would be eliminated only if the integrity of the cap is ensured over the long term. Damage to the cap may occur during site redevelopment.

The alternative is not a permanent remedy due to the fact that the contaminated waste will still be present in its current form on and in the site. The ranking in Table 6-1 must be reduced to accurately reflect the less compliant remedy.

Balancing Criteria – Reduction of Mobility, Toxicity or Volume

The Capping/Containment alternative ranked as a 2 due to the lack of reduction of toxicity and volume. The cap was credited with the reduction of mobility. The ranking of 2 should be reconsidered and reduced to a 1.

Balancing Criteria – Short Term Effectiveness

The Capping/Containment alternative was ranked as a 4 for short-term effectiveness. EPA indicated the implementation of the remedy will result in the release of dust and noise nuisance. These negative impacts must be considered when scheduling the relocation of the Clarinda Triangle. The relocation of the Clarinda Triangle must occur before implementation of the remedy at the ETC site is initiated.

RANKING OF ALTERNATIVES

The seven Remedial Alternatives were ranked according to the nine criteria and the information presented in Table 6-1. The Preferred Alternative Capping/Containment ranked the overall lowest (least compliant) and was the cheapest of all of the alternatives except the no action alternative. The Capping / Containment alternative ranked 24, no action ranked 10, the treatment alternatives ranked from 26 to 28, and the solidification alternative and off site disposal alternative ranked 25. If the Capping /Containment Alternative were re-ranked as suggested as above, the overall ranking of the EPA preferred alternative would be even lower than 24 and more in the range of 13 to 15. It is not appropriate to select the lowest ranking alternative, which is also the cheapest alternative, when addressing a site with a large quantity of extremely toxic contaminated soil in close proximity to a shallow sand and gravel aquifer which serves as the drinking water supply for the municipality.

EPA has stated that remedial activities are necessary at the ETC site to protect public health and welfare from actual or threatened releases of hazardous substances, pollutants, or contaminants in the soils. EPA further indicates that the cancer risk will be reduced by removing off site soils contaminated with Dioxin and Benzo-a-Pyrene above acceptable levels and containing the contaminated on site and off site waste soils in on-site excavations lined with a single liner. The Capping / Containment alternative proposed by EPA for the ETC is not an acceptable remedy. The remedy would not treat the chemicals that contaminate the soil. The failure to reduce and remove the chemical toxicity of the waste prior to disposal will result in negative impacts to public health. Containment is not an effective remedy over the long term.

EPA's PREFERRED ALTERNATIVE

The Remedial Alternative selected by EPA as their Preferred Alternative is unacceptable. The alternative referred to as Capping / Containment will place the untreated, as is, contaminated soil from the stockpile area, other onsite areas and off site areas in onsite excavations that have been lined with only a geomembrane liner.

The flaws with the alternative are as follows:

Lack of Toxicity Reduction or Elimination

The contaminated soil will not be treated to reduce or degrade the waste soil toxicity. It will merely be placed in the ground in its current toxic form. This approach does not protect human health or the environment and is not an acceptable approach.

Lack of Adequate Containment and Protection of Ground Water Resources

The untreated waste soil from the stockpile, and on site and off site locations will be placed in the on-site excavations, which will be lined with only a geomembrane liner.

The on-site excavations extend into the upper ground water bearing sands.

The waste will be placed in and near the groundwater with only a geomembrane liner separating the contaminated waste from the groundwater.

The geomembrane liner will leak.

- According to the manufacturers of the geomembrane liners, the liners have a 30-year life expectancy.
- The geomembrane liners have manufacturing process flaws, cracks and imperfections in the fabric that will allow the waste to leak and migrate into the groundwater.
- Holes and flaws in the seams and welds connecting the sections of geomembrane liners will allow waste to leak into the groundwater.

The use of a geomembrane liner to contain the contaminated waste soil does not eliminate exposure pathways, does not isolate contamination or eliminate further waste migration. A liner is not a long-term permanent remedy.

Cost of Geomembrane Liner for Onsite Excavations not Included in Cost Estimates

Upon examination of the Cost Estimates in the Final Feasibility Study (June 7, 2005) Appendix B - FS Cost Estimates, it is clear that the Cost Estimates for the five variations of Alternative 2 all lack a cost item for the geomembrane liner. The Cost Estimates do contain a cost estimate of the various individual layers that are proposed for capping the waste but lack a cost estimate for the geomembrane liner to be placed under the waste. The cost estimate for the geomembrane capping layer ranges from $940,600 to 956,000. The geomembrane layer needed to line the excavations should be larger and more expensive than the one proposed to cap the waste. Therefore the estimated cost of Alternative 2 is more than one million dollars below the actual cost due to the lack of the inclusion of the cost of the geomembrane liner.

Inadequate Protection of Human Health and the Environment

EPA has determined that remedial activities are necessary at the ETC to protect public health and welfare and the environment from the releases of pollutants from the ETC contaminated soils which may present an imminent or substantial endangerment to public health or welfare.

The EPA remedy is not a thorough and complete cleanup of the contaminated soil. The remedy does not treat the waste to reduce or eliminate toxicity. The remedy only contains the waste, which merely controls risks over the short term and ultimately results in negative impacts to human health and the environment. The remedy does not eliminate risk and thus is not protective of human health and the environment.

EPA has encouraged local interests to anticipate redevelopment of the site; however, Capping / Containment calls into question the viability of redevelopment. Construction of foundations and roadbeds and utility wok on the site may damage the cap, potentially exposing workers to the toxic wastes. EPA makes it clear it will take no responsibility for deed restrictions intended to limit future use of the property, leaving any enforcement to state and local agencies.

Although EPA proposes ground water monitoring for 30 years, no provision made for response to discovery of Capping / Containment system failure. There will be obvious practical challenges to repair of the liner and cap after the redevelopment that must be addressed unless another remedy is selected.

Extent of Contamination of Off Site Locations Not Complete

Figure 2.6 of the FS presents the extent of surface soil contamination above commercial cleanup levels in the Rosewood Terrace, Oak Park, and Escambia Arms area. The figure failed to include the areas where Carbazole in the soil exceeded the Cleanup Goal. These areas are matrix locations 9, 12, and 30.

Figure 2.7 of the FS presents the extent of surface soil contamination above commercial cleanup levels in the Herman and Pearl area. The figure failed to include the matrix areas 16 and 22 where Carbazole in the soil exceeded the Cleanup Goal.

Figure 2.9 of the FS presents the extent of surface soil contamination above the residential clean up level in the Clarinda Triangle area. The map failed to list CTSS 32, which exceeded the Residential BaP level. The inclusion of these areas would increase the area of contamination and the quantity of soil to be excavated and remediated.

Lowest Ranking Alternative

The EPA Preferred Alternative Capping /Containment ranked the overall lowest (least compliant) and was the cheapest of all of the alternatives except the no action alternative. Examination of the details of the ranking scores for the Capping /Containment alternative demonstrates that the rankings should have been even lower. It is not appropriate to select the lowest ranking alternative, which is also the cheapest alternative, when addressing a site with a large quantity of extremely contaminated soil in close proximity to a shallow sand and gravel aquifer which serves as the drinking waste supply for the municipality. In addition the Capping /Containment alternative is not a permanent remedy due to the fact that the contaminated waste will still be present in its current form on and in the site.

Cost Reducing Alternative

The cost reducing alternative that is being proposed will allow contaminated soil on the ETC site to remain in place and be covered by native and top soil. This alternative is not appropriate for short-term or long-term protection of human health and the environment.

COMPONENTS OF AN APPROPRIATE REMEDY, IN SEQUENCE

Permanently relocate Clarinda Triangle residents

Excavate all on site and off site soils contaminated above the cleanup levels

Treat the organics in the soil with Bioremediation or Chemical Oxidation to meet remedial / cleanup goals for organic contaminants and solidify the heavy metals in the soil to attain the cleanup levels for all chemicals in the waste.

Line the onsite excavations with geomembrane liners

Place the treated and solidified soils in the lined excavations

Cover the cleaned up soil with a multilayer cap

Develop institutional controls to insure surface and subsurface activities do not impact the cleaned up and contained soils.

The above detailed Appropriate Remedy is the only acceptable combination that satisfies the NCP criteria for the contaminants at the ETC site.

November 23, 2005

David Keefer, Project Manager
U.S. Environmental Protection Agency (EPA)
Region IV
61 Forsythe Street SW
Atlanta, Georgia 30303

Dear David Keefer:

Enclosed you will find comments on Proposed Plan Update Escambia Treating Company Operable Unite 1-soils October 2005 prepared by Wilma Subra, Technical Advisor of Citizens Against Toxic Exposure

Sincerely,

Francine D. Ishmael, President
Margaret L. Williams, President Emeritus
Citizens Against Toxic Exposure (CATE)

Cyj

Proposed Plan Update
Escambia Treating Company
Operable Unit 1-Soils
October 2005

Comments prepared by Wilma Subra for CATE
November 6, 2005

I. Lack of consideration of previous comments (*attached*) submitted in response to the Proposed Plan of August 2005

A. Extent of Contamination of Off Site Locations

The OU-1 Proposed Plan Update (October 2005) lacks any indication that the off site locations in excess of commercial cleanup levels not included in the OU-1 Proposed Plan (August 2005) [Rosewood Terrace, Oak Park and Escambia Arms (matrix locations 9, 12, and 30), Herman and Pearl Area (matrix locations 16 and 22) and Clarinda Triangle (CT SS 32)] have been included in the OU-1 Proposed Plan Update.

B. Lack of Cost of Geomembrane Liner for On Site Excavations

The OU-1 Proposed Plan update (October 2005) does not indicated that the cost of the Geomembrane Liner has been included in the additional cost estimates. The cost estimate in the Feasibility Study (June 7, 2005) and OU-1 Proposed Plan (August 2005) failed to include the cost of the Geomembrane Liner to be placed in the On Site Excavations.

C. Inadequate Containment System

The lack of adequate protection of ground water resources through the use f the Geomembrane Liner has been presented in previously submitted comments. The Proposed Plan Update does not address the problem areas associated with the use of the Geomembrane Liner. It is still inappropriate to place untreated waste in close proximity to ground water resources with only a 60 mil Geotextile liner separating the waste from the ground water resources.

II. Inadequate Response to Previous Comments

A. Redevelopment of Excavation Area

The Proposed Plan Update includes references to the establishment of and enforcement of appropriate controls and restrictions on land use (such as limits on excavation within the capped area and maximum loads per square foot for structures).

The specifics of the controls were not presented in the Proposed Plan Update and thus are not available for public comment.

B. Relocation

The relocation of Clarinda Triangle is proposed to adhere to the requirements of the federal Uniform Relocation Act and relevant EPA policy. Due to the problems experienced and documented by community members during the previous relocation, the implementation of the Uniform Relocation Act is not adequate to address the relocation situation of the Clarinda Triangle Area.

C. Relocation Resources

The cost estimate for the Clarinda Triangle relocation consists of an average per house cost of $57,273. This dollar amount is inadequate to replace existing homes with comparable houses and cover moving expenses. The Proposed Plan Update quotes an average cost per house for the additional 10 homes as $83,273 (assuming $6,727 demolition cost per home). This is still not adequate to cover the replacement cost of comparable houses and moving expenses.

III. Lack of Waste Treatment to Reduce or Eliminate Toxicity

A. Solidification of just a small portion of the waste is not treatment and does not satisfy the EPA reference for treatment.

The proposed remedy presented in the Proposed Plan Update still lacks treatment of the waste to reduce toxicity. The proposal to solidify a small portion of the waste prior to disposal in the ground still lacks a treatment component. Solidification is not treatment and does not reduce or eliminate the toxicity of the waste.

B. Solidification/Stabilization of only 13.5% of the Waste

The solidification/stabilization of a portion of the waste is proposed to be added to the proposed remedy. Based on the cost estimate of 2.3 million for the solidification/stabilization of a portion of the waste and a comparison to the initial cost of solidification/stabilization of all of the waste, $17 million, only 13.5% of the waste will be solidified/stabilized. The addition of solidification/stabilization of only a small portion of the waste stream does not address the EPA preference for treatment of the waste and inadequately proposed any method of addressing the majority of the waste stream.

5 9 0185

The League of Women Voters
of the Pensacola Bay Area

P.O. Box 2023, Pensacola, FL 32513

www..lwvpba.org (850) 458-5806

November 14, 2005

L'Tonya Spencer, Community Relations
Superfund Remedial & Technical Services Branch
U. S. EPA, Region 4
61 Forsyth Street, SW
Atlanta, GA 30303 spencer.latonya@epa.gov

Re: Proposed Plan Update, Escambia Treating Company Site, Operable Unit 1-Soils

Dear Ms. Spencer:

The League of Women Voters of the Pensacola Bay Area continues to support a complete and permanent clean up of the Escambia Treating Company site.

The proposed solution by the EPA is neither of these things.

1. There is no mention in the EPA proposal of detoxification of the organics using either bioremediation or chemical oxidation.
2. The proposal calls for solidifying "the most toxic soils". The separation of the most toxic soils from all the other toxic soils, we believe is not feasible.
3. Solidification works on metal contaminants like arsenic but not the organic contaminants, such as dioxin and PCP.
4. What life expectancy does the manufacturer guarantee on the proposed geomembrane? What will be done if and when the membrane starts to leak?

We believe the EPA proposed solution is inadequate to deal with the problem at hand and is therefore unacceptable. Government actions should provide for the long term sustainability of the community by implementing solutions that will not endanger future generations.

Vivian Faircloth and Mary Gutierrez
Co-Presidents

November 22, 2005

Mr. David Keefer
Remedial Project Manager
Superfund Remedial & Technical Services Branch
United States EPA
Atlanta Federal Center
61 Forsyth Street
Atlanta, Georgia 30303

Re: Escambia Treating Company Superfund Site
Proposed Soil Treatment Plan Update-OU 1 - Soils

Dear Mr. Keefer:

The Pensacola -area Chamber of Commerce appreciates this opportunity to provide comments on the proposed Soil Treatment Plan update for the OU-1 (soils) at the Escambia Treating Company Superfund site. The purpose of this letter is to follow up on the meeting that you and the other EPA representatives attended at our Environment Committee and our Sites and Buildings Committee on November 10, 2005. At that meeting, we discussed the proposed Soil Treatment Plan update and provided you with a number of comments and recommendations. Those comments and recommendations are recapitulated in the following text.

Following the publication of the first proposed Soil Treatment Plan for the Escambia Treating Company (ETC) Operable Unit 1 (OU-1) soils, the Pensacola_area community requested that EPA consider a number of improvements:

- Provide for the permanent relocation of additional residents in the "Clarinda Triangle" area of off-site soil contamination.
- Provide for additional sampling both on-site and off-site to ensure that all soils contaminated in excess of Florida's "commercial / industrial" cleanup standards are excavated.
- Provide for an improved design of the proposed "containment" facility that would receive the contaminated soil, so as to permit the redevelopment of the area over the "cap."
- Provide for incorporation of contaminated soil treatment into the remedial design.

Subsequently, Region IV published a Proposed Soil Treatment Plan Update (October 26, 2005; hereinafter, "Modified Plan") in an effort to address these concerns.

There appears to be no question that the EPA has made an effort to address the community's concerns with the Modified Plan. As with any document of this type, however, the "devil is in the details." While we understand that many of the details cannot be addressed until such time as a formal "Remedial Design" is undertaken, there are some questions where answers should be able to be forthcoming.

1. One method of determining the effectiveness of a proposed treatment plan for hazardous waste is through use of the Toxicity Characteristic Leaching Procedure (TCLP) test. Are there sites where

soils contaminated by equivalent levels of similar contaminants have been treated in the fashion described in the Modified Plan where "pre-treatment" TCLP values have been compared with "post-treatment" TCLP results? Can copies of the test reports be furnished to the Pensacola community? These questions were provided to you verbally at our November 10 meeting and you promised to research the issue and respond prior to the close of the comment period on November 28. Please understand that, as was stated by Mr. Dohms, a satisfactory answer to this inquiry is critical if the community is to be expected to accept the Modified Plan as it bears directly on the question of what constitutes "treatment" of the soils.

2. In determining the potential for migration of those contaminants of greatest concern (dioxin, which very likely originated as a manufacturing contaminant of the wood treating chemical pentachlorophenol), it is important to know the chemical form of pentachlorophenol that was used at the ETC site. Did ETC use the solid form of pentachlorophenol, which would have to be "dissolved" in diesel fuel prior to its use in the treatment process, or did they use the water-soluble sodium- or potassium-pentachlorophenate in the treatment process? It is naturally the case that the solid-phase pentachlorophenol would be far less mobile in the environment than the water-soluble form of that compound. It follows that the associated dioxin would similarly be less likely to migrate if contained in the solid-phase pentachlorophenol.. .

There are a few additional points where the Chamber's Sites and Buildings Committee would like to see some additional discussion and/or consideration by Region IV:

- Please clarify that soil placed in the containment would be properly compacted (e.g., 98% of Standard Proctor, or 95% of Modified Proctor).
- Discussions with construction firm representatives to the Sites and Buildings Committee indicates that a six-foot thickness of compacted clean soil above the cap would be amenable to site redevelopment much more readily than would a four-foot thickness.
- Additional placement of a treated soil-cement layer at the base of the contaminated soil and above the geotextile in the containment structure is recommended.
- Consideration of a treated soil-cement layer separating the contaminated soil from the geotextile along the sides of the containment structure is also recommended.

The addition of a "3 – 4 foot layer" of solidified / stabilized soil affected with the "greatest degree" of contamination near the top of the containment structure is greatly appreciated. It is the suggestion of the Sites and Buildings Committee that the thickness of this layer be not less than four feet.

The Pensacola Bay Area Chamber of Commerce sincerely appreciates the efforts of Region IV EPA to modify and improve the Proposed Soil Treatment Plan for the OU-1 Soils at the Escambia Treating Company site. We look forward to continuing the dialogue and rapidly reaching a point where the site is cleaned up and returned to the community as an asset for future growth and prosperity.

Sincerely,

Evon Emerson
President/CEO

5 9 0187

City of Pensacola

JOHN R. FOGG
Mayor

America's First Settlement
Established 1559

September 20, 2005

Mr. David W. Keefer, Remedial Project Manager
USEPA, Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

RE: Escambia Treating Company Superfund Site, Pensacola, Florida

Dear Mr. Keefer:

The enclosed resolution adopted by the Pensacola City Council rejects the Capping and Containment remediation method identified as the preferred alternative in the Escambia Treating Company Superfund Site Proposed Plan Fact Sheet for Operable Unit 1. The City of Pensacola has worked with the Environmental Protection Agency (EPA) and Florida Department of Environmental Protection (FDEP) over the past several years toward the goal of a thorough and complete clean-up of the contaminated soil and groundwater. The preferred alternative of Capping and Containment does not meet this goal nor does it afford a realistic opportunity to redevelop the site as envisioned in the *Palafox Commerce Park Master Plan* funded through EPA's Superfund Redevelopment Initiative (SRI) program. As evidenced by the consistently negative comments you received during the September 1st public meeting, this plan is not being accepted within the community. The City appreciates the involvement of EPA and the FDEP and encourages both agencies to formulate other remediation alternatives, or a combination of the alternatives identified in the Remedial Investigation Feasibility Study (RI/FS), that ultimately will reduce or degrade the amount of contaminants identified in the RI/FS.

We look forward to working with the EPA to develop a more complete and comprehensive cleanup plan that meets the goals of the EPA and FDEP, protects the health and welfare of the citizens of Pensacola, and provides for a reasonable and feasible reuse of the property. Thank you for your attention to this matter.

Sincerely,

John R. Fogg
Mayor

C: Nancy Murchison, FDEP Bureau of Waste Cleanup
Thomas J. Bonfield, City Manager, City of Pensacola
George Touart, County Administrator, Escambia County

RESOLUTION
NO. 34-05

A RESOLUTION
TO BE ENTITLED:

A RESOLUTION REJECTING THE CAPPING AND CONTAINMENT REMEDIATION METHOD SELECTED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA) IN THE PROPOSED PLAN ISSUED IN AUGUST 2005 FOR ESCAMBIA TREATING COMPANY SUPERFUND SITE IN PENSACOLA, FLORIDA.

WHEREAS, the Escambia Treating Company Superfund Site is contaminated from the previous operation of a wood-preserving facility; and

WHEREAS, In December 1994, the Escambia Treating Company Superfund Site was placed on the National Priority List which identifies contaminated sites that will be cleaned up under EPA's Superfund Program; and

WHEREAS, the Environmental Protection Agency (EPA) is responsible for developing and implementing a cleanup plan for the Escambia Treating Company Superfund Site; and

WHEREAS, the Escambia Treating Company Superfund Site is in close proximity to remaining homes, schools, churches, and businesses; and

WHEREAS, the Sand and Gravel Aquifer, which is the sole source of potable water for Escambia County, is vulnerable to contamination; and

WHEREAS, the surface waters in Pensacola, especially Bayou Texar, which is downgradient of the site and heavily used for fishing and recreation, are vulnerable to contamination; and

WHEREAS, the City Council of the City of Pensacola recognizes the importance and economic consequences of remediation decisions for the Palafox Corridor and its redevelopment potential; and

WHEREAS, the City Council of the City of Pensacola recognizes the economic consequences of remediation decisions for the residential areas surrounding Bayou Texar;

WHEREAS, the U. S. Environmental Protection Agency (EPA) is developing its draft Record of Decision (ROD) for the cleanup at the Escambia Treating Company Superfund Site of approximately 225,000 cubic yards of soil currently under a secure cover at the former wood preserving site, and a volume of approximately 312,000 cubic yards of soil from nearby residential and industrial areas; and

WHEREAS, the ROD process is dependent on public input from local government and from the citizens of Pensacola and Escambia County; and

WHEREAS, EPA has issued their Proposed Plan ("Plan") for cleanup to be disposal of the contaminated, untreated soil on site in a landfill consisting of membrane and clay liners and covered with a low permeability barrier cap (known as Capping and Containment); and

WHEREAS, EPA is seeking comments from the community on the opinions and preferred alternative described in the Plan; and

WHEREAS, EPA evaluated seven remedial alternatives using nine criteria and selected Capping and Containment as their preferred alternative; and

WHEREAS, the EPA criterion for the use of permanent solutions and alternative treatment technologies or resource recovery technologies is not met by the Plan; and

WHEREAS, the criterion for preference for treatment as a principal element to the extent practical is not met by the Plan; and

WHEREAS, EPA criterion for long-term effectiveness and performance for protection of human health and the environment is not met by the Plan because the scientific literature clearly demonstrates that at some point in time all landfills leak leachate; and

WHEREAS, EPA criterion for reduction in toxicity and volume of contaminants of concern is not met by the Plan; and

WHEREAS, the chemicals of concern in the soil include known cancer causing polyaromatic hydrocarbons and dioxins that will remain unaltered by the Plan; and

WHEREAS, Escambia County received a Superfund reuse grant from EPA to determine the best use of this site after appropriate soil cleanup; and

WHEREAS, as a result, community stakeholder consensus indicated that the best use of this site would be as a commerce park for commercial and light industrial use, and the conceptual design of such a commerce park has been completed; and

WHEREAS, the property will be difficult to market and develop into a commerce park because of public perception of toxic contamination, and the potential legal liabilities of businesses on the site if the chemicals of concern are land filled on site in their toxic forms;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PENSACOLA, FLORIDA:

SECTION 1: That the City Council of the City of Pensacola does hereby reject the preferred alternative of remediation selected by EPA in the Proposed Plan issued by the EPA in August of 2005 and urge the EPA to implement the following regarding the remediation of the Escambia Treating Company Superfund site in Pensacola, Florida:

1. Perform a complete and permanent remediation that includes but is not limited to; a remedial method or a combination of remedial methods that will yield a reduction and or degradation of the levels of the chemicals of concern for both onsite and offsite contamination identified in OU1.

2. Before the Record of Decision is issued, testing of any remedial methods proposed including treatability, bench, and pilot tests must prove the proposed remedy or remedies to be effective in achieving the remedial goals identified in the Remedial Investigation/Feasibility Study issued by the EPA in June of 2005.

3. Upon completion of the treatability, bench and pilot tests, immediately begin cleanup of the ETC OU1 and the permanent protection of human health, ecological health, and groundwater must be assured through complete cleanup and ongoing monitoring of OU1.

SECTION 2: This resolution shall take effect immediately upon its adoption by the City Council.

Adopted: SEPTEMBER 7, 2005

Approved: s/J.R. Fogg
Mayor

Attest:

s/Shirley F. White
City Clerk

Legal in form and valid if adopted:

s/Don J. Caton
City Attorney

CERTIFICATION
I, DO HEREBY CERTIFY THAT THE ABOVE AND FOREGOING IS A TRUE AND CORRECT COPY OF THE ORIGINAL THEREOF ON FILE IN MY OFFICE WITNESS MY HAND AND THE CORPORATE SEAL OF THE CITY OF PENSACOLA, FLORIDA THIS THE 16th September AD 2005
Ericka L. Burnett
Assistant CITY CLERK
CITY OF PENSACOLA, FLORIDA

THE COUNTY OF ESCAMBIA
PENSACOLA, FLORIDA

NEIGHBORHOOD AND ENVIRONMENTAL SERVICES DEPARTMENT

Marine Resources
Mosquito Control
Environmental Quality
Community Redevelopment Agency
Soil and Water Conservation District
Neighborhood Enterprise Foundation, Inc.

KEITH WILKINS
Director

June 22, 2005

Mr. W. David Keefer
Remedial Project Manager
South Site Management Branch
Atlanta Federal Center
11th Floor, (4 WMD-SSMB)
61 Forsyth St., S.W.
Atlanta, GA 30303

RE: Resolution supporting cleanup of soil at Escambia Treating Company Superfund site to commercial/industrial criteria

Dear Mr. Keefer:

Please find enclosed a certified copy of Escambia County Resolution R2005-106. The Escambia County Board of County Commissioners adopted the Resolution at the June 2, 2005 meeting in a 5-0 vote.

The Resolution supports soil cleanup at Escambia Treating Company (ETC) Superfund site to Florida Commercial/Industrial Soil Cleanup Target Levels for contaminants of concem. It also supports the use of appropriate Institutional and Engineering Controls as part of the final remedy. The final remedy should acknowledge, where appropriate, the proximity of nearby residences, schools, and businesses, the vulnerability of surface and groundwater resources, and the economic viability of the planned development for the Palafox Redevelopment Area. The redevelopment is a major effort of Escambia County Community Redevelopment Agency, which is working diligently to curb urban sprawl and encourage infill development.

Resolution R2005-106 supersedes Escambia County Resolution R2000-25 because of developments that have occurred since the adoption of R2000-25. The developments include the completion of the study and conceptual design of the proposed Palafox Commerce Park as the reuse option for the ETC site, the completion of an economic impact study of the proposed commerce park, the passage of "Global" Risk Based Cleanup Criteria legislation by the Florida Legislature, the relocation of the 358 effected households in the neighborhoods adjoining or near the ETC site, and the concurrence of USEPA and FDEP to clean the soil to commercial criteria.

The Board of County Commissioners requests your support of their Resolution providing for commercial/industrial criteria for cleanup of the ETC Superfund site.

The staff of Escambia County Neighborhood and Environmental Services Department is grateful to the many stakeholders that provided input into the Resolution.

If you have any questions, or need additional information, feel free to call me at 850-595-3496.

Sincerely,

Keith Wilkins,
Director
Neighborhood and Environmental Services Department

KW/ps
Enclosure

Distribution:
Tom Bonfield, City Manager, City of Pensacola
George Touart, County Administrator, Escambia County
Bob McLauglin, Assistant County Administrator, Escambia County
Nancy Murchison, Florida Department of Environmental Protection, Tallahassee
Michael Kennedy, Northwest District, Florida Department of Environmental Protection
Jodie Manale, Chief, Community Redevelopment Agency, Escambia County
Escambia County Citizens Environmental Committee
City of Pensacola Environmental Advisory Board
Evon Emerson, Pensacola Area Chamber of Commerce
Frances Dunham, Citizens Against Toxic Exposure
Muriel Wagner, League of Women Voters
Blair Stephenson, Bayou Texar Foundation
Ernie Rivers, Gulf Coast River Keepers
Peter Shuba, Senior Environmental Scientist, Escambia County

f:shuba/Letter to EPA on resolution 2005-106

Escambia County
Clerk's Original
6/2/2005 | CAR I-10

5 9 0190

Date: 6/9/2005 Verified By: D Harris
(Replacement Resolution based on Board action)

RESOLUTION R2005- 106

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ESCAMBIA COUNTY, FLORIDA SUPPORTING EFFORTS OF THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY CLEANUP OF THE ESCAMBIA COUNTY TREATING COMPANY SUPERFUND SITE; PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the U. S. Environmental Protection Agency (EPA) is developing its draft Record of Decision (ROD) for the cleanup at the Escambia Treating Company Superfund Site of approximately 225,0000 cubic yards of soil currently under a secure cover at the former wood preserving company site, and of a volume of soil to be determined by additional testing from the one-time nearby residential areas; and

WHEREAS, the ROD process is dependent on public input from local government and from the citizens of Escambia County; and

WHEREAS, the 2003 Florida Legislature passed "Global" Risk Based Cleanup Criteria (RBCA), Chapter 62-785, F.A.C., that requires Florida cleanup standards to be applied to all contaminated sites considering such a location's specific circumstances, risks, and the proposed redevelopment project; and

WHEREAS, Escambia County received a Superfund reuse grant from EPA to determine the best use of this site after appropriate soil cleanup; and

WHEREAS, during 2004, soil sampling was conducted and additional sampling will be conducted during 2005 to delineate the extent of off-site soil contamination; and

WHEREAS, as a result, community stakeholder consensus indicated that the best use of this site would be as a Palafox Commerce Park for commercial and light industrial use, and the conceptual design of such a commerce park has been completed; and

WHEREAS, the study for a commerce park is completed and a conceptual plan has been published in the report entitled, "Palafox Commerce Park Master Plan," and

WHEREAS, the economic impact of the Palafox Commerce Park is completed and the impacts are published in "Economic Impact of the Proposed Palafox Commerce Park Superfund Redevelopment Initiative," and

WHEREAS, EPA and the Florida Department of Environmental Protection (FDEP) have agreed upon the cleanup standards for these affected soils predicated on the intended use of the site as a commerce and light industrial park, and EPA is no longer proposing the higher Federal cleanup site standards; and

WHEREAS, the permanent relocation of an estimated 358 households from Rosewood Terrace Subdivision, Oak Park Subdivision, Goulding Subdivision, and Escambia Arms Apartments also has been completed; and

WHEREAS, the demolition of the houses and apartment complex in the relocation area is almost completed; and

WHEREAS, the entire area is planned for rezoning by Escambia County for its anticipated commercial and light industrial use as Gateway Industrial.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ESCAMBIA COUNTY, FLORIDA AS FOLLOWS:

Section 1. That the Board of County Commissioners supports the remediation (including active detoxification of organics) of soil at the Escambia Treating Company Superfund Site to the Florida Commercial Soil Target Cleanup Levels for chemicals of concern, and the use of appropriate Institutional and Engineering Controls to allow development for the intended use of the property as a commerce and light industrial park.

Section 2. That at this point, the Board of County Commissioners therefore supports soil cleanup, and the Board holds in abeyance recommendations and resolutions for the draft ROD concerning groundwater cleanup.

Section 3. That this Resolution supersedes Escambia County Resolution 2000-25 because of developments during the five years since that Resolution was passed, including the completion of the study and conceptual design of the Palafox Commerce Park as the reuse option for the Escambia Treating Company site, the passage of "Global" Risk Based Cleanup Criteria legislation, and the concurrence of the FDEP and EPA to cleanup to these commercial standards.

Section 4. That this Resolution shall take effect immediately upon its adoption by the Board of County Commissioners.

ADOPTED this 2nd day of June, 2005.

BOARD OF COUNTY COMMISSIONERS
ESCAMBIA COUNTY, FLORIDA

By: [signature]
J. W. Dickson, Chairman

ATTEST: Ernie Lee Magaha
Clerk of the Circuit Court

By: Doris Harris

(SEAL)

Date Executed
June 6, 2005

Certified to be a true copy of the original on file in this office
Witness my hand and official seal
ERNIE LEE MAGAHA
Clerk of the Circuit Court
Escambia County, Florida
By: Doris Harris **D.C.**
Date: June 9, 2005

This document approved as to form and legal sufficiency.
By [signature]
Title ACA
Date 2 June 05

THE COUNTY OF ESCAMBIA
PENSACOLA, FLORIDA

NEIGHBORHOOD AND ENVIRONMENTAL SERVICES DEPARTMENT

Marine Resources
Mosquito Control
Environmental Quality
Community Redevelopment Agency
Soil and Water Conservation District
Neighborhood Enterprise Foundation, Inc.

KEITH WILKINS
Director

October 21, 2005

Mr. David W. Keefer, Remedial Project Manager
Superfund Remedial and Technical Branch
USEPA, Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

RE: Proposed Cleanup Plan, Escambia Treating Company Superfund Site, Pensacola, Florida

Dear Mr. Keefer:

The enclosed resolution was adopted by the Escambia County Board of County Commissioners on September 15, 2005. The resolution rejects the Capping and Containment remediation method identified as the preferred alternative in the Escambia Treating Company Superfund Site Proposed Plan Fact Sheet for Operable Unit 1 (OU-1). Escambia County, the City of Pensacola, and many community groups have worked with the Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP) over the past several years toward a cleanup goal that will significantly reduce the chemicals of concern in the contaminated soil. The preferred alternative of Capping and Containment does not meet the goal, nor does it afford a realistic opportunity to redevelop the site as envisioned in the *Palafox Commerce Park Master Plan* funded through EPA's Superfund Redevelopment Initiative Program. As evidenced by the consistently negative comments EPA received during the September 1st public meeting, the plan is not accepted within the community. The County appreciates the involvement of EPA and FDEP and encourages both agencies to formulate other remediation alternatives, or a combination of the alternatives, identified in the Final Feasibility Study, that will reduce the amount of contaminants in OU-1.

Escambia County looks forward to working with EPA to develop a more complete and comprehensive cleanup plan that meets the goals of EPA and FDEP, protects the health and welfare of the citizens of Escambia County, protects the environment, and provides for reuse of the property. Thank you for your attention to this matter.

Sincerely,

J. W. Dickson, Chairman
Escambia County
Board of County Commissioners

c: Nancy Murchison, FDEP Bureau of Waste Cleanup
George Touart, County Administrator, Escambia County
Thomas J. Bonfield, City Manager, City of Pensacola
Shirley Gafford, County Administrator Office

1190 WEST LEONARD STREET • PENSACOLA, FLORIDA 32501 • 850-595-3496 • FAX: 850-595-3495
PUBLIC WORKS & LAND MANAGEMENT AGENCY

5 9 0192

Escambia County
Clerk's Original
9-15-05 [signature]
Add #5

2005-001169 BCC
Sep. 15, 2005 Page 11

RESOLUTION R2005-172

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ESCAMBIA COUNTY, FLORIDA REQUESTING CONTAMINANT TOXICITY REDUCTION THROUGH SOIL TREATMENT BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY FOR CLEANUP OF THE ESCAMBIA TREATING COMPANY SUPERFUND SITE; PROVIDING FOR DISAPPROVAL OF CONTAINMENT AND CAPPING ALTERNATIVE; PROVIDING FOR AN EFFECTIVE DATE.

Date: 9-23-05 Verified By: P. Cotton

WHEREAS, the U. S. Environmental Protection Agency (EPA) is developing its draft Record of Decision (ROD) for the cleanup at the Escambia Treating Company Superfund Site of approximately 225,000 cubic yards of soil currently under a secure cover at the former wood preserving site, and a volume of approximately 312,000 cubic yards of soil from nearby residential and industrial areas; and

WHEREAS, the ROD process is dependent on public input from local government and from the citizens of Escambia County; and

WHEREAS, EPA has issued their Proposed Plan ("Plan") for cleanup to be disposal of the contaminated, untreated soil on site in a landfill consisting of membrane and clay liners and covered with a low permeability barrier cap (known as Capping and Containment); and

WHEREAS, EPA is seeking comments from the community on the opinions and preferred alternative described in the Plan; and

WHEREAS, EPA evaluated seven remedial alternatives using nine criteria and selected Containment and Capping as its preferred alternative; and

WHEREAS, the EPA criterion for the use of permanent solutions and alternative treatment technologies or resource recovery technologies is not met by the Plan; and

WHEREAS, the criterion for preference for treatment as a principal element to the extent practical is not met by the Plan; and

WHEREAS, EPA criterion for long-term effectiveness and performance for protection of human health and the environment is not met by the Plan because the scientific literature clearly demonstrates that at some point in time all landfills leak leachate; and

WHEREAS, EPA criterion for reduction in toxicity and volume of contaminants of concern is not met by the Plan; and

WHEREAS, the chemicals of concern in the soil include known cancer causing polyaromatic hydrocarbons and dioxins that will remain unaltered by the Plan; and

WHEREAS, Resolution R2005-106 adopted at the regular meeting of the Escambia County Board of County Commissioners on June 2, 2005 specifies detoxification of organics; and

WHEREAS, Escambia County received a Superfund reuse grant from EPA to determine the best use of this site after appropriate soil cleanup; and

WHEREAS, as a result, community stakeholder consensus indicated that the best use of this site would be as a Palafox Commerce Park for commercial and light industrial use, and the conceptual design of such a commerce park has been completed; and

WHEREAS, EPA and the Florida Department of Environmental Protection (FDEP) have agreed upon the cleanup standards for these affected soils predicated on the intended use of the site as a commerce and light industrial park; and

WHEREAS, the permanent relocation of an estimated 358 households from Rosewood Terrace Subdivision, Oak Park Subdivision, Goulding Subdivision, and Escambia Arms Apartments has been completed; and

WHEREAS, the demolition of the houses and apartment complex in the relocation area has been completed; and

WHEREAS, the entire area is planned for rezoning by Escambia County for its anticipated commercial and light industrial use as Gateway Industrial; and

WHEREAS, the property will be difficult to market and develop into a commerce park because of public perception of toxic contamination, and the potential legal liabilities of businesses on the site if the chemicals of concern are land filled on site in their toxic forms; and

WHEREAS, as a result, the Containment and Capping remedy is not compatible with the planned reuse of the site because it will create difficulty for the successful installation of utilities and roadways necessary to develop the proposed commerce park as well as creating legal and financial uncertainty for the park tenants.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ESCAMBIA COUNTY, FLORIDA AS FOLLOWS:

Section 1. That the Board of County Commissioners requests a soil cleanup remedy, other than containment and capping that will provide long-term protection of human health and the environment of Escambia County and will allow successful development for the intended use of the property as a commerce and light industrial park.

Section 2. That this Resolution shall take effect immediately upon its adoption by the Board of County Commissioners.

ADOPTED this 15th day of September 2005.

BOARD OF COUNTY COMMISSIONERS
ESCAMBIA COUNTY, FLORIDA

By: [signature]
J. W. Dickson, Chairman

ATTEST: Ernie Lee Magaha
Clerk of the Circuit Court

By: [signature] Harris

(SEAL)

Date Executed
9-22-05

This document approved as to form and legal sufficiency
By [signature]
Title ACA
Date 30 Aug 05

Eleanor Godwin
City of Pensacola Environmental Advisory Board
2510 N. Yates Ave.
Pensacola FL 32503

August 24, 2005

David Keefer
Superfund Remedial & Technical Services Branch
US EPA
61 Forsyth Street
Atlanta GA 30303

Dear Mr. Keefer:

I am writing in response to the EPA's proposed plan for the Escambia Treating Company Site in Pensacola, FL. As a member or the City's Environmental Advisory Board, I was part of a process to accept a resolution concerning the cleanup for this Superfund Site. It was our understanding that the EPA, FDEP, and the County had reached an agreement to withdraw our request for residential level cleanup and accept the lower standard for commercial/industrial cleanup. In that move, we were led to believe that some kind of cleanup effort would be made, just not to the more stringent residential standards. We reviewed your 7 possible solutions, and though that we would fall somewhere in the middle – certainly not in the category just slightly better than "no action".

Upon reviewing the preferred solution, it appears that the EPA is looking to do the least amount of cleanup for the least amount of money. I realize that the Superfund account is dry, but it is deplorable to think of leaving this amount of contaminated material virtually untreated on this site. The proposed solution is nothing more than a glorified landfill, and we know first hand in this part of the state that landfills do not prevent leaching of contaminants. The mere fact that our water table is very close to the surface should preclude this solution for 560,000 cubic yards of toxic soil. I also realize that the groundwater issue is a separate Operable Unit, but at this juncture, the two cannot be separated. What is in the soil must be stopped from seeping into the groundwater before you can address what to do with what might already be present there. OU1 must at least set up OU2 for some measure of success.

Our community needs and deserves a solution that will adequately clean the soils and protect human health. I wonder whether the solution would be different if the decision makers lived in this area? Would you find this an acceptable solution if it were across the street from your child's school, in a commercial park where you planned to work for the next 20 years, or just upwind of your neighborhood? Our community has worked very hard to come to this latest resolution and to accept the plans proposed for redevelopment of the property. The site has been an eyesore and blight in the area for 20+ years, and we are anxious to move on and make the property productive once again. Every indication was given earlier in this process that the EPA would seek community acceptance of their plan. This proposal is unacceptable, and I think I speak for many others in my wish to reconsider a solution that includes some level of treatment from this mountain of contaminants. Thank you for your consideration.

Sincerely,

Eleanor Godwin

BLACK & VEATCH SPECIAL PROJECTS CORP.

MEMORANDUM

EPA Region 4
Escambia Wood Treating Company Site
Community Meetings

BVSPC Project 48377.01.28

November 22 2005

To: David Keefer (EPA)

From: Timothy Turner (Black & Veatch)

The following is my list of the information requests from the meetings held on November 10, 2005 on the Escambia Treating Company.

CATE

1. Provide information on the anticipated lifespan of HDPE in conditions anticipated for the Escambia project.

Response - Based on studies of the anticipated deterioration of buried liners, the anticipated life of the liner will be in excess of 300 years. (See Attachment A)

2. Provide information on the seaming of HDPE seams.

Response – Seaming of liner materials is dependent on the type of material selected. An experienced liner crew and strict QA/QC testing are critical to installing leak free seams. Attachment B describes typical HDPE seams and associated QA/QC that will be used for the selected liner material.

3. Explain why treatment of the contaminated soils is not required before the soils are placed into the containment cell.

Response – The contaminated soils will be isolated from human contact and the environment in a highly engineered containment cell. The primary component of the containment cell is the multi-layered capping system which is designed with redundant layers of extremely low permeability materials to ensure that water does not infiltrate into containment cell. Leachate will not be generated if water does not get into the containment cell. Containment of hazardous waste onsite in this manner has been successfully used to remediate many contaminated sites. See Attachment C for two EPA documents which provide several examples of successfully redeveloped sites where contaminated soils were contained onsite.

The proposed remedy for the ETC site also has several additional safeguards to ensure that contamination will not migrate outside of the containment cell. First, the most highly contaminated soils will be treated using Solidification/Stabilization (S/S) technology to form a 4 foot thick subcap. The subcap will add an additional layer of low permeability material to the capping system, immobilize the contaminants in the treated soil, and add strength to the cap to allow for the planned redevelopment of the site. Second, a liner system will be used to fully encapsulate the contaminated soil so that in the extremely unlikely event that water does get through the multi-layered capping system, it will be contained in the containment cell. Third, the bottom of the containment cell will be sloped to a sump point where a monitoring/extraction well will be located. The well will be monitored to verify that water has not entered the containment cell. Fourth, a series of monitoring wells will be placed around the containment cell to verify the performance of the containment cell.

Chamber of Commerce

1. Verify that the PCP used in the former Escambia facility was dissolved in fuel oil rather than water during operation. Fuel oil dissolved PCP is less likely to migrate.

Response - From 1944 to approximately 1970, coal-tar creosote was used as the primary wood preservative. PCP dissolved in No. 6 diesel fuel was used at the facility as a preservative from 1963, and was the sole preservative in use from 1970 to 1982 (*Draft RCRA Facility Assessment Report, Escambia Treating Company, Pensacola, Florida*, A.T. Kearney 1990).

2. The Chamber requested that 6 feet of cover over the liner system to allow for construction of future commercial structures. This was considered the minimum depth of cover necessary for construction of light pole foundations, building footings and utilities.

Response – Comment noted. Black & Veatch plans to work with the redevelopment team to optimize the design for future redevelopment. Flexibility exists in the design approach to accommodate some changes in cap/cover closure system thickness to support the intended future use of the property.

3. The Chamber asked if there are any TCLP tests on similar stabilized materials. Information on the leachability and or geochemical changes during stabilization was requested.

Response – Solidification/stabilization of soils contaminated with wood treating chemicals has been used at several EPA Superfund sites. EPA evaluated S/S treatment at four wood treating sites and published the findings in the journal "Remediation" in the summer of 2000. Leachability testing (i.e., TCLP and SPLP tests) has shown that the concentrations of contaminants of concern in leachate for S/S treated soils were generally 95 to 99% less than leachate from untreated soils. EPA's published paper is included in Attachment D.

4. It was suggested that additional soil cement be placed on the bottom and sides of the base liner system to provide additional encapsulation.

Response - The base liner system will be evaluated during detailed design to meet the performance requirements of the selected remedy. Preventing the leaching of contaminants from the containment system over the long-term is an objective of this remedy.

5. It was suggested that granular carbon could be added to the cement stabilized material to increase fixation of the organics in the soil.

Response - Additives, such as granulated carbon, have been used on many projects to stabilize organic contaminants. These additives will be evaluated during detailed design.

6. The need for the site to support rail access was noted.

Response - Comment noted. Black & Veatch plans to work with the redevelopment team to optimize the design for future redevelopment.

7. It was suggested that the base liner be specified as a RCRA Subtitle C level.

Response - The base liner system will be evaluated during detailed design to meet the performance requirements of the selected remedy.

8. Information on the success of other superfund sites using similar encapsulation techniques supporting future commercial development similar to the proposed end use was requested. These should include previous wood treatment sites.

Response – This technology has been a component of remedies with successful reuse for a commercial end use. It should be noted that only the capped containment cell portion of the site will have any constraints on the type of allowable construction over the area. Even the building constraints over the capped containment cell will be relatively minor and will accommodate the current redevelopment plan. (See Attachments C and E).

9. A testing plan to identify the soils to be segregated should be prepared.

Response – Such a plan will be developed during the detailed design.

10. A plan to identify any other areas requiring excavation should be prepared.

Response – EPA plans to conduct a detailed investigation to refine the extent of vertical and horizontal contamination to support the design effort. This investigation will likely take place early in 2006.

11. What is the general order of magnitude of compaction for the contaminated soil placed into the containment system?

Response – Black & Veatch currently expects that the soil will be compacted to at least 90% of the maximum dry density as determined by the Modified Proctor test (ASTM 1557). Black & Veatch will re-evaluate the density requirements during the remedial design.

<u>City and County Environmental Advisory Council</u>

1. What is the volume of soil anticipated to be stabilized? Please provide a volume range.

Response - The volume of the stabilized 4-foot thick subcap will vary depending on the depth of containment cell. Currently, we are assuming that the containment cell will be approximately 20 feet deep; therefore, the volume of the stabilized material will be about 75,000 cubic yards.

2. Please provide references of previously mitigated sites where a similar volume of contaminated soil has been contained and new development has occurred.

Response – Reuse of sites for commercial use that include containment of a large volume of contaminated material has occurred. These sites have ranged in volume from less than one thousand cubic yards to several hundred thousands cubic yards. Please note that the design and construction of the containment system is usually more critical to the future reuse than the volume of material. (See Attachment C).

3. Will the design consider the high soil temperatures associated with Florida, the potential for a high water table, and storms or other natural disasters?

Response – The design engineer will consider all of these variables to select the most appropriate design for the containment cell including construction techniques and the type of material to be used for the liner and cap.

4. How will the solidification/stabilization affect the natural degradation of the organic contaminants in the solidified matrix?

Response – The primary site organic contaminants such as dioxin and pentachlorophenol do not readily degrade biologically in the environment, which is why these chemical were used to preserve wood. Therefore, the solidification/stabilization will have almost no adverse affect on the natural organic degradation of these chemicals. Solidification/stabilization will affect the mobility of the contaminants by binding the contaminants in the cement matrix.

Geosynthetic Institute
475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441

GRI White Paper #6

- on -

Geomembrane Lifetime Prediction:
Unexposed and Exposed Conditions

by

Robert M. Koerner, Y. Grace Hsuan and George R. Koerner
Geosynthetic Institute
475 Kedron Avenue
Folsom, PA 19033 USA

Phone (610) 522-8440
Fax (610) 522-8441

E-mails:
robert.koerner@coe.drexel.edu
grace.hsuan@coe.drexel.edu
gkoerner@dca.net

June 7, 2005

Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions

1.0 Introduction

Without any hesitation the most frequently asked question we have had over the past 25 years' is "how long will a particular geomembrane last".* The two-part answer to the question, largely depends on whether the geomembrane is covered in a timely manner or left exposed to the site-specific environment. Before starting, however, recognize that the answer to either covered or exposed geomembrane lifetime prediction is neither easy, nor quick, to obtain. Further complicating the answer is the fact that all geomembranes are formulated materials consisting of (at the minimum), (i) the resin from which the name derives, (ii) carbon black or colorants, (iii) short-term processing stabilizers, and (iv) long-term antioxidants. If the formulation changes (particularly the additives), the predicted lifetime will also change. See Table 1 for the most common types of geomembranes and their approximate formulations.

Table 1 - Types of commonly used geomembranes and their approximate formulations (based on weight percentage)

Type	Resin	Plasticizer	Fillers	Carbon Black	Additives
HDPE	95-98	0	0	2-3	0.25-1
LLDPE	94-96	0	0	2-3	0.25-3
fPP	85-98	0	0-13	2-4	0.25-2
PVC	50-70	25-35	0-10	2-5	2-5
CSPE	40-60	0	40-50	5-10	5-15
EPDM	25-30	0	20-40	20-40	1-5

HDPE = high density polyethylene
LLDPE = linear low density polyethylene
fPP = flexible polypropylene
PVC = polyvinyl chloride (plasticized)
CSPE = chlorsulfonated polyethylene
EPDM = ethylene propylene diene terpolymer

* More recently, the same question has arisen but focused on geotextiles, geogrids, geopipe, fibers of GCLs, etc. This White Paper, however, is focused on geomembranes due to the general lack of information on the other geosynthetics.

The possible variations being obvious, one must also address the degradation mechanisms which might occur. They are as follows accompanied by some generalized commentary.

- Ultraviolet - occurs only when the geosynthetic is exposed; it will be the focus of the second part of this communication.
- Oxidation - this occurs in all polymers and is the major mechanism in polyolefins (polyethylene and polypropylene) under covered conditions.
- Ozone - this occurs in all polymers that are exposed to the environment. The site-specific environment is critical in this regard.
- Hydrolysis - this is the primary mechanism in polyesters and polyamides.
- Chemical - can occur in all polymers and can vary from water (least aggressive) to organic solvents (most aggressive).
- Radioactive - not a factor unless the polymer is exposed to radioactive materials of sufficiently high intensity to cause chain scission, e.g., high level radioactive waste materials.
- Biological - generally not a factor unless biologically sensitive additives (such as low molecular weight plasticizers) are included in the formulation.
- Stress State - a complicating factor which is site-specific and should be appropriately modeled in the incubation process.
- Temperature - clearly, the higher the temperature the more rapid the degradation of all of the above mechanisms; temperature is critical to lifetime and furthermore is the key to time-temperature-superposition which is the basis of the laboratory incubation methods which will be followed.

2.0 Lifetime Prediction: Unexposed Conditions

Lifetime prediction studies at GRI began at Drexel University under U. S. EPA contract from 1991 to 1997 and have continued under GSI consortium funding since that time. Focus to date has been on HDPE geomembranes beneath solid waste landfills due to its common use in this particular challenging application. Incubation of the coupons has been in landfill simulation cells (see Figure 1) maintained at 85, 75, 65 and 55°C. The specific conditions within these cells are oxidation beneath, chemical (water) from above, and the equivalent of 50 m of solid waste mobilizing compressive stress. Results have been forthcoming over the years insofar as three distinct lifetime stages; see Figure 2.

Stage A - Antioxidant Depletion Time

Stage B - Induction Time to Onset of Degradation

Stage C - Time to Reach 50% Degradation (Halflife)

2.1 Stage A - Antioxidant Depletion Time

The purposes of stabilizer antioxidants are to (i) prevent polymer degradation during processing, and (ii) prevent oxidation reactions from taking place during Stage A of service life, respectively. Obviously, there can only be a given amount of antioxidants in any formulation. Once the antioxidants are depleted, additional oxygen will begin to attack the polymer chains, leading to subsequent stages as shown in Figure 2. The duration of the antioxidant depletion stage depends on both the type and amount of antioxidants.

The depletion of antioxidants is the consequence of two processes: (i) chemical reactions with the oxygen diffusing into the geomembrane, and (ii) physical loss of antioxidants from the geomembrane. The chemical process involves two main functions; the scavenging of free radicals converting them into stable molecules, and the reaction with unstable hydroperoxide

(ROOH) forming a more stable substance. Regarding physical loss, the process involves the distribution of antioxidants in the geomembrane and their volatility and extractability to the site-specific environment.

Hence, the rate of depletion of antioxidants is related to the type and amount of antioxidants, the service temperature, and the nature of the site-specific environment. See Hsuan and Koerner (1998) for additional details.

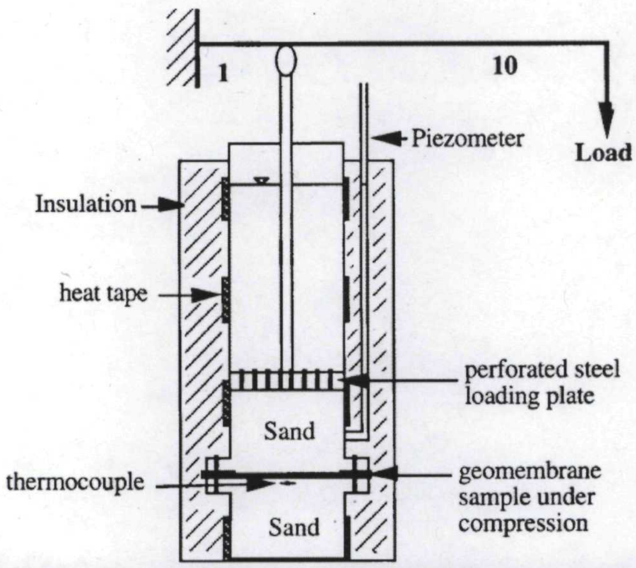


Figure 1. Incubation schematic and photograph of multiple cells maintained at various constant temperatures.

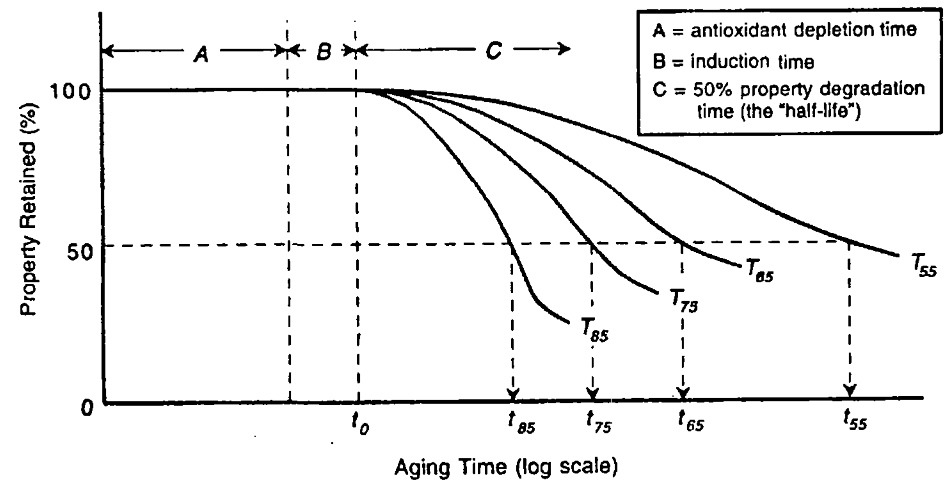


Figure 2. Three conceptual stages in chemical aging of polyolefin geomembranes.

2.2 Stage B - Induction Time to Onset of Degradation

In a pure polyolefin resin, i.e., one without carbon black and antioxidants, oxidation occurs extremely slowly at the beginning, often at an immeasurable rate. Eventually, oxidation occurs more rapidly. The reaction eventually decelerates and once again becomes very slow. This progression is illustrated by the S-shaped curve of Figure 3(a). The initial portion of the curve (before measurable degradation takes place) is called the induction period (or induction time) of the polymer. In the induction period, the polymer reacts with oxygen forming hydroperoxide (ROOH), as indicated in Equations (1)-(3). However, the amount of ROOH in this stage is very small and the hydroperoxide does not further decompose into other free radicals which inhibits the onset of the acceleration stage.

In a stabilized polymer such as one with antioxidants, the accelerated oxidation stage takes an even longer time to be reached. The antioxidants create an additional depletion time stage prior to the onset of the induction time, as shown in Figure 3(b).

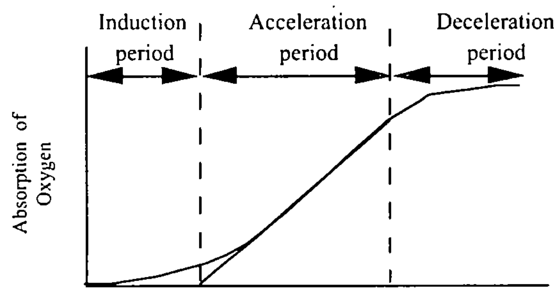
$$RH \rightarrow R\bullet + H\bullet \qquad (1)$$

(aided by energy or catalyst residues in the polymer)

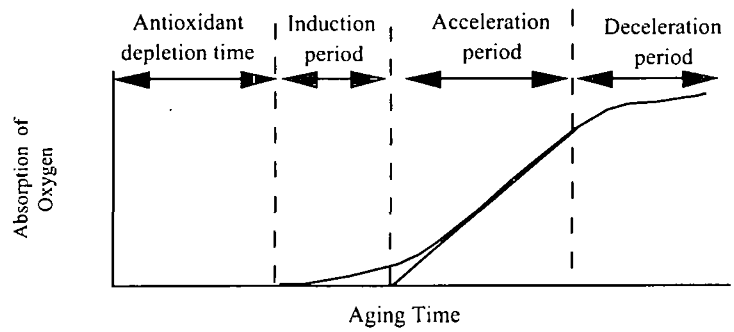
$$R\bullet + O2 \rightarrow ROO\bullet \qquad (2)$$

$$ROO\bullet + RH \rightarrow ROOH + R\bullet \qquad (3)$$

In the above, RH represents the polyethylene polymer chains; and the symbol "•" represents free radicals, which are highly reactive molecules.



(a) Pure unstabilized polyethylene



(b) stabilized polyethylene

Figure 3. Curves illustrating various stages of oxidation.

2.3 Stage C - Time to Reach 50% Degradation (Halflife)

As oxidation continues, additional ROOH molecules are being formed. Once the concentration of ROOH reaches a critical level, decomposition of ROOH begins, leading to a substantial increase in the amount of free radicals, as indicated in Equations (4) to (6). The additional free radicals rapidly attack other polymer chains, resulting in an accelerated chain reaction, signifying the end of the induction period, Rapopport and Zaikov (1986). This indicates that the concentration of ROOH has a critical control on the duration of the induction period.

$$ROOH \rightarrow RO \bullet OH \bullet \text{ (aided by energy)} \tag{4}$$

$$RO \bullet + RH \rightarrow ROH + R \bullet \tag{5}$$

$$OH \bullet + RH \rightarrow H2O + R \bullet \tag{6}$$

A series of oxidation reactions produces a substantial amount of free radical polymer chains (R•), called alkyl radicals, which can proceed to further reactions leading to either cross-linking or chain scission in the polymer. As the degradation of polymer continues, the physical and mechanical properties of the polymer start to change. The most noticeable change in physical properties is the melt index, since it relates to the molecular weight of the polymer. As for mechanical properties, both tensile break stress (strength) and break strain (elongation) decrease. Ultimately, the degradation becomes so severe that all tensile properties start to change (tear, puncture, burst, etc.) and the engineering performance is jeopardized. This signifies the end of the so-called "service life" of the geomembrane.

Although quite arbitrary, the limit of service life of polymeric materials is often selected as a 50% reduction in a specific design property. This is commonly referred to as the halflife time, or simply the "halflife". It should be noted that even at halflife, the material still exists and can function, albeit at a decreased performance level with a factor-of-safety lower than the initial design value.

2.4 Summary of Lifetime Research-to-Date

Stage A, that of antioxidant depletion for HDPE geomembranes as required in the GRI-GM13 Specification, has been well established by our own research and corroborated by others, e.g., Sangram and Rowe (2004). The GRI data for Standard and High Pressure Oxidative Induction Time (OIT) is given in Table 2. The values are quite close to one another. Also, as expected, the lifetime is strongly dependent on the service temperature; with the higher the temperature the shorter the lifetime.

Table 2 - Lifetime prediction of HDPE (nonexposed) at various field temperatures

In Service Temperature (°C)	Stage "A" (yrs.)		Stage "B" (yrs.)	Stage "C" (yrs.)		Total Lifetime (ave. values)
	Std OIT	HP-OIT	Field Data	(max.)	(min.)	
20	200	215	30	255	149	449
25	135	144	25	132	77	270
30	95	98	20	70	41	173
35	65	67	15	38	22	111
40	45	47	10	21	12	73

Notes: Stage "A" measured values from Hsuan and Guan (1997) research via GRI
Stage "B" estimated values from field samples by GRI
Stage "C" literature values from Gedde, et al. (1994)

Stage "B", that of induction time, has been obtained by comparing 30-year old polyethylene water and milk containers (containing no long-term antioxidants) with currently produced containers. The data shows that degradation is just beginning to occur as evidenced by slight changes in break strength and elongation, but not in yield strength and elongation. The lifetime for this stage is also given in Table 2.

Stage "C", the time for 50% change of mechanical properties is given in Table 2 as well. The data depends on the activation energy, or slope of the Arrhenius curve, which is very sensitive to material and experimental techniques. The data is from Gedde, et al. (1994) which is typical of the HDPE resin used for gas pipelines.

Summarizing Stages A, B, and C, it is seen in Table 2 that the halflife of covered HDPE geomembranes (formulated according to the current GRI-GM13 Specification) is estimated to be 449-years at 20°C. This, of course, brings into question the actual temperature for a covered geomembrane such as beneath a solid waste landfill. Figure 4 presents multiple thermocouple monitoring data of a municipal waste landfill liner in Pennsylvania for over 10-years, Koerner and Koerner (2005). Note that for 6-years the temperature was approximately 20°C. At that time and for the subsequent 4-years the temperature increased to approximately 30°C. Thus, the halflife of this geomembrane is predicted to be from 270 to 449 years within this temperature range. The site is still being monitored, see Koerner and Koerner (2005).

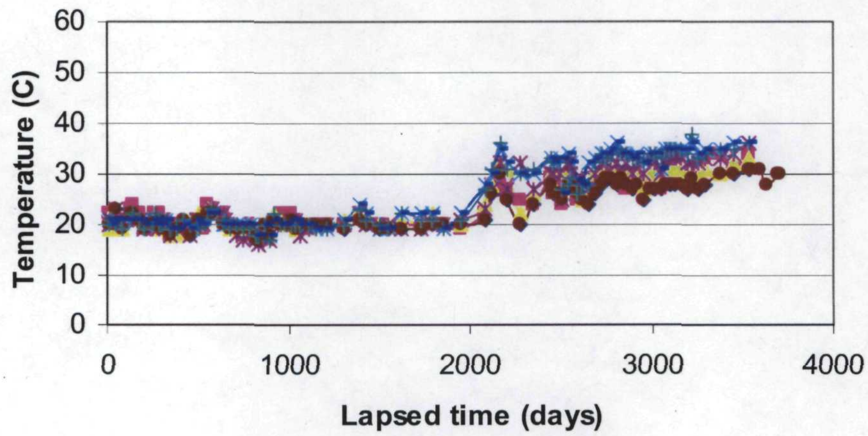


Figure 4. Long-term monitoring of an HDPE liner beneath a municipal solid waste landfill in Pennsylvania.

2.5 Lifetime of Other Covered Geomembranes

By virtue of its widespread use as liners for solid waste landfills, HDPE is by far the widest studied type of geomembrane. Note that in most countries (other than the U.S.), HDPE is the required geomembrane type for solid waste containment. Some commentary on other-than HDPE geomembranes (recall Table 1) follows:

2.5.1 Linear Low Density Polyethylene (LLDPE) geomembranes

The nature of the LLDPE resin and its formulation is very similar to HDPE. The fundamental difference is that LLDPE is a lower density, hence lower crystallinity, than HDPE; e.g., 10% versus 50%. This has the effect of allowing oxygen to diffuse into the polymer structure quicker, and likely decreases Stages A and C. How much is uncertain since no data is available, but it is felt that the lifetime of LLDPE will be somewhat reduced with respect to HDPE.

2.5.2 Plasticizer migration in PVC geomembranes

Since PVC geomembranes necessarily have plasticizers in their formulations so as to provide flexibility, the migration behavior must be addressed for this material. In PVC the plasticizer bonds to the resin and the strength of this bonding versus liquid-to-resin bonding is significant. One of the key parameters of a stable long-lasting plasticizer is its molecular weight. The higher the molecular weight of the plasticizer in a PVC formulation, the more durable will be the material. Conversely, low molecular weight plasticizers have resulted in field failures even under covered conditions. See Miller, et al. (1991), Hammon, et al. (1993), and Giroud and Tisinger (1994) for more detail in this regard.

2.5.3 Crosslinking in EPDM and CSPE geomembrnaes

The EPDM geomembranes mentioned in Table 1 are crosslinked thermoset materials. The oxidation degradation of EPDM takes place in either ethylene or propylene fraction of the co-polymer via free radical reactions, as expressed in Figure 5, which are described similarly by Equations (4) to (6).

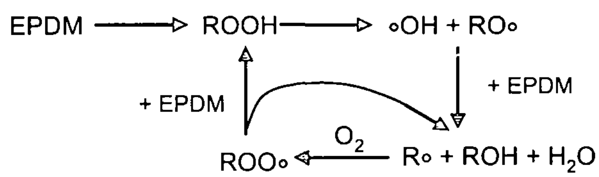


Figure 5. Oxidative degradation of crosslinked EPDM geomembranes, (Wang and Qu, 2003).

For CSPE geomembranes, the degradation mechanism is dehydrochlorination by losing chlorine and generating carbon-carbon double bonds in the main polymer chain, as shown in Figure 6. The carbon-carbon double bonds become the preferred sites for further thermodegradation or cross-linking in the polymer, leading to eventual brittleness of the geomembrane.

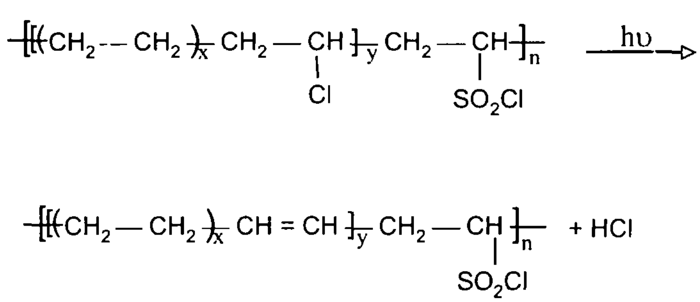


Figure 6. Dechlorination degradation of crosslinked CSPE geomembranes (Chailan, et al., 1995).

Neither EPDM nor CSPE has had a focused laboratory study of the type described for HDPE reported in the open literature. Most of lifetime data for these geomembranes is antidotal by virtue of actual field performance. Under covered conditions, as being considered in this section, there have been no reported failures by either of these thermoset polymers to our knowledge.

3.0 Lifetime Prediction: Exposed Conditions

Lifetime prediction of exposed geomembranes have taken two very different pathways; (i) prediction from anecdotal feedback and field performance, and (ii) from laboratory weathermometer predictions.

3.1 Field Performance

There is a large body of anecdotal information available on field feedback of exposed geomembranes. It comes form two quite different sources, i.e., dams in Europe and flat roofs in the USA.

Regarding exposed geomembranes in dams in Europe, the original trials were using 2.0 mm thick polyisobutylene bonded directly to the face of the dam. There were numerous problems encountered as described by Scuero (1990). Similar experiences followed using PVC geomembranes. In 1980, a geocomposite was first used at Lago Nero which had a 200 g/m^2 nonwoven geotextile bonded to the PVC geomembrane. This proved quite successful and led to the now-accepted strategy of requiring drainage behind the geomembrane. In addition to thick nonwoven geotextiles, geonets, and geonet composites have been successful. Currently over 50 concrete and masonry dams have been rehabilitated in this manner and are proving successful for over 30-years of service life. The particular type of PVC plasticized geomembranes used for these dams is proving to be quite durable. Tests by the dam owners on residual properties show only nominal changes in properties, Cazzuffi (1998). As indicated in Miller, et al. (1991) and Hammond, et al. (1993), however, different PVC materials and formulations result in very different behavior; the choice of plasticizer and the thickness both being of paramount importance.

Regarding exposed geomembranes in flat roofs, past practice in the USA is almost all with EPDM and CSPE and, more recently, with fPP. Manufacturers of these geomembranes regularly warranty their products for 20-years and such warrants appear to be justified. EPDM and CSPE, being thermoset or elastomeric polymers, can be used in dams without the necessity of having seams by using vertical attachments spaced at 2 to 4 m centers, see Scuero and Vaschetti (1996). Conversely, fPP can be seamed by a number of thermal fusion methods. All of these geomembrane types have good conformability to rough substrates as is typical of concrete and masonry dam rehabilitation. It appears as though experiences (both positive and negative) with geomembranes in flat roofs should be transferred to all types of waterproofing in civil engineering applications.

3.2 Laboratory Weatherometer Predictions

For an accelerated simulation of direct sunlight using a laboratory weatherometer one usually considers a worst-case situation which is the solar maximum condition. This condition consists of global, noon sunlight, on the summer solstice, at normal incidence. It should be recognized that the UV-A range is the target spectrum for a laboratory device to simulate the naturally occurring phenomenon, see Hsuan and Koerner (1993), and Suits and Hsuan (2001).

The Xenon Arc Weatherometer (ASTM G155) was introduced in Germany in 1954. There are two important features; the type of filters and the irradiance settings. Using a quartz inner and borosilicate outer filter (quartz/boro) results in excessive low frequency wavelength degradation. The more common borosilicate inner and outer filters (boro/boro) shows a good correlation with solar maximum conditions, although there is an excess of energy below 300 nm wavelength. Irradiance settings are important adjustments in shifting the response although they do not eliminate the portion of the spectrum below 300 nm frequency. Nevertheless, the Xenon

Arc weatherometer is commonly used method for exposed lifetime prediction of all types of geosynthetics.

UV Fluorescent Lamps (ASTM G154) are an alternative type of accelerated laboratory test device which became available in the early 1970's. They reproduce the ultraviolet portion of the sunlight spectrum but not the full spectrum as in Xenon Arc weatherometers. Earlier FS-40 and UVB-313 lamps give reasonable short wavelength output in comparison to solar maximum. The UVA-340 lamp was introduced in 1987 and its response is seen to reproduce ultraviolet light quite well. This device (as well as other types of weatherometers) can handle elevated temperature and programmed moisture on the test specimens.

Research at the Geosynthetic Institute (GSI) is actively pursuing both Xenon and UV Fluorescent devices on a wide range of geomembranes. Table 3 gives the geomembranes being incubated and the current number of hours of exposure.

Table 5 - Details of the GSI laboratory exposed weatherometer study on various types of geomembranes

Geomembrane Type	Thickness (mm)	UV Fluorescent Exposure*	Xenon Exposure*	Comment
1. HDPE (GM13)	1.50	8000 hrs.	6600 hrs.	Basis of GRI-GM13 Spec
2. LLDPE (GM17)	1.00	8000	6600	Basis of GRI-GM-17 Spec
3. PVC (No. Amer.)	0.75	8000	6600	Low Mol. Wt. Plasticizer
4. PVC (Europe)	2.50	7500	6600	High Mol. Wt. Plasticizer
5. fPP (BuRec)	1.00	2745**	4416**	Field Failure at 26 mos.
6. fPP-R (Texas)	0.91	100	100	Field Failure at 8 years
7. fPP (No. Amer.)	1.00	7500	6600	Expected Good Performance

*As of 12 July 2005 exposure is ongoing
**Light time to reach halflife of break and elongation

3.3 Laboratory Weatherometer Acceleration Factors

The key to validation of any laboratory study is to correlate results to actual field performance. For the nonexposed geomembranes of Section 2 such correlations will take hundreds of years for properly formulated products. For the exposed geomembranes of Section

3, however, the lifetimes are significantly shorter and such correlations are becoming possible. In particular, Geomembrane #5 (flexible polypropylene) of Table 3 was an admittedly poor geomembrane formulation which failed in 26 months of exposure at El Paso, Texas, USA. The reporting of this failure is available in the literature, Comer, et al. (1998). Note that for both UV Fluorescent and Xenon Arc laboratory testing of this material, failure (halflife to 50% reduction in strength and elongation) occurred at 2745 and 4416 hours, respectively. The comparative analysis of laboratory and field for this case history allows for the obtaining of acceleration factors for the two incubation devices.

3.3.1 Comparison between field and UV Fluorescent weatherometer

The light source used in the UV fluorescent weatherometer is UVA with wavelengths from 295-400 nm. In addition, the intensity of the radiation is controlled by the Solar Eye irradiance control system. The UV energy output throughout the test is 68.25 W/m^2.

The time of exposure to reach 50% elongation at break

= 2745 hr. of light
= 9,882,000 seconds

Total energy in MJ/m^2 $= 68.25\ W/m^2 \times 9{,}882{,}000$
$= 674.4\ MJ/m^2$

The field site was located at El Paso, Texas. The UVA radiation energy (295-400 nm) at this site is estimated based on data collected by the South Florida Testing Lab in Arizona (which is a similar atmospheric location). For 26 months of exposure, the accumulated UV radiation energy is 724 MJ/m^2 which is very close to that generated from the UV fluorescent weatherometer. Therefore, direct comparison of the exposure time between field and UV fluorescent is acceptable.

Field time = 26 Months vs. Fluorescent UV light time: = 3.8 Months Thus, the acceleration factor is 6.8.

3.3.2 Comparison between field and Xenon Arc weatherometer

The light source of the Xenon Arc weatherometer simulates almost the entire sunlight spectrum from 250 to 800 nm. Depending of the age of the light source and filter, the solar energy ranges from 340.2 to 695.4 W/m^2, with the average value being 517.8 W/m^2.

The time of exposure to reach 50% elongation at break

= 4416 hr. of light
= 15,897,600 seconds

Total energy in MJ/m^2 = 517.8 W/m^2 × 15,897,600
= 8232 MJ/m^2

The solar energy in the field is again estimated based on data collected by the South Florida Testing Lab in Arizona. For 26 months of exposure, the accumulated solar energy (295-800 nm) is 15,800 MJ/m^2, which is much higher than that from the Xenon Arc weatherometer. Therefore, direct comparison of halflives obtained from the field and Xenon Arc weatherometer is not anticipated to be very accurate. However, for illustration purposes the acceleration factor based on Xenon Arc weatherometer would be as follows:

Field	vs.	Xenon Arc	: Thus,	the acceleration factor is 4.3.
= 26 Months		= 6.1 Months		

4.0 Summary and Recommendations

This White Paper has described research on the geomembrane type which has had the majority of research effort, that being nonexposed HDPE used in landfill applications. While this material promises service lifetime of hundreds of years, the elevated temperatures of exposed or nearly exposed geomembranes in other applications (dams, canals, reservoirs, etc.) is expected to be greatly reduced. It was shown that HDPE decreases its predicted halflife from 449-years at 20°C, to 73-years at 40°C. Other geomembrane types (LLDPE, PVC, EPDM and CSPE) have had essentially no focused effort on lifetime prediction of the type described herein. All are candidates for additional research in this regard.

Exposed geomembrane lifetime was addressed from the perspective of field performance which is very unequivocal. Experience in Europe, mainly with relatively thick PVC containing high molecular weight plasticizers, has given 25-years of service and the geomembranes are still in use. Experience in the USA with exposed geomembranes on flat roofs, mainly with EPDM and CSPE, has given 20^{+}-years of service. The newest geomembrane type in such applications is fPP which currently carries similar warranties. To be noted, however, is that degradation is a very slow process and every time a formulation changes there is uncertainty as to its long-time field performance versus the previous formulation.

Alternatively, exposed geomembrane lifetime can be addressed by using accelerating laboratory weatherometers. GSI is fully involved in such an activity using UV Fluorescent and Xenon Arc weatherometers. Two types of polyethylene, two PVCs, and three fPP geomembranes (seven in total) are being incubated for sufficient time to reach their respective lifetimes. One type of fPP has reached this level and correlation to actual field failure time is reasonable. Analysis of this (poorly formulated) geomembrane results in acceleration factors of 6.8 for UV Fluorescent, and 4.3 for Xenon Arc devices. Based on such acceleration factors, for 20-year lifetime exposed geomembranes typical laboratory weatherometer exposure will be 3-years, or longer. As noted in Table 2 such testing is ongoing and will be continued so as to report our findings at a future date. In this regard we are proceeding as follows so as to develop the required confidence needed for use of geomembranes in long-term, permanent, systems.

(i) Extend HDPE laboratory studies on nonexposed geomembranes to other polymer types such as PVC, LLDPE, fPP, EPDM and CSPE.

(ii) Evaluate, to the extent possible, various additives particularly antioxidants in polyolefins (HDPE, LLDPE and fPP) and plasticizers in PVC.

(iii) Document and analyze geomembrane dam rehabilitation in Europe (and elsewhere) with particular emphasis on durability.

(iv) Document and analyze geomembrane use in flat roofs and other exposed applications, e.g., pond and reservoir liners as well as canal liners.

(v) Initiate a broad research program on lifetime prediction of exposed geomembranes (of all types and formulations) using laboratory weatherometers such as the ongoing study described herein.

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Resolving some of the outstanding issues in landfill barrier design

R. Kerry Rowe
GeoEngineering Centre at Queen's-RMC
Department of Civil Engineering
Queen's University, Kingston, Ontario, Canada
kerry@civil.Queensu.ca

ABSTRACT: Geosynthetics play a very important role in modern barrier systems designed to control contaminant migration from waste disposal sites. This presentation discusses a number of instances where appropriate use of geosynthetics can improve landfill performance. It also discusses some of the issues that need to be examined in developing barrier designs that are likely to provide good long term landfill performance. The specific issues addressed are (1) the design of leachate collection systems (LCS) to minimize clogging; (2) the use of rubber tire shreds as an alternative drainage materials for LCS; (3) providing adequate protection to geomembrane liners; (4) the service life of geomembranes; (5) leakage (advective flow) through the liners; (6) diffusion of contaminants through liners; and (7) the use of geosynthetic clay liners (GCL's) as an alternative to compacted clay liners (CCLs).

1 INTRODUCTION

This paper is not intended to be a primary reference but rather is directed at summarizing the key points to be raised in my oral presentation and to provide direction to the places where those interested in the topics discussed can find more information. The two key references upon which the keynote lecture is based are Rowe (2001) and Rowe *et al.* (2004), with the latter book providing the most recent summary of the state of the art with respect to barrier system design for landfills. Seven different issues related to the design of barrier systems and the role of geosynthetics with respect to the issues will be discussed. The following sections provide a brief summary with respect to each of these issues.

2 THE DESIGN OF LEACHATE COLLECTION SYSTEMS (LCS) TO MINIMIZE CLOGGING

Detailed field and laboratory studies of the clogging of municipal solid waste landfill leachate collection systems (see Rowe *et al.* 2004, Chapter 2) have indicted that:

- these systems must be designed recognizing that clogging can occur;
- a collection system has clogged when it no longer controls leachate to the design level in the landfill;
- clogging involves biological, chemical and physical processes; and
- the service life of LCS (i.e, how long they will serve their design function) is highly dependent on how they are designed.

These studies (e.g., Brune *et al.* 1991, Fleming *et al.* 1999) have shown that although substrate utilization by active micro-organisms drives the clogging processes in LCS, clogging of these systems is largely the result of biologically induced precipitation of inorganic constituents contained in leachate. Analyses of clog material both in the laboratory and the field provide very consistent results with 65% (or more) of mature clog material being calcium carbonate ($CaCO_3$).

Clogging of the collection system (typically involving a drop in hydraulic conductivity to about 10^{-6} m/s or lower) will give rise to leachate mounding, a consequent increase in the leachate head acting on the liner, and an increase in liner temperature (Barone *et al.* 1997; Rowe *et al.* 2004, Chapter 2). Systems involving French drains can be particularly problematic. Sand underdrains are also quite prone to clog (Rowe *et al.* 2004, Chapters 2 and 9). A coarse uniform gravel drainage blanket below the waste provides much better long term performance than a sand blanket, a geonet system or a French drain system. However, as shown by Fleming *et al.* (1999) the use of a suitable geotextile separator layer between the waste and the main drainage layer can substantially reduce clogging and prolong the service life of the gravel underdrain. Geotextiles do clog (Koerner *et al.* 1994) and it has been found that the use of geotextiles to wrap pipes or French drains can cause problems when the geotextile clogs. However provided that geotextiles are selected and used appropriately as a separator above a coarse granular drainage blanket (see Rowe *et al.* 2004, Chapter 2) they can be expected to improve the performance of the system even with clogging of the geotextile to the greatest levels reported in the literature.

3 THE USE OF RUBBER TIRE SHREDS AS AN ALTERNATIVE DRAINAGE MATERIALS FOR LCS

A comparative study of the clogging of tire shreds and gravel has been reported by Rowe and McIsaac (2004) based on tests involving shreds and gravel permeated with landfill leachate for up to two years. Two different types of tire shred (G shred: 100mm x 50mm x 10mm; and P shred: 125mm x 40mm x 10mm with many exposed wires) and a uniformly graded 38mm gravel were examined. The compressibility of the G and P shreds at 150kPa were found to be 48% and 44% respectively while the initial hydraulic conductivities were 0.007 m/s, 0.02 m/s respectively (compared to 0.8 m/s for the gravel). The gravel maintained a hydraulic conductivity greater than 10^{-5} m/s for about 3 times longer than a similar thickness of tire shreds. Some metals (e.g., iron and zinc) were found to leach from both the P and G shreds when exposed to typical MSW leachate, however they were then taken up in the clog material and were not detected at elevated levels in the effluent leachate. The highest concentration of metals was found in the P-shed clog and this is attributed to the greater abundance of exposed steel in these shreds. It was inferred that that gravel should continue to be used in critical zones where there is a high leachate mass loading. However the data suggests that an increased thickness of compressed tire shred may be used to give a service life similar to that of a given thickness of gravel in non-critical zones.

4 PROVIDING ADEQUATE PROTECTION OF GEOMEMBRANE LINERS

In addition to the obvious mechanisms of damage due to puncturing or tearing during construction, geomembranes can develop holes due to stresses that do not initially cause a hole but which act to cause stress cracking over time. Both forms of damage can be minimized by providing adequate protection. Protection layers may comprise sand, geotextiles or other geosynthetics (i.e., rubber geomats) or geocomposites (Rowe *et al.* 2004, Chapter 13).

Reddy *et al.* (1996) evaluated the damage to a 1.5 mm HDPE geomembrane due to construction loads and concluded that "a geotextile as light as 270 g/m^2 ...completely protects the geomembrane from construction loading". While investigations such as this are useful for establishing the level of protection needed to minimize damage during construction, they do not consider the long term effects of stresses arising when the overburden stresses are in place. Narejo *et al.* (1996) go some way towards addressing this concern and have proposed empirical equations and a design methodology for selecting the mass per unit area (g/m^2) of a nonwoven needle-punched geotextile required to prevent puncture in a 1.5 mm thick HDPE geomembrane under field stress conditions. This approach appears to provided levels of protection that will avoid puncture; however it was not developed to address the issue of long term stress cracking. To minimize the risk of stress cracking, Brummermann *et al.* (1995), Saathoff and Sehrbrock (1995), Bishop (1996) and Seeger and Müler

(1996) have recommend minimizing the geomembrane strain under long term loading condition to a very low (~ 0.25%) strain level.

Large scale laboratory tests conducted to assess the effectiveness of different protection layers have been reported by Zanzinger (1999) and Tognon *et al.* (2000). The results of Zanzinger (1999) likely underestimate the strains in the geomembrane since arch elongation was used to calculate strains from the measured deflections. The tests of Tognon *et al.* (2000) examined a range of protection materials for vertical pressures between 250 to 900 kPa. The smallest strains were obtained with the sand-filled cushion and a grid-reinforced rubber protection layer. The maximum strains of 13% calculated for 1200 g/m^2 geotextile protection at a vertical pressure of 900 kPa were very close to the short term yield strain. These tests highlight the need for protection over and above that commonly adopted and certainly support Narejo *et al.* (1996) recommendation of adopting a high factor of safety (3 or greater) when using their design methodology.

5 THE SERVICE LIFE OF GEOMEMBRANES

As discussed in detail by Rowe *et al.* (2004, Chapter 13), the service life of an HDPE geomembrane depends on the type and formulation of the polymer (e.g., crystallinity, stress crack resistance, and antioxidants), and the exposure conditions including: temperature, surrounding medium, chemical concentration, and long-term tensile stresses. Oxidative degradation is the principal mechanism of chemical ageing for HDPE geomembranes in landfills. The rate of oxidation is controlled by the amount of antioxidant in the geomembrane and the rate of antioxidant consumption and/or removal from the geomembrane. Geomembranes should have a specified minimum oxidative induction time (OIT).

The use of laboratory-accelerated ageing tests to examine the depletion of antioxidants from high density polyethylene (HDPE) geomembranes as a result of their exposure to various environments is discussed (Hsuan and Koerner 1998; Rowe and Sangam 2002; Sangam and Rowe 2003; Rowe *et al.* 2004, Chapter 13). The results indicated that the antioxidants are depleted at rates 1.6 to 2.4 times faster for samples in water than for air-exposed samples. For samples in leachate, the depletion is about 4 times faster than in air and 1.6 to 3.2 times faster than in water. Tests examining antioxidant depletion rates from accelerated ageing tests at elevated temperatures can be used to obtain lower bound estimates of geomembrane service life. Based on presently available data, a primary HDPE geomembrane liner with minimum specified properties (OIT, stress crack resistance etc; see GRI-GM13), has a service life greater than 200 years provided that the temperature is not higher than 15°C, whereas the service life is estimated to be reduced to 70 years if the temperature at the base of the landfill is at 33°C. These findings highlight the importance of controlling temperature on the liner.

6 LEAKAGE (ADVECTIVE FLOW) THROUGH THE LINERS

An intact geomembrane (i.e., one that is free of holes or tears) is essentially impermeable to water. However geomembranes will have some holes and the fluid that flows through these holes is referred to as "leakage". The quantity of leakage depends, on: the number and size of holes in the geomembrane, the hydraulic head acting above and below the composite liner, the hydraulic conductivity and thickness of any underlying soil, and the nature of the interface between the geomembrane and underlying material. Techniques for calculating the leakage through composite liners are described in detail by Rowe *et al.* (2004, Chapter 5). In this lecture issues such as the number of holes that might be expected, the effect of the number of holes on leakage, and the difference between leakage observed for composite liners involving compacted clay and GCL are discussed from both a theoretical perspective and from the perspective of observed field behaviour (Bonaparte *et al.* 1996; Othman *et al.* 1996). A detailed discussion of these issues is provided by Rowe *et al.* (2004, Chapter 13).

7 DIFFUSION OF CONTAMINANTS THROUGH LINERS

For well designed and constructed barrier systems the leakage through holes is very small and the primary mechanism for contaminant transport is molecular diffusion. Diffusion has been well documented over thousands of years from natural sources and over periods of up to 14 years from landfill sites (see Rowe *et al.* 2004, Chapter 9). Diffusion can occur through thick compacted clay liners (Rowe *et al.* 2003), GCLs (Lake and Rowe 2000, 2004) and geomembranes (Sangam and Rowe 2001b). HDPE geomembranes act as an excellent diffusion barrier to water and hydrated ions such as chloride with negligible migration being observed in tests that have been running for over a decade (Rowe *et al.* 2004, Chapter 13). However, for certain low solubility organic contaminants, diffusive migration may be quite significant for a well constructed liner (i.e., one with only a few holes), and should be considered if one is to ensure a safe design. While there can be diffusion through geomembranes, the combination of geomembrane, clay liner and, as needed, an attenuation layer can control the migration of these organic contaminants and provide negligible impact on groundwater (Sangam and Rowe 2001a; Rowe *et al.* 2004, Chapter 16).

8 GEOSYNTHETIC CLAY LINERS (GCL'S) AS AN ALTERNATIVE TO COMPACTED CLAY LINERS (CCLS)

Any assessment of the "equivalency" of GCLs and CCLs must consider the total design performance rather than individual properties. Rowe (1998), Shackelford *et al.* (2000), Manassero *et al.* (2000) and Rowe and Lake (2000) have discussed properties of a GCL important to an assessment of equivalency. Any assessment of the environmental protection afforded by the two systems should involve calculations that include consideration of the: (1) hydraulic conductivity of GCLs permeated with the leachate of interest (Petrov and Rowe 1997, Petrov *et al.* 1997a,1997b), (2) the effect of high gradients and potential for internal erosion (Rowe and Orsini 2003), (3) diffusion and sorption (Lake and Rowe 2000, 2004), (4) interface contact with any overlying geomembrane (Harpur *et al.* 1993), and (4) the thickness of the entire barrier system (Rowe and Brachman 2004). A qualitative comparison of GCLs and CCLs is given in Rowe *et al.* (2004, Chapter 12). For many criteria, the performance of a GCL is either equivalent to or better than that of a CCL. However, in terms of liner applications, both the liner itself and the underlying attenuation layer must be considered when examining contaminant transport and equivalency in terms of potential contaminant impact over the contaminating lifespan of the facility. This is discussed by Rowe *et al.* (2004, Chapter 16) and it is shown that provided the total thickness of liner and attenuation layer between the contaminant source and the receptor aquifer are similar, a liner system involving a geomembrane and GCL is comparable to (or better than) the system involving compacted clay from a contaminant transport perspective.

9 CONCLUSION

This presentation shows that considerable advances have been made in recent years with respect to the development and use of geosynthetics in landfill barrier applications. It has been shown that:

(1) Leachate collection systems (LCS) can be designed of to minimize clogging and that appropriate use of geotextiles can results in an extended service life of these systems.

(2) Subject to field verification of laboratory studies, rubber tire shreds may potentially be used as alternative drainage materials in non critical areas of LCS provided that the thickness of material is increases to make allowance for the difference in compressibility and porosity under compression. However conventional uniform coarse gravel should continue to be used in critical areas.

(3) More attention needs to be paid to providing adequate protection of geomembrane liners (GM) in order to achieve long service lifetimes for these liners.

(4) The service life of geomembranes is very sensitive to temperature. Based on current studies it appears that a suitable 1.5mm HDPE geomembrane that meets specified criteria (GRI-GM13), and is adequately installed and protected may have a service life greater than 200 years provided that the temperature is not higher than 15°C, whereas the service life is estimated to be reduced to 70 years if the temperature at the base of the landfill is at 33°C.

(5) Leakage (advective flow) through composite liners is highly dependant on the number of holes, the presence of wrinkles, and the nature of the interface between the geomembrane and clay liner. However the evidence also suggests that for well designed and constructed landfills, the leakage is very small throughout the service life of the leachate collection systems and the geomembrane. Under these conditions diffusion is likely the primary contaminant transport mechanism.

(6) Diffusion of contaminants through liners can be well predicted and assessed in design. By appropriate design of liner materials and attenuation layer, diffusion can be controlled to negligible levels at the receptor aquifer.

(7) With appropriate design and construction, geosynthetic clay liners (GCL's) represent a viable alternative to compacted clay liners (CCLs).

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Drexel UNIVERSITY

Geosynthetic Research Institute
475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441

Revision 1: May 15, 2003
Revision 2: January 28, 2005
Revision schedule is on pg. 12

GRI Test Method GM19*

Standard Specification for

Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

1. Scope

1.1 This specification addresses the required seam strength and related properties of thermally bonded polyolefin geomembranes; in particular, high density polyethylene (HDPE), linear low density polyethylene (LLDPE) and flexible polypropylene both nonreinforced (fPP) and scrim reinforced (fPP-R).

1.2 Numeric values of seam strength and related properties are specified in both shear and peel modes.

Note 1: This specification does not address the test method details or specific testing procedures. It refers to the relevant ASTM test methods where applicable.

1.3 The thermal bonding methods focused upon are hot wedge (single and dual track) and extrusion fillet.

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

Note 2: Other acceptable, but less frequently used, methods of seaming are hot air and ultrasonic methods. They are inferred as being a subcategory of hot wedge seaming.

1.4 This specification also suggests the distance between destructive seam samples to be taken in the field, i.e., the sampling interval. However, project-specific conditions will always prevail in this regard.

1.5 This specification is only applicable to laboratory testing.

1.6 This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards

- D751 Standard Test Methods for Coated Fabrics
- D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

2.2 EPA Standards

EPA 600/2.88/052 (NTIS PB-89-129670)
Lining of Waste Containment and Other Containment Facilities

2.3 NSF Standards

NSF International Standard, Flexible Membrane Liners, NSF 54-1993 (depreciated)

2.4 GRI Standards

- GM13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
- GM14 Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes
- GM17 Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes
- GM18 Test Properties, Testing Frequency and Recommended Warranty for Flexible Polypropylene (fPP and fPP-R) Geomembranes

3. Definition

3.1 Geomembrane, n – An essentially impermeable geosynthetic composed of one or more synthetic sheets used for the purpose of liquid, gas or solid containment.

3.2 Hot Wedge Seaming – A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a hot metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Seams of this type can be made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual hot wedge seams or double-track seams.

3.3 Hot Air Seaming – This seaming technique introduces high-temperature air or gas between two geomembrane surfaces to facilitate localized surface melting. Pressure is applied to the top or bottom geomembrane, forcing together the two surfaces to form a continuous bond.

3.4 Ultrasonic Seaming - A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a ultrasonically vibrated metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Some seams of this type are made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual-track seams or double-track seams.

3.5 Extrusion Fillet Seaming – This seaming technique involves extruding molten resin at the edge of an overlapped geomembrane on another to form a continuous bond. A depreciated method called "extrusion flat" seaming extrudes the molten resin between the two overlapped sheets. In all types of extrusion seaming the surfaces upon which the molten resin is applied must be suitably prepared, usually by a slight grinding or buffing.

4. Significance and Use

4.1 The various methods of field fabrication of seams in polyolefin geomembranes are covered in existing ASTM standards mentioned in the referenced document section. What is not covered in those documents is the numeric values of strength and related properties that the completed seam must meet, or exceed. This specification provides this information insofar as minimum, or maximum, property values are concerned when the field fabricated seams are sampled and laboratory tested in shear and peel. The specification also provides guidance as to what spacing intervals the samples should be taken at typical field installation projects.

5. Sample and Specimen Preparation

5.1 The spacing for taking field seam samples for destructive testing is to be 1 per 500 feet (1 per 150 m) of seam length, or as by directed by the construction quality assurance inspector. As the project continues and data is accumulated, however, this sampling interval should be varied according to the procedure set forth in GRI GM14. Following this procedure three different situations can result.

5.1.1 Good seaming with fewer rejected test results than the preset historic average can result in a sequential increase in the spacing interval, i.e., one per greater than 500 ft. (one per greater than 150 m).

5.1.2 Poor seaming with more rejected test results than the preset historic average can result in a sequential decrease in the spacing interval, i.e., one per less than 500 ft. (one per less than 150 m).

5.1.3 Average seaming with approximately the same test results as the preset historic average will result in the spacing interval remaining the same, i.e., one per 500 ft. (one per 150 m).

Note 3: The method of attributes referred to in GRI GM14 is only one of several statistical strategies that might be used to vary sampling frequency. The use of control charts should also be considered in this regard.

5.2 The size of field seam samples is to be according to the referenced test method, e.g., ASTM D6392 or site-specific CQA plan.

5.3 The individual test specimens taken from the field seam samples are to be tested according to the referenced test method, i.e., ASTM D6392 for HDPE, LLDPE and fPP, and ASTM D751 (as modified by NSF 54) for fPP-R. The specimens are to be conditioned prior to testing according to these same test methods and evaluated accordingly.

6. Assessment of Seam Test Results

6.1 HDPE seams – For HDPE seams (both smooth and textured), the strength of four out of five 1.0 inch (25 mm) wide strip specimens in shear should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values. In addition, the shear percent elongation, calculated as follows, should exceed the values given in Tables 1(a) and 1(b):

$$E = \frac{L}{L_o}(100) \qquad (1)$$

where

E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original average length (usually 1.0 in. or 25 mm)

Note 4: The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

For HDPE seams (both smooth and textured), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 1(a) and 1(b). The value shall be based on the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation (%)
A = average area of separation, or incursion (in^2 or mm^2)
A_0 = original bonding area (in^2 or mm^2)

Note 5: The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Note 6: It should be recognized that ASTM D6392 recommends that peel separation be based on the linear measurement of incursion depth. This specification is based on incursion area which is felt to be more indicative of the behavior of peel separation.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2 and AD-WLD (unless strength is achieved)

6.2 LLDPE seams – For LLDPE seams (both smooth and textured), the strength of four out of five 1.0 in. (25 mm) wide strip specimens in shear should meet or exceed the values given in Table 2(a) and 1(b). The fifth must meet or exceed 80% of the given values. In addition, the shear percent elongation, calculated as follows, should exceed the values given in Tables 2(a) and 2(b).

$$E = \frac{L}{L_o}(100) \qquad (1)$$

where

E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original average length (usually 1.0 in. or 25 mm)

Note 4: The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

For LLDPE seams (both smooth and textured), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 2(a) and 2(b). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 2(a) and 2(b). The value shall be based on the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \tag{2}$$

where

S = separation (%)
A = average depth of separation, or incursion (in.^{2} or mm^2)
A_0 = original bonding distance (in.^{2} or mm^2)

Note 5: The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Note 6: It should be recognized that ASTM D6392 recommends that peel separation be based on the linear measurement of incursion depth. This specification is based on incursion area which is felt to be more indicative of the behavior of peel separation.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2, AD-WLD (unless strength is achieved)

6.3 fPP Seams – For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in shear should meet or exceed the values given in

Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are 4.0 in. (100 mm) wide grab tests. In addition, the shear percent elongation on the unreinforced specimens, calculated as follows, should exceed the values given in Tables 3(a) and 3(b).

$$E = \frac{L}{L_o}(100) \tag{1}$$

where
E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original gauge length (usually 1.0 in. or 25 mm)

Note 4: The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

Shear elongation is not relevant to scrim reinforced geomembranes and as such is listed as "not applicable" in Table 3(a) and 3(b).

For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in peel should meet or exceed the values given in Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are grab tests. In addition, the peel percent separation (or incursion) should not exceed the values given in Tables 3(a) and 3(b). The values should be based on the proportion of area of separated bond to the area of the original bonding as follows.

$$S = \frac{A}{A_o}(100) \tag{2}$$

where

S = separation in (%)
A = average depth of separation, or incursion (in.^{2} or mm^2)
A_o = original bonding distance (in.^{2} or mm^2)

Note 5: The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Note 6: It should be recognized that ASTM D6392 recommends that peel separation be based on the linear measurement of incursion depth. This specification is based on incursion area which is felt to be more indicative of the behavior of peel separation.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2 and AD-WLD (unless strength is achieved)

7. Retest and Rejection

7.1 If the results of the testing of a sample do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the construction quality control or construction quality assurance plan for the particular site under construction.

8. Certification

8.1 Upon request of the construction quality assurance officer or certification engineer, an installer's certification that the geomembrane was installed and tested in accordance with this specification, together with a report of the test results, shall be furnished at the completion of the installation.

Table 1(a) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembranes **(English Units)**

Geomembrane Nominal Thickness	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams(1)							
shear strength(2), lb/in.	57	80	100	120	160	200	240
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), lb/in.	45	60	76	91	121	151	181
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), lb/in.	57	80	100	120	160	200	240
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), lb/in.	39	52	65	78	104	130	156
peel separation, %	25	25	25	25	25	25	25

Notes for Tables 1(a) and 1(b):

1. Also for hot air and ultrasonic seaming methods
2. Value listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 1(b) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembranes **(S.I. Units)**

Geomembrane Nominal Thickness	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams(1)							
shear strength(2), N/25 mm.	250	350	438	525	701	876	1050
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), N/25 mm	197	263	333	398	530	661	793
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), N/25 mm	250	350	438	525	701	876	1050
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), N/25 mm	170	225	285	340	455	570	680
peel separation, %	25	25	25	25	25	25	25

Table 2(a) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembranes **(English Units)**

Geomembrane Nominal Thickness	20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams(1)								
shear strength(2), lb/in.	30	45	60	75	90	120	150	180
shear elongation(3), %	50	50	50	50	50	50	50	50
peel strength(2), lb/in.	25	38	50	63	75	100	125	150
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength(2), lb/in.	30	45	60	75	90	120	150	180
shear elongation(3), %	50	50	50	50	50	50	50	50
peel strength(2), lb/in.	22	34	44	57	66	88	114	136
peel separation, %	25	25	25	25	25	25	25	25

Notes for Tables 2(a) and 2(b):

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 2(b) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembranes **(S.I. Units)**

Geomembrane Nominal Thickness	0.50 mm	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams(1)								
shear strength(2), N/25 mm	131	197	263	328	394	525	657	788
shear elongation(3), %	50	50	50	50	50	50	50	50
peel strength(2), N/25 mm	109	166	219	276	328	438	547	657
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength(2), N/25 mm	131	197	263	328	394	525	657	788
shear elongation(3), %	50	50	50	50	50	50	50	50
peel strength(2), N/25 mm	95	150	190	250	290	385	500	595
peel separation, %	25	25	25	25	25	25	25	25

Table 3(a) – Seam Strength and Related Properties of Thermally Bonded Nonreinforced and Reinforced Flexible Polypropylene (fPP) Geomembranes **(English Units)**

Geomembrane Nominal Thickness	30 mil-NR	40 mil-NR	36 mil-R[4]	45 mil-R[4]
Hot Wedge Seams[1]				
shear strength[2], lb/in. (NR); lb (R)	25	30	200	200
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], lb/in. (NR); lb (R)	20	25	20	20
peel separation, %	25	25	n/a	n/a
Extrusion Fillet Seams				
shear strength[2], lb/in. (NR); lb (R)	25	30	200	200
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], lb/in. (NR); lb (R)	20	25	20	20
peel separation, %	25	25	n/a	n/a

Notes for Tables 3(a) and 3(b):

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongations per D751 for laboratory tested specimens

Table 3(b) – Seam Strength and Related Properties of Thermally Bonded Nonreinforced and Reinforced Flexible Polypropylene (fPP) Geomembranes **(S.I. Units)**

Geomembrane Nominal Thickness	0.75 mm-NR	1.0 mm-NR	0.91 mm-R[4]	1.14 mm-R[4]
Hot Wedge Seams[1]				
shear strength[2], N/25 mm (NR); N (R)	110	130	890	890
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], N/25 mm (NR); N (R)	85	110	90	90
peel separation, %	25	25	n/a	n/a
Extrusion Fillet Seams				
shear strength[2], N/25 mm (NR); N (R)	110	130	890	890
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], N/25 mm (NR); N (R)	85	110	90	90
peel separation, %	25	25	n/a	n/a

Adoption and Revision Schedule

for

Seam Specification per GRI-GM19

"Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes"

Adopted: February 18, 2002

Revision 1: May 15, 2003; Increased selected shear and peel test requirements, per the following:

Material	Test	Seam Type	Current GM19	Proposed GM19	Difference
HDPE	Shear	Hot Wedge	95% yield	95% yield	no change
		Extrusion	95% yield	95% yield	no change
	Peel	Hot Wedge	62% yield	72% yield	16% increase
		Extrusion	62% yield	62% yield	no change
LLDPE	Shear	Hot Wedge	1300 psi break	1500 psi break	15% increase
		Extrusion	1300 psi break	1500 psi break	15% increase
	Peel	Hot Wedge	1100 psi break	1250 psi break	14% increase
		Extrusion	1100 psi break	1100 psi break	no change

Revision 2: January 28, 2005; added Note 6 (in three locations) stating that incursion is measured on an area basis and not depth as in ASTM D6392.

5 9 0218

United States
Environmental Protection
Agency

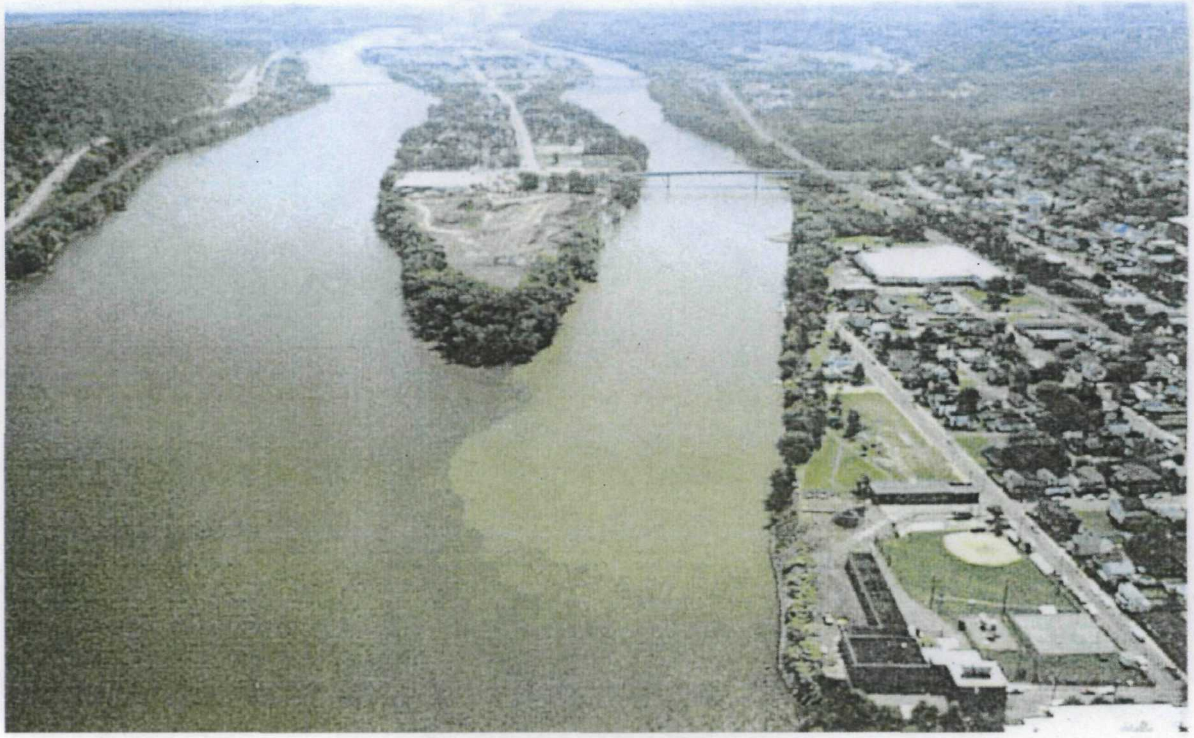
Office of Emergency and
Remedial Response
Washington, D.C. 20460

EPA 540-K-01-008
OSWER 9230.0-100
February, 2002

EPA

Reusing Superfund Sites:

Commercial Use Where Waste is Left on Site



5 9 0219

United States Environmental Protection Agency
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February 2002

Reusing Superfund Sites:

Commercial Use Where Waste is Left On Site

Office of Emergency and Remedial Response
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
Washington DC 20460

EPA Contract 68-W6-0046, Work Assignment 4

Notice

Preface

As of February 2001, more than 190 cleaned up Superfund sites have been returned to productive use. Half are being used for commercial or industrial purposes. Other sites are restored for use as recreational or ecological areas, such as wildlife habitats. Many more Superfund sites, and some non-time-critical removal sites, may have potential for similar uses after they are cleaned up. Recognizing this, the Environmental Protection Agency (EPA), through the Superfund Redevelopment Initiative, encourages and supports the productive reuse of Superfund sites. EPA's overriding objective for any site is to ensure it is safe. With forethought and effective planning, communities can return sites to productive use without jeopardizing the effectiveness of the remedy put into place to protect human health and the environment.

This report provides industry and government officials with technical information useful in planning, designing, and implementing safe commercial reuse of sites where the remedy calls for on-site containment of contaminated material. This information may be useful when considering commercial reuse options during EPA's process of selecting, designing, and implementing a cleanup plan for a Superfund site or non-time-critical removal action. The report draws from experiences at completed and current redevelopment projects, EPA technical guidance, and other sources to describe remedy approaches and commercial facility design features that have been used to accommodate commercial and industrial uses at Superfund sites where waste has been left on site.

This document is intended for information only, and should not be considered agency policy or guidance. It is one of a series of planning reports being developed under EPA's Superfund Redevelopment Initiative to inform interested parties at hazardous waste sites about how EPA may take intended and potential reuse into account during the process of selecting, designing, and implementing remedies. Other reports in this series provide technical information on the reuse of Superfund waste containment areas for outdoor recreational areas, golf courses, and ecological resources.

Table of Contents

1. Introduction

Former landfills, abandoned dumps, and other contaminated sites throughout the United States, once thought to be of limited or no value, are being transformed into viable commercial and industrial developments, parks and other recreational areas, and wildlife areas. Half of the over 190 Superfund sites that have been redeveloped over the past 20 years are being used for commercial or industrial purposes. Cleaned up Superfund sites are being used for high-rise office buildings, retail centers, intermodal transportation facilities, port cargo handling facilities, airports, restaurants, and indoor recreational buildings. These commercial developments provide positive economic impacts and social and environmental benefits to their communities.

At many successfully redeveloped sites, waste has been left on the property in containment systems that protect people and the environment from exposure and prevent contaminant migration. This report provides techniques for ensuring that these containment systems can accommodate the broadest possible range of potential commercial uses, while ensuring that reuse activities do not reduce the effectiveness of the remedy. If the remedy allows for a broad range of uses, communities will not be left with containment systems that preclude the most efficient use of their land. The successful and safe use of a remediated site for commercial purposes requires careful planning, the involvement of the community and other interested parties, and appropriate design, construction, and post-construction operation and maintenance practices.

Purpose

This report was developed to provide federal and state Superfund site managers, property owners and developers, potentially responsible parties, local planning officials, and remediation contractors with information useful for planning, designing and implementing site cleanups that will safely support commercial and industrial uses. The information could also be applied at certain non-time-critical removal sites. The report describes how redevelopment and remediation design can be coordinated to ensure successful commercial projects at sites where some or all of the hazardous wastes will be, or have been, left on site. It focuses on the planning-level issues, not detailed design information. This document does not address how communities and property owners plan for the reuse of these cleaned up sites. It is generally their responsibility to decide how they will use these properties, although the remedy may limit some future uses.

The information in this document is based on the combined experiences of successful Superfund remediation and reuse projects, previous EPA technical guidance, and other sources. It includes considerations for determining the types of uses possible; remedy design, construction, and maintenance issues important for a site; and references to completed projects. This information may be useful in supporting remedy selection, design, construction, long-term monitoring and maintenance, and general reuse and community planning. It is also useful to planners designing remedies when no clear redevelopment plan is available. This information can help a site manager determine the remedy design features that would be compatible with a number of different future reuses. This approach may afford communities more flexibility in planning future development.

Superfund Redevelopment Initiative

EPA prepared this report as part of the agency's Superfund Redevelopment Initiative. This initiative reflects EPA's commitment to consider reasonably anticipated future land uses when making remedy decisions at Superfund sites, and to ensure that the cleanup of Superfund sites allows for safe reuse for commercial, recreational, ecological, or other purposes.

Through this initiative and other efforts, the agency works with communities to determine remedial action objectives that will allow for reasonably anticipated future land uses, wherever possible. The determination of how to reuse a site is the responsibility of the community, and EPA's primary responsibility is to ensure that the remedy is effective in protecting human health and the environment. Land use is a local matter, and EPA does not favor one type of reuse over another.

The safe and appropriate redevelopment of sites can provide significant benefits to communities and help ensure that remedies will be maintained. These potential benefits include:

- New employment opportunities, increased property values, and catalysts for additional redevelopment;
- New recreational areas in communities where land available for such activities is scarce;
- Better day-to-day property management, which can result in improved maintenance of the remedy and continued protection of human health and the environment; and
- Improved aesthetic quality of the area through the creation of well-maintained commercial facilities and discouragement of illegal waste disposal and similar unwanted activities.

For more information on the Superfund Redevelopment Initiative, including information about current developments, pilot programs, tools and resources, and site-specific case studies, visit the Superfund Redevelopment Initiative web site at **www.epa.gov/superfund/programs/recycle**, or contact the following numbers:

Outside the Washington, DC area: 800-424-9346;
TDD for the hearing impaired outside the Washington, D.C. area: 800-533-7672;
In the Washington, D.C. local area: 703-412-9810; or
TDD for the hearing impaired In the Washington, D.C. local area: 800-412-3323.
Hours: 9:00 AM to 5:00 PM Eastern Standard Time, Monday through Friday.
Closed on federal holidays.

Integrating Reuse Plans With Cleanup Remedies

The future use of a Superfund site can affect all aspects of the removal and cleanup processes, from the remedial investigation/feasibility study (RI/FS), through remedy selection, to remedy design and implementation. Thus, it is important to carefully consider the roles of anticipated future land uses, EPA's process and timing for considering the anticipated future use, and the scope of EPA's authority to accommodate the remedy throughout the remedial process. For some sites it may also be possible to begin development while remediation is still occurring on other parts of the site.

Consideration of Future Land Uses

The anticipated future use of land is an important factor that EPA uses to determine the appropriate remedy. The process for identifying the reasonably anticipated future use of land begins during the Remedial Investigation/Feasibility Study (RI/FS) stage of the Superfund cleanup. A useful way to accomplish this is to conduct a reuse assessment.

The reuse assessment typically identifies broad categories of potential reuse (*e.g.*, recreational, commercial). This assessment may also initiate the reuse planning process and lay the groundwork to integrating reuse into the cleanup plan. In some cases, property owners, PRPs, and communities may have initiated a reuse planning process. Information from a reuse plan may serve as useful input to the reuse assessment. As part of the reuse assessment process, EPA holds discussions with local land-use planning authorities, local officials, property owners, PRPs, and the public to understand the reasonably anticipated future uses of the land on which the Superfund site is located. Based on these discussions, EPA develops remedial action objectives and identifies remedial alternatives that are consistent with the anticipated future land use. If there is substantial agreement on the future use of a site (*e.g.*, commercial, residential), EPA may be able to select a remedy that supports that use and take measures to accommodate that use when designing the remedy.

However, EPA must balance this preference for future land use with other technical and legal provisions in the Superfund law and its implementing regulations.[1] For example, the Agency's decisions must conform with preferences for using one or more of a number of approaches, such as treating principal-threat wastes, engineering controls such as containment for low-level threats, institutional controls to supplement engineering controls, and innovative technologies. In addition, EPA must comply with other laws when they are "applicable or relevant and appropriate" (ARAR).

After considering these factors, EPA selects a remedy. Two general land-use situations could result from EPA's remedy selection decision:

- If the remedy achieves cleanup levels that allow the site to be available for the reasonably anticipated future land use, EPA will work within its legal authorities to support that reuse; or
- If the remedy achieves cleanup levels that require a more restricted land use than the

1 See section 300.430(a)(1)(iii) of the National Contingency Plan at 40 CFR Part 300.

reasonably anticipated future land use, the site will probably not support the community's reuse preferences and the interested parties will have to discuss other reuse alternatives.

For detailed information on how EPA considers land use in the remedy selection process, see EPA's *Land Use in the CERCLA Remedy Selection Process*, EPA OSWER Directive No. 9355.7-04 (http://www.epa.gov/swerosps/bf/ascii/land_use.txt); and *Reuse Assessments: A Tool to Implement the Superfund Land Use Directive*, OSWER Directive No. 9355.7-06P (http://www.epa.gov/superfund/programs/recycle/pdf/reusefinal.pdf).

Timing

To allow for evaluations of a variety of remediation and reuse options, reuse planning should be initiated as early in the cleanup process as possible. The longer reuse planning is delayed, the greater the possibility that some reuse options will be foreclosed by decisions already made.

There are two major components to the reuse planning process: making reuse assessments and creating reuse plans. A reuse assessment, which typically identifies broad categories of potential reuse (*e.g.*, recreational, industrial), should be developed at the RI/FS stage. This assessment initiates the reuse planning process and lays the groundwork for additional planning. Because the land-use categories used in making the reuse assessment are broad, they may not provide sufficient detail to ensure that the remedy being considered will allow for a specific use or to guide the detailed design or implementation of the remedy. When communities need more detailed land-use proposals, they may initiate the second component of the reuse planning process—the creation of reuse plans.

Reuse plans may be developed by communities to provide more specific and detailed proposals for the redevelopment of a property. These plans are often developed after the RI/FS and may not be available until later stages of the site management process, such as during remedy design or construction. When the EPA receives the reuse plans prior to remedy selection, the site manager should evaluate them in the course of developing the remediation alternatives. When reuse information is received after the remedy is selected, the site manager evaluates it to determine whether the response action is consistent with the proposed reuse and whether design modification might be easily made to accommodate it.

Development of the reuse project can sometimes begin on parts of a site before construction of a remedy is completed. This can be done by segmenting the site into different operable units (OUs) which proceed on different schedules according to the nature of the cleanup approaches, location, and expected completion time; deleting portions of the site from the NPL while cleanup continues elsewhere; and sequencing the cleanup work to coordinate with development needs. For example, at the Ohio River Superfund site in Neville Island, Pennsylvania, remedial investigation and remediation activities were interrupted when EPA agreed to make part of the sight available for replacing the old, unusable Coraopolis Bridge, which was important to the community.

Although many cleaned up Superfund sites currently do not support any type of reuse activity, EPA expects that a number of these sites may eventually be returned to productive use. Where hazardous substances, pollutants, or contaminants remain on site above levels that would allow for unlimited use and unrestricted exposure, EPA conducts reviews at least every five years to ensure that the remedy remains protective. Should land use change, it will be necessary to evaluate the implications of that change for the protectiveness of the selected remedy.

In many cases, a completed remedy may not be able to accommodate the planned use without modification because of technical, legal, or other factors. If, in the future, landowners or others decide to change the land uses in such a way that makes further cleanup necessary, EPA does not prohibit them from conducting such a cleanup, so long as protectiveness of the remedy is not compromised. Retrofitting an existing remedy to support reuse requires careful planning, design, coordination with, and approval by, EPA and other regulatory agencies. As discussed below, EPA is prohibited from funding, nor can it require PRPs or others to fund, activities that are considered "enhancements" to the remedy.

Accommodating Future Use in the Remedy

The consistency of the chosen remedy with the future use of a site contributes to its long-term protectiveness. Protecting human health and the environment over the long term is the key objective of remedial action. EPAs Land Use Directive identifies anticipated future use of land as an important factor that EPA considers when it selects a remedy. Thus, understanding and accommodating future use in selecting and implementing remedies is an integral part of EPA's cleanup responsibility, and not a separate discretionary goal.

Because the effectiveness of a remedy can be compromised if it is not consistent with the eventual use of a redeveloped site, EPA chooses remedies that are consistent with anticipated use, and implements them, insofar as possible, in ways that accommodate that use. The Agency will not for example, leave a site with no means, short of modifying the remedy, to support structures that will be required for the anticipated use. The remedy will allow reasonable areas for them. As a part of the remedy, EPA may provide clean corridors for future utility access when anticipated use makes it likely that they will be needed. EPA may also, for example, move wastes to a location other than the one that might otherwise have been chosen, in order to avoid blocking an access to the site that will be needed for its anticipated future use. In another example, EPA may take future use into account in deciding on the placement of monitoring or extraction wells, air-stripping towers, or other treatment units, so that they do not interfere with placement of structures needed for the redevelopment of a site. EPA may fund, or require a potentially responsible party (PRP) to fund such actions as are necessary to ensure that the site is capable of accommodating the reasonably anticipated future land uses, so that the remedy will remain protective over the long term.

Activities like those in the examples above, which are necessary to accommodate the remedy to the anticipated future use, are remedial activities because they contribute to the long-term protectiveness of the remedy. They are not "enhancements" or "betterments." An enhancement is not a remedial feature or activity. It is not necessary for the effectiveness of the remedy, even though it may make some contribution to its effectiveness. Enhancements include such things as building roads, foundations or parking lots. Providing additional compaction of a site beyond what is needed to keep the protective cap from settling under anticipate future use would be an enhancement, as would providing extra clean fill above a containment system cover beyond that required to make it protective under the anticipated future use. EPA is not authorized to pay for enhancements, nor to require PRPs to construct them. EPA determines case-by-case whether an activity or feature constitutes an enhancement.

Organization of Report

The remainder of this document describes the key technical considerations that should be addressed when developing and operating commercial facilities on properties where hazardous waste has been left on site. It includes the following:

Section 2 This Section describes the most common site configurations and remedy design features that affect the suitability of a site for reuse when removal or on-site destructive treatment are not viable options. It addresses the most frequently used remedy design components, such as containment system covers and groundwater extraction and treatment systems. It also provides references to relevant EPA guidance documents.

Section 3 This Section outlines remedy and commercial facility design issues that may have to be considered to ensure that the facility is compatible with the remedy. The key design features include techniques for the safe placement of utilities, footings, foundations, and containment cells; methods for managing gases; and provisions for utilities, site access, and short-term and long-term stewardship of the effectiveness of the remedy.

Section 4 This Section describes seven previous projects where successful redevelopment has occurred on remediated waste sites that have contaminated material left on site or where waste treatment is to continue for a number of years. The discussion for each site includes the site configuration and contamination problems encountered, key factors considered during remediation that were important to the commercial redevelopment, and the redevelopment plan. These case studies demonstrate how remediation and redevelopment efforts may complement each other.

Section 5 This Section provides references on remedy and redevelopment design features, such as EPA guidance manuals, text books, and journal articles.

Appendix A This appendix describes some of the key monitoring and maintenance needs that EPA, developers and property owners should address after construction of the remedy is completed.

Appendix B This appendix includes brief descriptions of 15 completed projects where various types of commercial and industrial development occurred on sites with a range of containment systems.

2. Site Configurations and Remediation Approaches for Commercial Reuse

Remediation and redevelopment approaches differ according to whether the contaminated materials are closed in place, as in the case of an old landfill or large impoundment; placed in a new containment system created as part of the remedial action; or treated over time with special structures or equipment that remain on site after the initial remedy construction is completed. Each of these potential situations presents a different set of remediation and redevelopment considerations, such as how to design and build containment systems, prevent or reduce groundwater contamination, and ensure long-term stewardship.

This Section describes key factors considered during remediation that will influence the commercial redevelopment of a property that has contaminated material or operating waste treatment systems left on site. By examining the potential impact of the remediation process on the ultimate uses for the site, site managers may contribute to positive outcomes for the community.

Closed-in-Place Sites

Sites that are closed in place primarily include municipal or industrial/commercial waste depositories, some large surface impoundments, and mine tailings. Site managers and developers for many of these sites have to deal with existing conditions such, as the potential for substantial subsidence, gas production, and very hazardous materials remaining on site. These types of facilities frequently lack bottom liners and, if covered prior to becoming a Superfund site, the covers may be poorly designed. The primary redevelopment issues include general subsidence, differential settlement, cover integrity, and, in many cases, the presence of gases. There are generally few remedial options for old landfills and other existing waste depositories that are to be closed in place. The presumptive remedy for these sites is to install a protective cover and, where necessary, treat or control groundwater.

New Containment Systems

New containment systems are those that are created as part of the site remediation. These systems range from simple covers over contaminated materials that are left in place to highly engineered depositories into which waste from the site or other sites are consolidated. A new containment system may also include material that has been solidified or stabilized *ex situ*. High-hazard wastes are generally not placed into new containment systems, as these would either be treated or sent to an off-site commercial disposal facility.

Engineered containment systems generally do not have serious differential or general subsidence, or gas production. As part of good construction practice, the materials would be compacted as they are placed into this type of containment system. A minimum amount of compaction may be necessary to minimize settling of the cover. If there is commercial interest in redeveloping the site from the beginning, and the planned redevelopment requires additional compaction, it should be arranged for early in the remediation process. This approach was followed at the Raymark Superfund site in Stratford, Connecticut, where a prospective developer, anticipating that a building would later be placed on the site, paid for dynamic compaction and the installation of pilings during the construction of the containment system.

EPA site managers have more flexibility in deciding which materials will remain on site and in designing and locating new containment systems, than in existing waste depositories. This flexibility allows for a greater range of development options. The site manager typically considers factors such as the types of contaminants, their stability, the media through which they travel (*i.e.*, air, soil, groundwater), and the type of future commercial facilities anticipated. For example, instead of building one large containment cell, smaller separate cells with channels of clean soil between them could be designed to allow for utility access. Also, the containment areas could be located where buildings are not likely to be placed. Utility corridors and shallow foundations can often be located in uncontaminated materials by placing sufficient clean fill above the containment system cap. When this is done, a good safety measure is to place visible barriers, such as colored soil or brightly colored synthetic geotextile material between the contaminated material and the clean fill to act as permanent markers for future workers. Some of these approaches were used at the Denver Radium site in Denver, Colorado. A large retail store and parking lot was built on a site where insoluble metals-contaminated soil was consolidated into four containment cells with unlined bottoms. The spaces between the cells were used for utility corridors, and the asphaltic covers also serve as a parking lot.

The asphalt parking lot at the Home Depot site in Denver, Colorado also serves as a protective cover for insoluble metals-contaminated soils. The contaminated soils were consolidated into four containment cells.

A simple cover may be used at some sites with widespread surficial contamination where the main health threat is through direct contact with the soil or inhalation of wind-borne particulates. In this situation, the material may be covered in place. If the solubility of the contaminants is low, the cover can be constructed of materials such as native soils or asphalt. Such areas are generally good candidates for parking lots and commercial buildings. At the Mid-Atlantic Wood Preservers site in Harmans, Maryland, surficial contamination over a three-acre area was covered with asphalt, which is being used as a parking and storage facility by a trucking company. Building over these types of containment systems is often no more difficult than building on an uncontaminated area, as long as the construction crew is properly trained and any contaminated material excavated is properly managed.

On-site Waste Treatment Facilities

The selected remedy often includes treatment or containment equipment that will remain on site for a number of years after the initial remedy construction at the site is completed. This equipment can include groundwater extraction and treatment systems, monitoring wells, reactive walls, and diversion walls. When development is to occur on a site, provision should be made to allow access for maintenance and repair, and to prevent the public from having ready access to the equipment. Also, with the exception of *in situ* stabilization, the EPA site manager has some flexibility in determining the location of the systems and can use this flexibility to avoid diminishing the usefulness of the site. For example, the site manager has some discretion in determining the location of extraction wells, on-site treatment facilities, and underground piping.

Piping for groundwater treatment at the Peterson/Puritan Superfund site in Cumberland and Lincoln, Rhode Island.

Common Containment Methods and Features

At many Superfund sites, the remedial action leaves contaminated material on site. A number of technologies can be used to ensure that the waste is safely contained. This section addresses the most common approaches, including the use of cover systems, gas collection and treatment systems, groundwater collection and treatment systems, diversion walls, solidification and stabilization, and permeable reactive barrier walls.

Cover Systems

Cover systems at containment sites are used to minimize the infiltration of water into the contaminated material and to serve as protective barriers to isolate contaminants from the public and the environment. Regulations under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) require that cover systems at Superfund sites attain, at a minimum, applicable or relevant and appropriate requirements (ARARs). Resource Conservation and Recovery Act (RCRA) Subtitle C and Subtitle D and state regulations are the most common ARARs for containment systems at Superfund sites. RCRA regulates wastes that are the same as or similar to those found at CERCLA sites. Although cover systems at Superfund sites are not necessarily based on RCRA closure regulations, these requirements are the prevalent basis for cover system design. RCRA and state regulations usually require that the cover be built to:

- minimize the migration of liquids through the system over the long term,
- function with minimum maintenance,
- promote drainage and minimize erosion, and
- accommodate settling and subsidence.

EPA encourages flexibility in the design of covers for all waste sites. Covers can range from a simple soil or asphalt layer to protect people from contact with the contaminants, to multi-layered composite caps recommended for more demanding situations. General design requirements are based on federal or state criteria.[2] Cover systems can use one or more of the following types of barriers:

Hydraulic barriers, the most common of the three types, use low-permeability material to impede the downward migration of water. They are usually multi-layered cover systems that typically incorporate geomembranes, geosynthetic clay liners, compacted clay liners, or a combination of these as the hydraulic barrier or barriers. These systems may also include features such as a gas venting layer, biota layer to prevent burrowing animals or plant roots from damaging the cover systems, drainage layer, and soil and vegetative or other top layer. However, in some cases, asphalt or other materials may also be used as a barrier. Currently, multi-layered hydraulic barriers are the most common type of cover systems, and are typically used at RCRA "Subtitle C" and "Subtitle D" facilities that require covers.

Capillary barriers are intended for use in arid to semi-arid climates where unsaturated soil conditions prevail. This type of cover exploits the differences in pore water pressure potential between fine and coarse grained soils to limit the downward movement of water. A simple configuration of this type of cover system consists of a fine-grained soil (clay) located over a coarser-grained soil (sand). Under unsaturated conditions the fine-grained clay holds water, preventing its movement to the lower coarse-grained sand. However, when the entire fine-grained layer becomes saturated, it will release water to the lower coarse layer.

Evapotranspiration barriers are also used predominantly in arid and semi-arid environments. This type of cover typically consists of a thick layer of relatively fine-grained soils, which is capable of supporting vegetation. The soil layer inhibits downward water movement and serves as a storage reservoir that holds water until it is removed by evapotranspiration. It is built to have a greater storage capacity than that needed for the maximum anticipated rainfall.

Depending on site-specific conditions, cover systems may be composed of multiple layers of natural and/or synthetic materials, each designed for one or more specific purposes, such as gas control, internal drainage, and vegetative support. Section 5 (Bibliography) lists a number of

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2 For example, the Resource Conservation and Recovery Act (RCRA) Subtitle C closure requirements for hazardous waste management facilities (40CFR 264.310). EPA anticipates that it will issue new technical guidance for RCRA/CERCLA final covers in 2001.

EPA guidance documents that address cover system function and design (EPA 1983, 1985a, 1985b, 1987a, 1987b, 1989b, 1991c, and 1994).

Gas Collection and Treatment Systems

Gas management systems used in containment areas can be grouped into two types: passive and active venting. Passive venting allows gases building up in a containment area to exit through a vent that has an air pressure equal to that of the outside air. As gas pressures build up inside a containment area, the gas migrates towards the vent and out of the containment area. Active venting produces a negative pressure by pumping air out of the vents. Vents, discharge points, and treatment systems should be located so as not to interfere with the future use of the property. Structures placed over an area that has a gas problem, should be designed with their own gas management system. Some of these are discussed in Section 3.

Groundwater Extraction and Treatment Systems

Groundwater extraction and treatment systems are used to remove contaminated groundwater to an above-ground facility for subsequent treatment. These systems typically consist of extraction wells or french drains (collection drains). Extraction wells can be deployed in most hydrogeologic situations, while french drains are generally limited to shallow, low hydraulic conductivity aquifers. A typical groundwater extraction and treatment system can also be combined with techniques that treat or remove contaminants from the subsurface without extracting the soil or groundwater. Some of these techniques are dual phase extraction, soil vapor extraction, and air sparging.

Whatever the specific groundwater treatment system and media, all collection and treatment systems require piping, utilities, and on-site or off-site treatment systems, in addition to wells and drains. Since access for operation and maintenance must be available throughout the life of the systems, which can be many years, the placement of the components will have an impact on redevelopment activities. To the extent that there is flexibility in placing this equipment, the site manager should consider potential development scenarios or land-use plans, if any are available. Careful consideration of the location of groundwater treatment wells and equipment can maximize the potential for commercial or other reuse of the site.

Diversion Walls

A diversion wall is a below-grade vertical structure designed to divert groundwater flow away from contaminated material or to divert or channel contaminated groundwater. Diversion walls can be grouped into three types: sheet pile, grout, and slurry.

Construction of a slurry wall at the Ohio River Park Superfund site in Neville Island, Pennsylvania.

Of the three types, slurry walls are the most common. They are less costly and have lower permeability than grouted barriers. They are often used in combination with hydraulic controls or extraction and treatment technologies to channel groundwater into a particular area or to enhance containment measures. These structures are also used in conjunction with covers to fully confine a waste area and to prevent clean water from leaching through the wastes. A slurry wall is built by excavating a narrow trench, filling it with a bentonite-water slurry or other mixtures, which solidify to form the wall. Sheet pile walls are built by driving strips of steel or other material into the soil to form a subsurface barrier. Grout walls, also called grout curtains, are built by injecting fluid under pressure into soil or rock, where it permeates voids and gels or sets in place.

Groundwater wells, which are used to monitor the continued effectiveness of the remedy, are usually used in conjunction with all types of diversion walls. Since there may be a need to repair a failing wall or well, access to them should not be blocked. Thus, the EPA project manager should consider the potential impact of the location of these walls on future development. For example, barrier walls can be placed near the property line, outside of any building footprint, and under open areas.

Solidification/Stabilization

Solidification and stabilization (S/S) involve modifying the physical or chemical properties of the waste to improve its engineering or leaching characteristics, or to decrease its toxicity. Solidification encapsulates contaminants into a solid material of high structural integrity. Stabilization converts waste contaminants into a less soluble, mobile, or toxic form. S/S can be done either *in situ* or *ex situ*. *Ex situ* processing involves (1) excavation to remove the contaminated waste from the subsurface, (2) sorting to remove large pieces of debris, (3) mixing with an S/S agent, and (4) delivering the treated wastes to molds or trenches, or for subsurface injection. *In situ* processing entails only mixing the waste with an S/S agent. Some types of waste require solidification or stabilization prior to being placed into a landfill or covered by an engineered cover system.

Vitrification, a special type of S/S, is the application of high temperature treatment aimed primarily at reducing the mobility of metals by incorporating them into a vitreous mass. The temperatures required to vitrify soils will also result in the pyrolysis and combustion of organic contaminants. As with most S/S operations, vitrification can be performed both *ex situ* and *in situ*. If *ex situ* S/S is used, the RPM has the choice of returning the treated material to the original excavation or placing it in another excavation at a different part of the site. The location of this material may significantly affect the type and amount of development that can occur on the site.

Permeable Reactive Barrier Walls

Permeable reactive barrier (PRBs) walls are both a containment and treatment system for contaminated groundwater. Reactive material is placed in the subsurface in the path of a plume to intercept it. As the groundwater flows through the media, contaminants are "trapped" or destroyed by the reactive material and treated water flows out the other side of the barrier. When properly designed and implemented, PRBs are capable of remediating a number of contaminants to regulatory concentration goals.

The PRBs generally have monitoring wells behind them to monitor their compliance with the cleanup goals. They may also have performance monitoring wells placed within them to evaluate changes in physical and chemical characteristics over time. Because of both sampling activities and the potential need to replace or repair the reactive materials, access to the wall is required until the cleanup is complete.

3. Remedial Design Considerations for Commercial Facilities

Federal and state law requires that containment systems be designed to comply with federal, and state standards, whether the property is to be reused or not. At most sites, remedies and commercial facilities can be structured to safely accommodate each other and still meet all the regulatory requirements. However, some remedy design considerations that are not critical to sites that are not being reused can, if not accounted for in the remedial design, have a detrimental impact on the reuse activities. For example, general subsidence can seriously damage a building or parking lot, but may have little impact on the cover's effectiveness at an unused site.

This Section describes key planning and design issues that must be addressed when a waste containment area is expected to have commercial reuse in the future. These issues include settlement and subsidence; the design of foundations and platforms; the provision for utilities and managing gas; access for people and goods; and methods for ensuring the short-term and long-term effectiveness of the remedy and the health and safety of site users and communities. The information is based on EPA's experience at Superfund and other waste sites and is not intended to serve as policy or guidance.

The community will have the greatest flexibility if redevelopment and remediation plans are coordinated prior to remediation. Nonetheless, redevelopment can still occur if it is not conceived until after the remedy is in place. In this situation, it is especially important that the developer coordinate with regulatory authorities concerning the development plans and obtain accurate, current, as-built drawings of the remedy construction rather than base the plans on designs prepared prior to construction of the remedy.

Key Commercial Facility Design Issues

- Settlement and subsidence
- Foundations
- Gas management
- Utilities
- Site access for people and goods
- Other design considerations
- Ensuring the near-term and long-term effectiveness of the remedy

Settlement and Subsidence

General subsidence and differential settlement may cause damage to containment systems, buildings, parking lots, and other site features. It is primarily an issue at closed-in-place sites, such as old landfills and impoundments. Most old landfills experience general subsidence over time. Studies show that most municipal landfill sites settle from 5 to 20 percent of the landfill depth over a 15 to 30 year period, and some have been known to settle as much as 30 percent. Subsidence and differential settlement are primarily caused by the compression of the contaminated material under its own weight and the weight of the cover system and any overlying materials or structures and chemical and biological degradation of subsurface material.

The magnitude, distribution, and rate of settlement are governed by a number of factors including material age, density, thickness, and manner of placement, loadings, and the amount of moisture.

Differential settlement results when the disposal history and practices of the landfill were not uniform or portions of the disposed material decay more quickly than others. This situation is more likely to result in a "sinkhole" effect, than widespread uniform settlement. Settlement of somewhat wider areas often results from some landfill operators' practice of segregating wastes by type, such as construction debris in one area, appliances in another, and municipal refuse in yet another. As a result of this practice, some large areas of a landfill may settle faster than others. Differential settlement can result in high maintenance costs to prevent or repair damage to covers, and pose special problems for structures built on footer or slab foundations. A number of EPA guidance documents address settlement and cover subsidence of hazardous waste landfills (U.S. EPA 1985b, 1987b, and 1991c).

Types of Sites Likely to be Affected

Current operating practices at RCRA Subtitle C facilities (*e.g.*, banning of liquids and partially filled drums of liquids) are expected to minimize major settlement of newer landfills after they close. However, most Superfund abandoned dumps, industrial waste, and landfill sites were created using older disposal practices. Because these practices allowed liquids, drums, and other containers, there is potential for significant general subsidence and differential settlement of containment systems built on such sites. For current Subtitle D facilities and older co-disposal sites (municipal and industrial), the normal decomposition of the waste will invariably result in settlement and subsidence.

Evaluating Settlement and Subsidence

While many cover systems can be designed to accommodate settlement, many structures do not have the same flexibility. The first step in addressing settlement is to estimate its magnitude, distribution, and rate. These values are determined by a number of factors, such as material age, type, density, thickness, loadings, and moisture conditions. In addition, it is necessary to evaluate the potential for localized settlement from the collapse of buried drums and other subsurface processes. The estimation should be undertaken as early in the remedial investigation process as possible. These estimates can help determine if any special design features are needed for the cover and the feasibility of commercial redevelopment. The rate and magnitude of general and differential settlement will profoundly affect the foundation design and maintenance procedures.

> Because it is difficult and time-consuming to estimate the magnitude and rate of subsidence, measurement should begin early in the site management process.

It can be difficult to accurately estimate the magnitude and rate of waste consolidation and the corresponding settlement of cover systems and other structures, particularly at sites where there is a variety of subsurface materials or where little is known about the waste types and distribution. In some cases, survey instruments or settlement gauges may be used to monitor the settlement rate of the surface of the waste prior to and during design, in order to improve the accuracy of the settlement estimates. Because this approach usually requires an extended period of time, it should begin as early in the Superfund process as possible (*e.g.*, remedial investigation). Field or laboratory load tests may also be used to estimate potential subsidence. CERCLA guidance recommends that the remedial design include estimates of the rate of subsidence (U.S. EPA 1995c).

Cover Integrity

After the potential for settlement and subsidence is evaluated, it should be accounted for in the final cover design. Usually, general subsidence does not result in excessive strains on the cover and may improve its stability. Differential settlement, on the other hand, can produce excessive strains that can result in damage to the cover. The cover design process should consider the stability of all the waste layers and their intermediate soil covers (if known), the soil and foundation materials beneath the landfill, leachate and gas collection systems, and all final cover components. To ensure cap integrity in the future, after construction of the remedy is completed, regular inspections need to be scheduled and any apparent problems, such as the appearance of low spots, should be repaired.

Considering Subsidence and Differential Settlement in Planning Facilities

Several methods are available to reduce the potential for damage due to settlement and subsidence. When severe general or differential settlement is expected, it is sometimes best to delay redevelopment until settlement has largely ceased. One approach is to install an interim cover that protects human health and the environment. Then, when settlement and subsidence is essentially complete, the interim cover could be replaced or incorporated into the final cover. Another approach is to phase in redevelopment by first developing already stable areas and delaying development on the parts of the site still settling. In the interim, some settling areas may be suitable for temporary uses for low-impact or moderate-impact activities, such as a park or parking lot.

One or more construction techniques may also be used to avoid potential damages to future facilities and the cover systems. Options to improve foundation conditions include accelerating the consolidation of the subsurface materials and grade modifications. Subsurface materials can be consolidated by preloading, dynamic compaction, and vibrocompaction. However, these approaches will not affect settlement caused by chemical and biological degradation.

Preloading involves piling soil or other heavy material and allowing it to stand over a period of time. A rule of thumb is that the longer and heavier the preloading, the less likely it is that settlement due to poor compaction and voids will pose a problem. The decision of how much preload to use and for how long is related directly to the types of materials disposed of in the landfill, the age of the landfill, and the trade-offs between the costs of the preloading, delay in site use, and building construction costs. More preloading may entail additional labor and materials and delay the site's productive use. Less preloading may necessitate additional building design and construction cost to accommodate a greater potential for post-development settlement.

Dynamic compaction involves compressing the materials by dropping a heavy weight from a crane. This method was used at the Raymark Industries Superfund site in Stratford, Connecticut, to prepare the site for a retail development (see the case study in Section 4). Dynamic compaction may not be possible for some sites where unknown wastes may present worker safety concerns.

Grade modification may also be used to accommodate settling. This technique is primarily used for open areas such as lawns, athletic fields, and common areas. In order to meet minimum regulatory grade requirements for proper drainage (typically three to five percent), cover systems are commonly built with steeper angles than required, with the expectation that the site will flatten over time as the underlying material consolidates. As the cover system settles, additional fill can be placed on the surface to maintain the desired slope without impacting the performance of the underlying cover system.

Foundations

Foundations support the walls, floors, and roof of a structure. The two most important issues in placing a building foundation in a waste containment area are the protection of the final cover system and, where relevant, the prevention of damage to the building or creation of unsafe conditions that may result from subsidence or differential settlement. Although the foundation systems that can be used at sites containing contaminated waste are similar to those used in general construction, their use may entail special considerations.

Deep Foundations

Deep foundations are generally used when the ground immediately below the surface is not strong enough to support the proposed structure, and it would be too costly to increase its strength. Deep foundations are pilings that are driven or drilled into the subsurface to reach a geologic material capable of supporting the proposed structure. Pilings may be made of steel I-beams, precast reinforced concrete, poured in place concrete, and caissons (metal casings set at the appropriate depth and subsequently filled with concrete).

Because many closed-in-place containment areas are expected to undergo settlement, deep foundations are an effective way of protecting structures placed on them. Pilings may be driven or drilled into a containment system that has an unlined bottom. However, pilings may not be appropriate in situations where the waste contains materials that can damage them, such as construction debris or corrosive chemicals, nor where the geologic conditions indicate that a piling may provide a conduit for contaminants to reach an uncontaminated aquifer. Also it may be unsafe to drill into a containment area where the contents are not known.

Piling Foundations are Useful in the Following Situations:

- The site has the potential for extensive settlement, which makes a shallow foundation inappropriate
- The containment system has an unlined bottom
- The waste material can be driven or drilled through
- There is no potential of reaching an uncontaminated aquifer

If piling type foundations are to be used at a containment area, they will have to be engineered into the cover system. This process involves the installation of engineered seals (sometimes called boots) where the pilings penetrate the cover. The boots need to be attached to both the cover and the piling and be built to prevent water from infiltrating around the piling. At the Raymark Industries, Inc. Superfund site in Stratford, Connecticut, a developer and EPA worked together to arrange for soil compaction on parts of the site and the installation of pilings during construction of the containment system.

If a structure built on pilings settles less than the surrounding ground, gaps can occur between roads, parking lots, or lawns and the structure, which can result in damage to utilities and building entrances. The future building owners would find it necessary to periodically renovate the building entrances and regrade the area around the building. At the Columbia Point Landfill in Boston, Massachusetts, over 100 pilings were driven into the bedrock to provide foundations for the University of Massachusetts' Boston campus buildings. Following completion of the structures, general settlement of the ground adjacent to the buildings was noticed and regular maintenance was required to keep the grounds level and to landscape or fill the gap between the base of the buildings and the receding ground.

Shallow Foundations

Shallow foundations can be divided into two broad categories–footing and slab. A footing foundation is one designed to support the outside walls or vertical support columns of a building. They are placed in the ground directly beneath the structure to be supported. While they can be placed directly into some contaminated materials, this practice is generally avoided because of concerns for the health and safety of the construction crew and future maintenance workers. More commonly, footing foundations are placed in clean fill above the cover of the containment system. When differential settlement is a concern, one design alternative for one and two story buildings is the use of tilt-up wall construction. In this type of construction both the wall and the footing are broken up into discrete sections that allow for some differential settlement without putting stresses across the entire building. Control and leveling joints are used to offset the settlement of specific wall sections.

Built Up Grades Can Provide the Following:

- An uncontaminated space for foundations, utility corridors, and piping for gas ventilation systems
- Protection of the cover and utilities from freeze/thaw cycles
- Protection of the cover and commercial facilities from floods
- Additional compaction of waste materials

Slab foundations are usually reinforced concrete placed directly on the ground. One approach to using slabs on a site that has potential for differential settlement is to build the slab in separate sections and install cable linkages between them and precast ports for pressure grouting. This arrangement allows for differential settlement of each slab, and provides the building owner the capability to separately level each section by pressure grouting into the areas that have settled. Slab foundations can also be "stiffened" by incorporating beams into their construction. This approach allows the slabs to bear differential settling to a greater degree than regular slabs. Slab foundations can be engineered to accommodate a variety of situations, depending upon the type of waste containment system and budget.

Although buildings with slab foundations are usually relatively low and carry light to moderate loads, these foundations can be engineered for heavy loads. For example, concrete slabs at a cargo container handling facility built on the Ascon Landfill in Los Angeles, California, are designed to carry very heavy loads, such as cargo containers, and heavy-duty forklifts (with 68,000 pounds of load per single axle), and a building.

Managing Gases

Depending on their composition, containment sites have the potential to generate gas, which, if not properly controlled, could damage the cover system, infiltrate buildings, provide fuel for fire or explosion, stress vegetation, and pose other health or safety hazards. Although gas control is important for all sites, added emphasis and caution are required at sites containing structures with enclosed spaces that will be used by the public.

The quantity, rate, and type of gas that a landfill or other containment site will generate are primarily dependent on the composition, age, and volume of the waste, and moisture conditions. Gases from municipal landfills generally contain approximately 50 percent methane, 40 percent carbon monoxide, and 10 percent other substances, including nitrogen and sulfur compounds (U.S. EPA, 1991c). Gases from mixed waste municipal landfills and industrial landfills may also contain other volatile organic compounds.

Sites that are expected to produce significant amounts of gas may not be good candidates for commercial uses, unless the gas is well controlled. There are two aspects to gas control: a gas collection system that is usually built into the containment system, and gas protection incorporated into the commercial facilities developed on or near the containment system. Section 2 discusses gas management for waste containment areas. Gas collection systems can include subsurface piping, and wells and vents that extend through the cover system and discharge gases to the atmosphere or to a treatment system. When designing a gas collection system in an area that will be used by the public, particular attention should be given to the types and concentration levels of the gases and their potential health and safety impacts on site users, site aesthetics, and access to future commercial facilities. Vents, collection wells, piping, discharge points, and treatment systems can be placed in areas that will not interfere with planned or prospective uses, where they minimize noise, odors, or other disamenities, and where they are less likely to be accessible to potential trespassers and vandals.

> Structures placed over a landfill or other containment area that has a gas problem, should be designed with gas protection and not depend solely on the cover's gas management system.

If structures are to be placed over a landfill or other containment area that has a gas problem, they should be designed with gas protection and not depend solely on the cover's gas management system. The following are examples of gas protection techniques for buildings:

- Construct floor slabs with convex bottoms to prevent methane from pooling below the structure.
- Place an impermeable (gas resistant) geomembrane or other hydraulic/gas barrier under the structure or within the building's floors. This is especially important for sites likely to experience settlement that may disrupt the cover.
- Engineer an air space below a structure to allow for gas detection and venting, as well as to facilitate inspection and maintenance of the cover.
- Place gas detectors in closed structures to warn of potential gas buildup.
- Install vent fans to remove methane buildup from the structure.
- Ensure that the design of utilities does not allow for gas migration along utility conduits. One approach is to attach utility service entrances to the outside wall of the structure so they do not penetrate the floor slab, which may create a pathway for gas entry.

If they carefully consider both the needs of the development project and the remediation system, site managers and developers could coordinate to determine the least invasive ways to place the venting system.

Utilities

Almost all commercial facilities will require utilities, such as sanitary sewers, potable water, natural gas, electricity, and telecommunications. Although most utilities are installed underground, some, such as electricity and telecommunications lines, can be above ground. Utilities can impact the effectiveness of the containment system in the following ways:

- If the utility is located within or below the cover system, liquids leaked from a sewer or water supply line can increase the quantity of leachate being generated and accelerate biodegradation of wastes in specific areas within the containment system.
- Leakages from a sanitary sewer located above a cover system's barrier layer might be captured by the cover's internal drainage system and cause excessive bio-fouling of drainage media.
- A utility line can become a conduit for gas, which can migrate along a pipe or wire.
- A utility line can hamper the normal flow of water off the site or into the drainage layers of the protective cover.
- A utility structure that penetrates the cover system can serve as a conduit for surface water to infiltrate the cover.
- If water does not drain properly around a utility, it can pool, thereby aggravating any settlement.
- If the utility is located within or below the cover system, repair or upgrade work would also require excavation into the cover and contaminated material.
- If a utility is located in an area where significant differential settlement occurs, the above conditions may be aggravated.

A number of engineering approaches are available to ensure that these potential occurrences do not hinder the effectiveness of the containment system. Some of the approaches that site managers and developers can use to locate and configure the containment systems and utilities.

When the containment system is newly built on the site, the EPA site manager may have a great deal of discretion in how containment systems are built and where they are placed on the site. For example, clean "utility corridors" can be created by placing the piping and other components into oversized trenches, which are then backfilled with uncontaminated, or "clean" soils. The additional width and depth of the trenches limits the possibility that waste will be encountered or the cover system will be damaged during future excavations. This method was used to install electrical conduit trenches to accommodate development of athletic facilities at the Chisman Creek Site in Virginia. A variant of this approach was used at the Denver Radium site in Denver, Colorado. Instead of building one large containment cell, four smaller ones were built with spaces between them. These spaces contain sufficient volumes of uncontaminated native soils to allow the utilities to be laid in clean material between the cells. Also, the containment areas were located where buildings were not likely to be placed, such as areas designated as parking lots or lawns.

Utility corridors can often be placed in uncontaminated materials by adding sufficient clean fill above the contaminated material. When this technique is used, a good safety measure is to place visible barriers, such as colored soil or brightly colored synthetic geotextile material between the contaminated material and the clean fill to act as permanent markers for future workers. However, with proper precautions, such as the use of a contractor who is certified to work with hazardous waste, the utilities can be installed directly in the contaminated area. A contractor or property owner who intends to excavate into material classified as a RCRA hazardous waste is required to obtain authorization from EPA to excavate into the materials, as well as obtain EPA approval of the plan for the proper management of any contaminated material. The requirement for EPA approval may be specified in the remedy, whether or not the material is a RCRA hazardous waste.

Approaches for Installing Utilities on Remediated Sites:

- Put service entrances for gas, water, sewers, electricity, and communications on the wall of the building, so they do not penetrate the floor slab, which could create a potential for gas entry.
- Place active or passive gas control and warning systems in all closed structures.
- Place clean fill on either side and below the utility conduit, where it is built below the protective cover.
- Place utilities in clean areas constructed between containment "cells."
- Place the utilities in built up areas of clean fill above the protective cover. (Some building codes mandate that utilities be below the frost line).Where settlement is likely, design piping and other components to accommodate some movement.
- Incorporate monitoring systems to detect leakage or breakage of utilities.

When used in areas that will experience differential settlement, piping should be designed to accommodate some movement by using features such as ductile materials and flexible connections. For pressurized water and gas systems, automatic monitoring devices and shut-offs could be used to prevent large uncontrolled releases. Gravity sewers and other non-pressurized systems should also be designed for easy monitoring. For example, double-walled piping equipped with an integrated leak detection system could be used. Another example of a monitoring system consists of lining the utility trench with a geomembrane prior to installing the piping and backfilling, and sloping the trench to direct the flow to monitoring sumps. The sumps could be periodically checked for liquids. The need for and type of monitoring system would be decided based on cost, implementability, performance, maintenance, and perceived risk of leaks.

Site Access

Efficient ingress and egress for people and freight is crucial to the success of a commercial facility. Poorly designed entrances and exits may cause site occupants, vendors, and customers to lose valuable time waiting for traffic or negotiating difficult turns. Local governments and state highway jurisdictions determine the general requirements of site access. Their primary concerns are to minimize disruption to traffic flow on streets and highways and to ensure the safety of neighborhoods and highways. State and local planning agencies may restrict access on certain roads within a specified distance from an intersection. Thus, one of the first actions of a site planner should be to contact the local planning agencies.

To avoid dangerous traffic jams on public streets and highways, properties are often designed to favor incoming traffic. Incoming traffic can be expedited by providing a reservoir of space inside the property's entrances. If necessary, this may be done at the cost of a more complicated exit, since exiting traffic moves more slowly than incoming traffic and can more easily negotiate complicated turns. After considering the requirements of local planning authorities, the RPM and other stakeholders should consider the potential impact of the following important factors on containment systems:

- the loads and stresses from heavy or outsized trucks that are expected to enter the site; and
- the future maintenance and repair requirements for remedy components, such as monitoring wells or diversion walls.

If some remedy components are placed near or under an entrance or exit, future maintenance activities could disrupt access to the property.

Other Design Considerations

Paved Surfaces

Most commercial sites have paved surfaces for parking lots, sidewalks, roads, and common areas. Paved surfaces can be an integral part of the cover system, placed above a complete cover system, or located outside the contaminated area. Paved surfaces that serve commercial functions and are an integral part of the remedies are in place at the Mid-Atlantic Wood Preservers Superfund site in Harmans, Maryland, the Peterson/Puritan Superfund Site in Cumberland and Lincoln, Rhode Island, and the Ascon Landfill site in Los Angeles, California, among others.

Paved surfaces are generally made of asphalt, concrete, or crushed rock. The factors to consider when choosing among these are: their permeability, load-bearing capacity, durability, long-term maintenance needs, susceptibility to damage from settlement, ease of repair of settlement damage, the amount of subsidence and settlement anticipated, and the nature of the contaminated material. Also, the needs of the commercial activities need to be considered.

Asphalt has been the most frequently used material for paved surfaces over containment areas. Because it is somewhat flexible, it can deform somewhat without failing. Settled or damaged areas can be quickly filled in. Most asphalt surfaces, by themselves, are too permeable for some types of contaminants. However, they may be used at sites where the underlying contaminated material is insoluble, or where the principle purpose of the cover is to prevent human contact with the waste. Where the situation warrants the expense, special asphalt mixtures and engineering techniques are available. For example, at the Ascon Landfill, a special double-sealed asphalt design was used. It included 12 inches of asphalt aggregate and 2-3 inches of asphalt-macadam as a wearing surface. Although the slope was only one percent, the state accepted the design because it met permeability requirements. The asphalt cover over the Mid-Atlantic site's containment area is used by a trucking company as a parking lot. Because the contaminated soil under the cover is only slightly soluble, there is little risk of contaminants leaching into the groundwater. Nevertheless, the site owner has agreed to monitor groundwater as a precaution.

Although concrete surfaces may be used to cover many containment systems, it is not used as often as asphalt. At the Enterprise Avenue Superfund site, a concrete runway was placed over part of a containment system. Concrete can be damaged by settling, and is expensive and time-consuming to repair.

Part of the Enterprise Avenue site at the Philadelphia International Airport is covered with a concrete runway capable of landing large aircraft.

Crushed rock or gravel surfaces are often used for access roads, support areas, and parking lots that experience limited traffic volume. Because surfaces made with these materials can be quickly repaired, they are useful for temporary surfaces where development is being delayed pending the cessation of settlement. Although crushed rock or gravel are generally not useful as the primary cover material, they may be useful as a component of a cover system. For example, a gravel surface can protect a soil cover from damage caused by heavy truck traffic.

Surface Vegetation

Most landscaping at commercial developments is included in the overall site design to enhance common areas, walkways, roads, and buildings. The landscape features and vegetation can also limit erosion of the underlying soil and promote evapotranspiration. The type of vegetation used at a site depends on the climate in the region, type of containment system, the planned future use, and the availability of irrigation. Grasses are often used because they have shallow root systems, minimize erosion, and often require little irrigation or fertilization. Deep-rooted plants, such as trees and shrubs, typically have not been used because of the potential that roots would damage the cover systems or grow into the contaminated material. However, if properly accounted for in the design, a Superfund site can support a wide variety of vegetation. Specially designed "planting zones," "islands," terraces, or above-ground planters may be located within the limits of the cover system. Such features may require thicker layers of supporting soils, biota barriers, enhanced drainage, and other modifications to ensure the integrity of the cover system.

Surface Water Management

Surface water can erode the surface layer of a cover system as well as percolate into the cap. Examples of techniques used to manage surface water on cover systems include grading the cap to establish an effective slope (usually 3-5 percent), and building drainage channels and swales. However, many commercial uses require a flatter slope. To accommodate such needs while maintaining the integrity of the cover, the surface layer may be minimally sloped to support the reuse activity, while the underlying drainage or other layers can be more steeply sloped. Flat areas should be periodically inspected to avoid pooling of water.

Ensuring the Effectiveness of the Remedy

While considering the need for reuse, all remediations should include measures to ensure that future activities at the site do not reduce the effectiveness of the remedy. These measures include the consideration of future stewardship in the planning, design, and implementation of the remedy and redevelopment projects, techniques for ensuring the integrity of the protective cover, operations and maintenance (O&M) on a continuing or periodic basis, and institutional controls.

Planning and Design

Preparation for safeguarding the effectiveness of the remedy should begin as early in the remedy planning and design process as possible. It is important that the remedy maintenance be practicable, to minimize disruption to the site's future uses and to foster implementation and oversight. Although a state or PRP is generally responsible for O&M, many maintenance tasks can be implemented by the site operator or owner. For example, at the Denver Radium site in Denver, Colorado, the owner's maintenance of the parking lot also serves to maintain the protective cover. Overly complex O&M requirements are less likely to be fully implemented. It is important that regulatory authorities, developers, and other stakeholders know, in as much detail as possible, the implications of institutional controls, so they can plan their operations accordingly. The O&M plan and institutional controls should be considered early, along with reuse information, although it may not be possible to specify the details until later in the remedy design stage. By considering the long-term stewardship requirements early in the Superfund process, site managers and communities can help select remedies that are practical and that can be implemented.

Ensuring Containment System Integrity

Maintaining the integrity of the cover system involves controlling whether and how facilities on the surface penetrate the cover system, and preventing accidental intrusion into the cover system. Foundations and supports for fences, light poles, signs, and other features could penetrate the cover system and possibly extend into waste if standard construction techniques are used.

Because items that penetrate the cover can provide a conduit for gas and water movement, special construction techniques, such as engineered seals to prevent the migration of gas or water or built up clean soil above a cover system to allow foundations and utilities to be placed in uncontaminated material, must be used. These techniques were addressed earlier in this Section.

Accidental intrusion into the containment system can result from unauthorized digging for repairs or improvements, wear and tear of surface layers due to traffic or animals, and other activity. The use of warning or barrier layers, therefore, should be considered to minimize damage to critical cover system components and encroachment into waste. Visible barriers, such as colored geotextiles or other synthetic layers, can be placed in the upper portion of the cover system to serve as a warning to workers that additional digging can result in damage to underlying layers and exposure of contaminated material. A visible layer can also be used under high-activity areas to provide early warning that the soil has eroded to a point where repair is necessary.

Intrusion into the containment system can also be caused by digging activity by animals and people. A biota-barrier may be used to prevent such activities. Depending on the situation and anticipated intruder (*e.g.*, children or animals) an appropriate barrier layer might range from a geogrid or other geosynthetic to gravel or cobbles. The barrier will be most effective if it is separated from the critical components of the cap or is thick enough to withstand a limited degree of intrusion. For example, at the Cohen Property Superfund site in Taunton, Massachusetts, a salt storage area was constructed over lead contaminated soils. High visibility orange fencing was placed over the contamination to mark the beginning of contaminated soil and to serve as a warning against encroachment.

Another method for preventing damage to containment systems is to register the site with the county or state "one call system," which all states have to prevent excavators from inadvertently damaging subsurface utilities. The site could be registered with the one-call system, and markers could be placed on the site to help workers locate the containment areas before digging. Although EPA does not know of any such application at a Superfund site, there in no reason why such an arrangement could not be negotiated with a one call system.

Operating and Maintaining Remedy Components

After construction of the major portions of the remedy is completed, the site may require monitoring and periodic maintenance of fixed and operating components to ensure that the remedy functions properly and protects human health and the environment. O&M can include a wide range of activities, such as operating gas and groundwater collection and treatment systems, caring for surface vegetation and paved areas, conducting annual and special inspections, monitoring air, water, and soil quality, and making any necessary repairs and upgrades to remedy components. Appendix A describes some common monitoring and maintenance needs. O&M is especially important at reuse sites since, in addition to normal operations of the remedy, the site is subject to continued wear and tear by people and vehicles. Moreover, the site may be used in ways that were not anticipated when the remedy was designed, or in ways that were not specified in the reuse plans existing at the time of the site remediation.

Monitoring and maintenance are usually arranged for by the PRP or state and may be conducted by the site owner or occupant, or a state or local government agency. At some redeveloped sites, the responsibility for implementing and paying for O&M may be split among various parties. Generally, an agreement is reached between the regulatory authority, developer, and PRP to establish monitoring procedures, acceptance criteria, and remediation methods for the critical maintenance needs. It is important that the roles and responsibilities are clearly delineated in enforceable agreements and specified in an O&M plan. For more details on operation and maintenance of Superfund sites, see *Operation and Maintenance in the Superfund Program*, OSWER 9200.1-37FS, EPA 540-F-01-004, May 2001.

At certain sites, normal maintenance of buildings and surface features may also address concerns about maintaining the integrity of the containment systems. At the Ohio River Park, Pennsylvania, Ascon Landfill, Los Angeles, and Denver Radium, Colorado sites, the property owners are responsible for normal maintenance of the asphalt and other surfaces, which also serves to protect the containment systems. If such areas are properly maintained, the need for maintenance by PRPs or the state would be minimal.

EPA regulations require that an O&M plan be developed for fund-financed sites to aid in the transition from EPA to the state for O&M. O&M plans may also be useful for PRP-financed sites. The plan should delineate the responsibilities of the various parties, and such items as the nature and frequency of maintenance activities, sampling, and inspections. It should also address limitations on the reuse activity; for example, if vehicles above a certain weight are to be prohibited from the property. The plan should also include requirements for documenting and reporting maintenance and related activities at the site. This information typically would be included in an annual report distributed to interested parties and regulatory agencies. In addition to the requirements for annual and special inspections, EPA conducts an in-depth review of the remedy at least every five years, for any Superfund site where the remedial action resulted in hazardous substances, pollutants, or contaminants remaining on site above levels that would allow for unlimited use and unrestricted exposure. The five-year review generally results in two products: a determination of whether the remedy is still protective of human health and the environment, and a list of recommendations of activities that need to be performed to ensure continued protectiveness, including an identification of the parties responsible for those activities. The results of these reviews can be used to modify operating plans and site-use plans as needed.

Institutional Controls

Remedies often incorporate institutional controls to prohibit certain activities and land uses that are incompatible with the remedy. Because of their importance in restricting future land uses and in defining long-term compliance needs, the need for institutional controls should be identified as early in the remedy selection process as possible. Stakeholders are required to be informed whenever institutional controls are added or modified if ti constitutes a substantial change in the remedy documented in the ROD.

Institutional controls include measures such as prohibiting drilling wells, excavating below a specified depth, and placing buildings on the site. Public access to certain parts of the site, such as areas containing gas vents, may also be restricted to authorized personnel. These controls are implemented through land-use regulations imposed by local governments; property law devices such as easements and covenants that restrict future land or resource use; and informational devices such as deed notices that inform prospective purchasers of residual on-site contamination.

Several of the above mentioned controls were used at the Bunker Hill Superfund site in Kellogg, Idaho. The site encompasses both the smelter facilities and a surrounding 21-square mile area that includes five towns. The ROD specifies that surface soils in the towns be excavated, a plastic barrier be placed in the shallow (1-2 feet) excavations, and clean soil and sod be placed over the barrier. Institutional controls were imposed on digging in the re-sodded areas. During remedy selection and design a PRP can address how to accommodate a potential future need to excavate into contaminated materials and how to ensure that institutional controls are maintained well into the future, especially when properties change hands. The following are some considerations for designing effective institutional controls.

- **Excavating into Contaminated Materials**. A site owner who intends to excavate into a containment system must obtain prior written approval from the EPA Region and use a contractor certified to handle hazardous materials if the materials are classified as a RCRA hazardous waste, or if the requirement is specified in the remedy. This requirement could mean costly delays for the developer. The process can be simplified by including excavation procedures in the institutional controls and other site agreements. This approach could preclude the need for special approvals, as long as the contractor follows the established procedures and notifies EPA or a state regulatory authority. Another useful approach to ensure that future excavations at a site do not disturb the containment system is to require the PRP or property owner to file a survey plot recording the type, location, and quantity of contained waste, and as-built drawings with the clerk of the local court and with the local recorder's office.

- **Long-Term Compliance with Institutional Controls**. Institutional controls are often incorporated into consent decrees and other enforcement documents. One potential pitfall of this approach is that enforcement documents may only be binding on the signatories and do not "run with the land." Thus, a property transfer can occur without informing the future owner of the requirements. Although the responsible parties are still ultimately responsible for compliance with the institutional controls, future owners of the property may not be bound to the terms of the consent decree. It may be possible to avoid this pitfall by requiring signatories of an enforcement document to implement more long-term institutional controls, such as information devices or proprietary controls, and to record all relevant information about the site with the clerk of the local or district court.

In developing remedial alternatives that include institutional controls, EPA may also consider the capability and resolve of local authorities or private sector interests to implement the institutional control program. At the Bunker Hill site, a system of flexible institutional controls is operated by existing local administrative structures and programs that are consistent across all jurisdictions affected by the site. Using this strategy, the Environmental Health Code in the Idaho Legislature was amended to include specific containment management regulations and performance standards. With the state legislature's approval, the local jurisdictions were given the authority to

At the Bunker Hill Superfund site in Kellogg, Idaho, a system of flexible institutional controls is operated by existing local administrative authorities.

govern all excavation, building, development, grading, and renovation at the site. Furthermore, the local jurisdiction was made responsible for educating the community about the redevelopment program.

At the Fairchild Semiconductor Superfund site in Mountain View, California, the PRP signed an indemnity agreement to protect the developers, lenders, tenants, and successors in title as the redevelopment process proceeded. In these circumstances, the agreement holds the buyer harmless for actions, liability, loss, or damage arising from claims made for further remediation, third party damages, and the like.

4. Redevelopment Case Studies

This Section describes seven projects where successful redevelopment has occurred on remediated waste sites where contaminated material or waste treatment systems remain on site. Although these projects represent a wide range of sites, pollution problems, and commercial uses, they are not exhaustive of all circumstances that occur at Superfund sites. Nevertheless, they demonstrate how remediation and redevelopment efforts may complement each other. The discussion for each site includes a brief description of the site and contamination, key factors considered during remediation that were important to the redevelopment, and the redevelopment plan. Appendix B contains one-paragraph summaries of these seven sites plus eight other sites where redevelopment has occurred on containment systems. The seven detailed cases are listed below.

- **Denver Radium, Denver, CO:** A large retail store and parking lot was built on a site where insoluble metals-contaminated soil was consolidated into four containment cells with unlined bottoms and asphaltic covers. The covers also serve as the store's parking lot.

- **Raymark Industries, Stratford, CT:** A 300,000 square foot retail center is planned for this 33-acre site. The site was compacted to accommodate planned structures and fill dirt was added above the protective cover. Piles were driven into the ground on part of the site to provide for future buildings. The piles extend through the cap, and are fitted with seals to prevent water infiltration.

- **Mid-Atlantic Wood Preservers, Harmans, MD:** A 3.2 acre site with shallow contaminated soil was covered with asphalt and is being used as a parking lot for a trucking business.

- **Ascon Landfill, Los Angeles, CA:** A port facility was built on a municipal landfill with a deep water table. Although not an NPL site, this landfill was compacted and covered with a uniquely engineered surface that would meet most requirements for a RCRA type C cover.

- **Ohio River Park, Neville Island, PA:** A sports center that includes several acres of indoor facilities, outdoor sports fields, and parking areas was built on a 32-acre site that contained a number of contaminated areas. The project involved installing protective covers, a slurry wall, groundwater monitoring system, and gas collection system; adding clean fill above the covers; compacting parts of the site; and foundation designs that accommodate the remedy.

- **Rentokil, Inc., Henrico County, VA:** Light industrial and commercial buildings are planned for this 10-acre site. Building foundations are to be incorporated into the cover, using special structures that Rentokil calls "divider walls."

- **Peterson/Puritan, RI:** This 980-acre site contains six businesses, an industrial condominium complex, a little league park, a dog pound, and a riverside park and bike path. Cleanup of the site, including operation of in place waste treatment systems, was accomplished without shutting down existing businesses.

Denver Radium

Site History: Operable unit (OU) 9 of the Denver Radium Superfund site in Denver, Colorado is a 17-acre property that includes a former brick plant, a parking lot, and a large area of exposed soil. Land use in the vicinity of the site is predominantly commercial and industrial, with a residential area located several blocks to the east. Industrial activities began at the site in 1886 with the construction of the Bailey Smelter. In 1890, the Gold and Silver Extraction Company began a cyanide leaching operation. By 1903, a zinc milling operation had been added. From 1914 to 1917 the U.S. Bureau of Mines operated a radium ore processing facility on site. Other industrial operations have included minerals recovery, manufacturing and servicing of storage batteries, and oil reclamation. The last industrial use, from 1940 to 1980, was for brick manufacturing.

Remedy: The remedial investigation (RI) found that the site was contaminated at various depths with radioactive materials, heavy metals (primarily zinc and lead), and arsenic. All radioactive materials found at the site were excavated and shipped to an offsite-licensed disposal facility. Approximately 16,500 cubic yards of metals-contaminated soil remained on site. The selected remedy called for the consolidation of the remaining contaminated soil into four separate on-site cells with asphaltic caps. The contaminated material presents an ingestion or, if windblown, inhalation risk. A highly impermeable cap was not required, because the material is only slightly soluble and water infiltration is not likely to cause it to migrate. Nevertheless, long-term groundwater monitoring (to monitor existing groundwater contamination) and maintenance of the cap are required to ensure that the remedy is working. Deed restrictions prohibit the placement of drinking water wells on the site because of the existing groundwater contamination.

At Denver Radium

- Contaminated soil was compacted as it was placed into the excavation.
- The original ROD, which called for a multi-barrier cap, was changed to allow a less restrictive cap, because the solubility of the contaminated material is low.
- The containment system was redesigned to include four containment cells, instead of one, to allow for areas of clean soil for utility corridors.

Redevelopment Plan: Before the remedial action was implemented, Home Depot Inc. expressed an interest in purchasing the property to build a retail store. The remedy included consolidation of the metals-contaminated soils into four cells. To allow utility corridors to be placed in uncontaminated material the cells were separated by clean fill. Future utility maintenance contractors do not need to encounter hazardous materials. Geotextile materials were placed at the edges of cells to provide markers for the contaminated soils, and these were covered with clean fill. As a condition of the agreements between EPA and other interested parties, the developer was required to build and maintain an asphaltic cover, which limits access to the materials below and serves as the store's parking lot. The groundwater monitoring wells were completed at the grade level of the parking lot to prevent obstructions to the redevelopment.

Lessons:

- If the contaminated material is not soluble, water infiltration will not cause migration of hazardous materials, and a highly impermeable cover is not required. Thus, the cover may be constructed of available materials with moderately low permeability, such as clean soil and asphaltic materials.
- If the contaminated material is somewhat soluble, the cover could be of a single barrier design.
- The bearing strength of the consolidated material should be enough to support the cover without subsidence and should be checked to ensure that it will support the planned or anticipated redevelopment.
- The potential for future disruption of the waste can be minimized by strategically locating the consolidated materials where they are least likely to be disturbed.

A Home Depot store has been built on a portion of the Denver Radium Superfund site in Denver, Colorado.

Raymark Industries

Site History: The Raymark Industries, Inc. Superfund site encompasses 33 acres in Stratford, Connecticut. Raymark produced automotive parts and products at the site from 1919 until 1989. During that time, manufacturing waste was disposed of on the plant site, 46 residential properties, and numerous commercial and municipal properties in Stratford. Contaminants include polychlorinated biphenyls (PCBs), dioxin, semi-volatile and volatile organic compounds (SVOCs and VOCs), asbestos, and metals.

Remedy: The Raymark remedial action began in September 1995 with the demolition of 15 acres of buildings and the placement of an impermeable cover over the demolished buildings and the remaining 20 acres of the property. Underneath the cover, a pump-and-treat system is removing solvents from groundwater, and a gas collection system is operating. Two buildings on the property house equipment for collecting solvents pumped out of the groundwater and treating gases collected from beneath the cover.

At Raymark, close cooperation between EPA and the developer led to effective strategies

- Special efforts were made to compact the ground to accommodate development.
- The grade level above the containment system can be raised enough to allow foundations and utilities to be placed in clean fill.
- Pilings were installed through the cap and the cover is properly sealed; the containment area does not have a bottom liner, and there is no potential for damage to any underlying aquifer.
- Groundwater extraction and treatment systems were designed to be inconspicuous and allow for site reuse.

Construction of the protective cover involved the following:

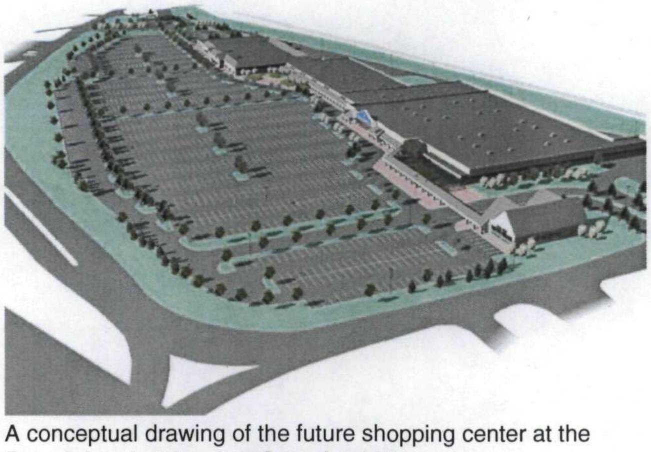
- A gas collection system was built using four miles of perforated piping laid within an 8-12 inch thick bed of sand.
- Over 36 acres of cover materials, including a plastic liner, a clay liner, and other synthetic materials were placed over the waste.
- Between three and ten feet of clean fill were placed over these liners.
- Two miles of storm water piping were installed in the clean fill layer to collect rainwater and carry it off-site. Over 100 catch basins, manholes, and water quality units connect to this storm drainage system. On-site pavement directs rainwater into the catch basins and protects the underlying soil from erosion.
- Fifty-three wells were installed beneath the cover to monitor groundwater quality. Twelve vapor extraction wells pump solvent contaminated air out of the soil beneath the cover into a treatment building. Five extraction wells pump solvent located in pockets in the groundwater into a holding tank on the western edge of the property.
- Two buildings were built at opposite ends of the property to treat collected gases.

Redevelopment Plan: The protective cover was designed to allow for the redevelopment of the property for retail and other commercial uses, without compromising its performance. Prior to the cover's construction, soil and wastes on the site were stabilized to support development. This effort involved the following activities:

10,000 truck loads of waste excavated from contaminated off-site locations were stabilized with cement.
Six piles of soil up to four stories high covering areas as large as two acres were placed on the ground to compress the underlying soils by as much as 5.4 feet.
A 15-ton weight was dropped 70,000 times from a height of 60 feet to stabilize the soil in certain areas of the property.
9,545 wick drains were installed to help compress underlying peat deposits.
277 fourteen-inch steel piles were driven 100 feet into the ground to support a one-half acre platform designed to support the weight of planned commercial buildings.

Lessons:

- Various construction methods, such as those discussed in Section 3, can be used to build on a RCRA type C or other containment system. If the containment system does not have a bottom liner it may be feasible to drive pilings through it, so long as the cover is properly sealed and the pilings do not affect an underlying aquifer.
- It often helps to coordinate remediation plans with potential developers.
- There may be some flexibility in locating the consolidation area on the site.
- There is little difference in cost between the typical method of completing groundwater monitoring wells (with a 2-3 foot standpipe with locking cover, a concrete pad, and protective barrier) and completing the wells at the grade level, which generally improves the appearance of the property.
- There are a number of effective strategies for groundwater treatment, such as extraction wells and reactive barriers, as described in Section 2.



A conceptual drawing of the future shopping center at the Raymark Industries, Inc. Superfund site.

Mid-Atlantic Wood Preservers

Site History: The 3.2 acre Mid-Atlantic Wood Preservers facility in Harmans, Maryland is located in a mixed industrial, commercial, and residential area. The site is adjacent to a major international airport and the closest residence is within 200 feet. The facility treated lumber from 1974 through 1993. The operation employed a two-part process to preserve the wood with chromated copper arsenate (CCA). First, the lumber was pressure treated with a CCA solution in a housed processing plant; then the wood was allowed to drip and dry in the open. A spill of CCA solution in 1978 resulted in the contamination of nearby drinking water wells.

Remedy: In 1980, the owners removed 26 cubic yards of highly contaminated soil and shipped it to an off-site disposal facility. However, large portions of the facility's surface soil remained contaminated with chromium and arsenic. In 1990, the facility was ordered to move 90 cubic yards of contaminated soils from off-site areas and consolidate them on site. Following the consolidation, the whole area was covered. Groundwater testing revealed no health hazards.

Redevelopment Plan: An adjacent trucking business expressed an interest in the property. After the company entered into a prospective purchaser agreement with EPA, the land was covered with asphalt and converted to a parking lot. The new owner agreed to perform long-term monitoring and maintenance to ensure the asphalt was preventing the leaching of chromium and arsenic into the underlying groundwater. Monitoring wells were placed at grade.

At Mid-Atlantic Wood Preservers

- A moderately permeable asphalt cover was allowed because the solubility of the contaminants was not high.
- After removing highly contaminated materials, the remaining soils were consolidated with soils from off-site areas.
- Monitoring wells were installed downgradient at grade.
- The new property owner has agreed to perform long-term monitoring and maintenance to ensure that the asphalt is preventing metals from leaching into underlying groundwater.

Lessons:

- On-site consolidation and burial is not always an option, such as when the contaminants are soluble and the water table is shallow. If the solubility of the contaminants is not too great, a moderately permeable cover, such as asphalt, may suffice.
- Monitoring wells may also be placed downgradient to ensure that the contaminants are not leaching into the groundwater.
- When a simple cover, such as an asphaltic material slab is used, the institutional controls should detail how activities that require excavation into the cover should be conducted.
- If utilities or other facilities are to be placed in contaminated material, it is best done before the cover is installed. It may also be done after the fact, as long as the developer follows the procedures outlined in Section 3.

Ascon Landfill

Site History: The State of California required the formal closure of an abandoned 38-acre landfill located near Los Angeles Harbor. Although not listed on the NPL, this site provides valuable lessons for any type of waste depository. The site was originally used in the 1940s and 1950s as a source of soil for other construction projects. Prior to excavation and landfilling, the site contained silty fine sand and alluvial deposits. When groundwater was encountered, excavation of materials from the pit ceased. From 1964 to 1981, the open excavation was turned into a landfill. It was initially filled with construction debris and old tires. At a later date, these materials were covered with municipal waste. The total depth of the fill is about 95 feet with the upper 50 feet consisting of trash. After the landfill was full (1981), it was closed. A 1.5-foot soil cover was placed over the waste, and a passive gas extraction system was installed. From 1981 to 1986, large piles of coke (up to 40 feet high) were stored on the site. This process served to partially compact the waste.

The site is in an area that has saltwater intrusion, and the groundwater is not potable. Beginning in 1965, government authorities have operated a wastewater injection system just south of the site to prevent saltwater from further intruding inland. This system raised the water table about 20 feet and will keep the groundwater at this artificially high level for as long as it operates. Although a large portion of the construction debris is now inundated with groundwater, there is no evidence of groundwater contamination.

Remedy and Redevelopment: Because this site is near Los Angeles Harbor, it was ideal for locating a cargo-container handling, storage, and maintenance facility. The developer, prospective user, and State of California cooperated to develop a landfill cover that will also serve as the foundation for the new facility. The developer paved the top of the fill for work surfaces that can be adjusted to account for differential settlement and built a 7,500 square foot, five story warehouse and a small one-story office building.

Pavement Construction. Since the pavement was also to function as the final cover for the fill, its design required a permanent cover material that would be impermeable to both runoff water on the surface and to methane landfill gas from below. The design would also have to account for subsidence of the underlying material, which had recently been measured at 3.5 inches per year. The planned commercial use required that the pavement be capable of supporting the operations of a container forklift vehicle with a 68,000-pound single axle load on the front wheels and a 38,000-pound steering axle load on the rear wheels. These loads are similar to those of commercial aircraft and three to four times those used in the design of highways that carry commercial trucks. In addition, the slope of the pavement would have to be nearly flat to prevent tipping of the forklifts. The state closure law requires at least a three percent slope, which is too steep for the vehicles. A special double seal asphalt design and a one percent slope was accepted by the state in lieu of the requirement.

Before construction of the pavement began, the top of the fill was regraded by importing about 230,000 cubic yards of silty fine sand that provided a level, minimum 2-feet thick layer of soil above the existing soil cover. The total thickness of the fill over the rubbish ranged from three to ten feet, with an average of four feet. This fill was compacted to 90 percent of maximum density, per ASTM D1557, using a sheepsfoot compactor and a heavy rubber-tired loader. The compacted surface was covered by 12 inches of asphalt aggregate and two to three inches of asphalt macadam as a wearing surface. The resulting pavement has a vertical permeability of less than 10^{-6} cm/sec and a rigidity slightly less than that of road grade pavement. This level of permeability meets requirements for closures of RCRA Subtitle D facilities.

The fill side slopes were 20 feet high with a 4:1 slope. These were completed by placing two feet of compacted sand over them followed by 12 inches of compacted clay. A compacted clay cutoff wall was placed at the interface of the fill material, natural soil, and clay barrier. The clay layer was covered with fill to achieve a final slope of 2:1. The fill soil was landscaped to prevent erosion.

Building Construction. Like the pavement design, the building design had to take into consideration subsidence, differential settlement, and methane gas. Because the lower 45 feet of the fill consists of construction rubble and tires that would prevent the driving of piles, a deep foundation was ruled out. Instead, the buildings were placed on reinforced concrete mat foundations. The mat sections were approximately 50 feet by 50 feet by 18-inches thick. They were connected by post tension cables to allow for movement between segments. Regularly placed permanent pipe sleeves were fitted in the segments to enable them to be re-leveled with cement grout. The building is designed with leveling pads at the column connections to allow movement, and to tolerate up to six inches of differential settlement.

Both buildings have methane gas collection systems. These systems consist of (from bottom to top) waste covered by five feet of compacted soil, 12 inches of pea gravel, and an 80 mil HDPE membrane. The extraction piping is embedded in the gravel.

Other Observations:

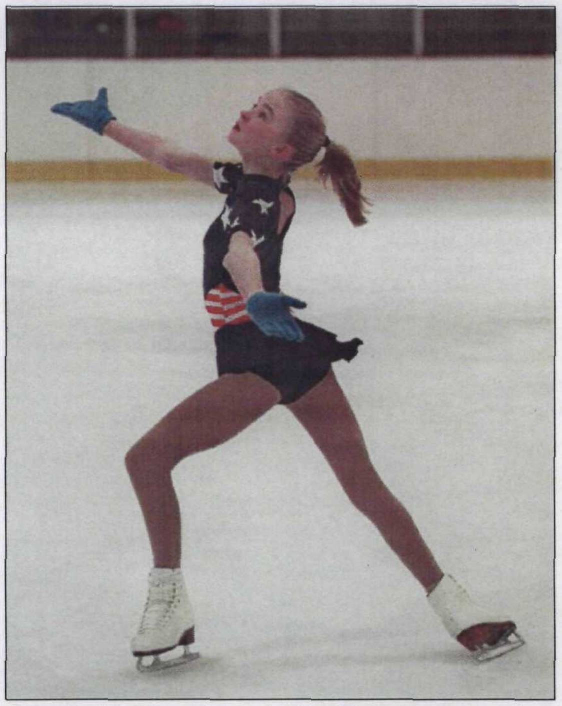
- The seal, as installed, can probably be employed only in a dry climate because the asphalt mix is very moisture sensitive and cannot be placed or cured (30-60 days) during rainy weather.
- To obtain the low permeability rating, the asphalt cover required extremely close quality control measures with respect to asphalt and moisture content.
- The maintenance cost of the surface over a landfill is approximately twice the maintenance cost of a parking lot. Maintenance for this cover is estimated to be two to three cents/square foot/year.
- The closure cost for the project was approximately 10 to 20 percent higher than the closure costs for normal landfills without a planned reuse.
- The coke stock piling that occurred earlier served to partially compact the site, thereby reducing subsequent settlement.

Lessons:

- Structures employing foundations placed over or in fill material may experience subsidence or differential settlement. In such cases, consideration should be given to the impact this may have on the integrity of the cover, and the stability of structures placed over it.

- Alternative approaches to managing runon and runoff may be used in place of the requirements for the finished grade of the cover (*e.g.*, 3-5 percent required for a RCRA type C cover). The developer must demonstrate that the reuse has an equivalent runoff removal efficiency or will prevent infiltration entirely.
- Creative engineering based on knowledge of an existing landfill and hydrogeology can lead to useful designs, especially unique ways to meet requirements for permeability of the cover.
- Depending upon the size of the landfill, its final closure configuration, and the demand for usable land in the area, this type of landfill may be redeveloped for a variety of commercial, industrial, or recreational uses.
- Landfill contents, such as construction debris, may preclude the use of pilings.

Ohio River Park



1999 Junior Olympics at the Island Sports Center Ice Rink, one of several facilities, at the Ohio River Park site.

Site History: The site consists of approximately 32 acres on the western end of Neville Island, roughly 10 miles downstream from the City of Pittsburgh. The Ohio River borders the site to the north and the river's back channel borders it to the south. The site is accessible from the mainland via the Coraopolis Bridge, linking the Town of Coraopolis with Neville Island. Land use on the island is primarily industrial/commercial, although there are some residential areas between the site and the eastern end of the island, which is occupied by petrochemical facilities, coal coking facilities, and abandoned steel facilities. The nearest residence is approximately 450 feet from the site. The site sits on a 20-30 foot high bluff overlooking the river. The bluff shows signs of erosional sloughing. A large part of the site is within the 100-year flood plain. The river has flood control dams that periodically cause the water table to rise above the level of areas filled with waste. Industrial waste disposal activities were conducted at the site from 1952 through the 1960s. Much of the industrial waste was disposed of in two ways: wet wastes were placed into trenches and dry wastes were piled on the surface. Construction debris was also deposited on the site.

Remedy: The Remedial Investigation determined that there were three primary areas of soil contamination: one approximately seven acres and the other two approximately one-half acre each. The principal contaminants were coal tars, pesticides, organic chemicals, and metals. The coal tars had been disposed of in an unknown number of trenches, and were slowly migrating. The investigation also found a groundwater plume consisting primarily of volatile hydrocarbons.

The remedy, which was installed in 1998 and 1999, involved covering the three concentrated waste areas with a Subtitle C type cover; covering areas without concentrated waste with an erosion protection cover; providing for runon and runoff control by directing the water flows into ditches or piping systems that discharge into the river or its back channel; and installing a passive gas collection system. The passive gas collection system, which was incorporated into the cover, consists of a series of trenches that were backfilled with gravel and perforated pipe. These were overlain with compacted soil and covered with an HDPE liner. The overall slope of the surface of the liner was kept at three percent. The liner was covered by a synthetic drainage layer and a thin layer of fill. Groundwater monitoring wells were placed through the cover. For non-concentrated waste areas, a 10-inch thick soil cover was placed to control erosion and prevent direct access. It was determined that the groundwater plume had stabilized and long-term monitoring of natural attenuation of the groundwater contaminants would be appropriate, unless otherwise indicated.

Before placing the RCRA cover, it was discovered that the coal tar had migrated to the edge of the bluff and could be observed along the upper wall. To prevent further migration and subsequent release down the slope, a 15-20 foot deep by 200 foot long cement slurry wall was placed along the edge of the slope. Although a cement slurry generally has a higher permeability than a bentonite one, cement was chosen because of its higher physical strength. Rip rap was placed along the slope to shore up the bluff during construction of the slurry wall and to prevent further erosion.

Redevelopment: The site's owner determined that the property's location and size made it ideal for a sports center that could include several acres of indoor and outdoor facilities. The construction to date has included a five-acre building housing two Olympic class indoor ice skating rinks, a golf training facility, a fitness center, and restaurant; an approximately 2-3 acre covered golf dome; an outdoor site appropriate for team sports such as soccer and baseball; and accompanying parking lots and sidewalks. Before construction could begin, the grade levels of several areas of the site were raised with clean fill to bring them above the 100-year flood plain elevation.

The approximately 250 by 300 foot covered golf dome was situated on the eastern section of the seven-acre covered landfill area. Prior to construction of the facility, settlement plates were placed on the fill and loaded with five or more feet of clean soil. Potential settlement was monitored for one to three months. The site was then re-graded to make it completely level. This involved placing from three to eight feet of clean fill (equivalent to an erosion layer) over the cover. By allowing at least three feet of clearance between the drainage layer of the cover and grade, it was possible to run utility and sewer lines to the structure in clean soil. The foundation for the dome is anchored by concrete footers 2.5 feet deep by 10-12 feet long. These types of footers, which are usually narrower and deeper, were made wider and shallower to keep them in clean soil. The parking area is asphalt, and the field is built with synthetic turf. The turf's design calls for sand to be worked into the artificial fibers to give a true turf "feel." The design allows the surface to be used both with and without a cover. The playing field includes a drainage layer to accommodate the potential for precipitation when the cover is down. This drainage layer directs water to collection pipes and then to the sewer system. It is not associated with the RCRA cover drainage system.

The ice rink and restaurant are placed in an area of the site where the Record of Decision (ROD) calls for at least a ten-inch erosion protection cover of clean soil. Since this area was below the 100 year flood plain, an average of eight feet of fill was placed there, to raise the elevation above the flood plain. This fill serves as the erosion cover and provides more than sufficient clearance of clean soil to allow for utility construction.

Lessons:

- When the waste materials are deposited in an area that is too large and diverse to excavate and treat or remove, a combination of techniques may be used to remediate and redevelop the site.
- A Subtitle C type cover over the landfill is useful to prevent further leaching of materials from the unsaturated zone to the groundwater and to collect gas.
- The use of clean fill and effective grading of the site can promote a safer remediation as well as flexibility in redevelopment.
- A groundwater monitoring system is a useful precaution, especially when there is incomplete knowledge about the types of materials that have been placed in the landfill.
- Deed restrictions to prevent people from disturbing the cover or installing drinking water wells are crucial to the long term viability of the remedy.

Protective cover installation, slurry wall construction, and the completed Island Sports Center.

Rentokil, Inc.

Construction of "divider wall" at the Rentokil site. All development must occur within the walls to prevent cover disruption.

Site History: The 10-acre Rentokil, Inc. site in Henrico County, Virginia is the location of a former wood treating plant that operated between 1957 and 1990. Although the manufacturing processes that were used at this site are similar to those used by Mid-Atlantic Wood Preservers, the remediation and redevelopment options were quite different.

Between 1982 and 1990, Rentokil used only the chromated copper arsenate process to treat wood. Prior to 1982, it also used several other compounds, including chromated zinc arsenate, creosote, xylene, pentachlorophenol, and fire retardants in a solution of ammonium phosphates and sulfates. These processes used mineral spirits and fuel oil in the preserving mixtures. From 1957 to 1963, waste processing liquids were discharged into an open earthen pit. In 1963, this pit was cleared, cleaned, and replaced with a concrete holding pond. In 1976 or 1977, approximately 1,100 to 1,400 pounds of chromated copper arsenate (CCA) were disposed of in an on-site pit. The EPA site investigation determined that the groundwater, soil, and surface water are contaminated with pentachlorophenol, creosote derivatives, copper, chromium, arsenic, and dioxin.

Remedy: All wood treating equipment was removed from the site and sediment control structures were built to reduce further migration of sediment containing arsenic, chromium, copper, and zinc to a tributary of North Run. The remaining structures were demolished, material contaminated with unusable CCA and pond sediments were excavated and disposed of or incinerated off site, and a RCRA Subtitle C type cover was built. In addition, a slurry wall and dewatering system (horizontal wells) were installed, and three wetland areas were restored.

Redevelopment Plan: A 1996 ROD amendment included a provision allowing Virginia Properties, Inc. to redevelop the site after completion of the remedy. The company plans to construct light industrial and commercial buildings on the site. The building foundations are to be incorporated into the cover, a concept Rentokil terms "divider walls." All structures must be placed within the area enclosed by these subsurface barriers. The divider walls extend below the cover and enclose approximately 50,000 square-feet. A concrete pad was placed on top of the divider walls to further prevent disturbance of the materials below the cover. To prevent slurry wall damage, heavy vehicle crossings were built where parking lots will cross the slurry wall. These crossings are designed to distribute vehicle mass over a larger area, minimizing the possibility of damage to the underlying slurry wall. Construction was completed in August 1999.

Lessons: When barrier walls are used, some planners recommend not building structures over them, to avoid potential damage from heavy loads or vibrations, and to allow for future repairs. However, with proper engineering design to spread the load over a larger area, some structures, parking lots, or roads may be built on them.

Peterson/Puritan, Inc. Superfund Site

Gracious Living industrial condominiums in an old textile mill near the waste treatment shed

Site History: The site is approximately two-miles long and extends about 2,000 feet to the east and west of the main river channel of the Blackstone River. It is located in a mixed industrial and residential area within the towns of Cumberland and Lincoln in north-central Rhode Island. The concentrated industrial area of the site (OU1) was used for the manufacture of general industrial and specialty chemicals, and packaging of aerosol products, soaps, and detergents. In 1974, a railcar accident resulted in the release of an estimated 6,000 gallons of solvents on the site. Groundwater is contaminated with chlorinated solvents, volatile organic compounds (VOCs), and heavy metals. Surface water is contaminated with low concentrations of VOCs. Prior to the cleanup, people in the area faced risks from contact with, or ingestion of, contaminated groundwater, surface water, sediment, or soil. Other environmental concerns at the site relate to a closed industrial landfill (OU2), which is still being investigated.

Remedy: The remedial action addressed identified two primary sources of contamination in OU1, which were identified in the Remedial Investigation. At the first property, known as CCL, some of the contaminated soil was excavated from two catch basins and a manhole located at the property's tank farm, and a subsurface soil vapor extraction system was installed to treat the rest of the soils in the area. Contaminated groundwater at this part of the site is being extracted and treated by air stripping and granular carbon filtration. At the second property, known as PAC, soils contaminated with VOCs and arsenic were excavated and an in-place oxidation treatment system was installed to immobilize the arsenic in the soil and reduce its concentration in the groundwater. At this part of the site, natural attenuation of groundwater contaminants is being monitored, and institutional controls have been implemented to restrict activities on the site. The remedy for the closed landfill on the property has not yet been determined.

Redevelopment Plan: Since the site contains a number of operating commercial and light industrial businesses, as well as an outdoor athletic facility, a remediation plan was developed that allows for continued use of these facilities. A concrete cover was placed in the tank farm area to allow for vehicle and cart access. An asphalt pad was placed in the PAC area to increase the size of the parking and truck facility, and a bituminous concrete cover was placed over the soil vapor extraction system. These covers protect people from exposure to the contaminated soils, prevent infiltration of rainwater into the subsurface contaminated materials, and allow parking and other commercial activities to be conducted in the areas over the subsurface treatment systems and the contaminated soils. Thus, commercial and recreational activities continue while the soil and groundwater are being treated.

Lessons:

- It is possible to install and operate *in situ* treatment technologies, such as soil vapor extraction and oxidation, without removing existing buildings or hampering the operations of their tenants.
- In a commercial area, contaminated areas that are unpaved can be covered with asphalt or concrete to eliminate direct contact exposure and protect and enhance the *in situ* treatment systems.
- The above ground portion of the groundwater pumping and treatment systems can be placed in a small building in an inconspicuous location on the site.

The CCL Custom Manufacturing facility on Martin Street is one of a number of businesses on the site.

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Appendix A
Key Monitoring and Maintenance Needs at Containment Systems

Agreements between the EPA, PRP, developer, and other interested parties should address the following monitoring and maintenance needs:

1. ***Groundwater quality.*** For containment systems that do not have an active treatment component, monitoring generally requires periodically drawing samples from monitoring wells to ensure that the water quality is stable and that the potentiometric surface remains within an allowable range. The former indicates that the containment system is effective and the latter that the direction of groundwater flow has not changed nor has the water level risen above the level of the waste. The monitoring frequency may range from monthly to annually, depending on the type of containment and historical data available. If there is an active treatment system on site, then provision should be made for regular inspections to verify that the equipment is working and process stream testing to verify effectiveness. Redevelopment activities will have to allow for access to this equipment.

2. ***Leachate monitoring.*** Containment systems that have an engineered bottom liner with a leachate collection system will generally require monitoring of these systems to ascertain if the quantity and chemical makeup of the leachate is consistent over time. For many Superfund sites where there is no engineered bottom to the containment area, the groundwater monitoring system is analogous to leachate monitoring.

3. ***Gas release concentrations.*** When it is anticipated that a containment system will generate gas, the remedy designer can specify passive or active gas collection and venting. Both types of systems require monitoring and maintenance. Passive systems require regular monitoring to ensure that the system is not violating air quality standards and is behaving in a predictable fashion. When it is determined that gas production has ceased, the vents should be removed, as they represent a weak point in the cover system. The critical component in active systems is the equipment used to handle, treat, or recover gas. This equipment requires regular maintenance. A gas meter in a building will indicate if the gas control system needs repair.

4. ***Subsidence monitoring.*** When subsidence and settlement are expected, EPA recommends that the entire area be monitored, not just the vicinity of building structures. Monitoring can include routine re-surveying of pre-placed markers and regular walkovers of the property, especially after heavy rain. Subsidence in the basement of a structure may also provide warning of potential damage to any subsurface cover. Puddling of water indicates settling, which represents a potential danger to the integrity of the cover, and should be repaired.

5. ***Surface erosion.*** Unless the cover system is a rock armor or hardened surface (*e.g.*, asphaltic concrete), there will generally be some erosion. Routine inspections of the runon/runoff control systems should be conducted to ensure they are functioning. All above-grade slopes should be examined for signs of erosion, such as rills, and repaired as necessary.

Appendix B
Waste Sites With Commercial Use Over Containment Systems

Below are brief descriptions of 15 completed projects where various types of commercial and industrial development occurred on sites with a range of containment systems.

Abandoned Municipal Landfills, Coquitlam, British Columbia, Canada: The closed landfills, which contained municipal waste, construction debris, and wood waste, were redeveloped to accommodate light industry and commercial structures. The construction techniques used for the redevelopment included preloading, pile foundations, and load compensating foundation designs constructed with lightweight cellular concrete.

Ascon Landfill, Los Angeles, CA: This former 95-foot deep landfill near Los Angeles Harbor was ideal for locating a ship-container handling, storage, and maintenance facility. The developer, prospective user, and State of California cooperated to develop a landfill closure design that would also serve as the foundation for the new facility. The design included unique paving approaches on top of the fill to create work surfaces that can be adjusted to account for differential settlement, and construction of a 7,500 square-foot, five story warehouse and a small one-story office building. Although the slope of the top surface is lower than usually required for a containment system cover, the use of a special asphaltic concrete mixture provided a permeability low enough to meet the RCRA Subtitle D requirements. Both buildings have methane gas collection systems.

Bangor Gas Works, Bangor, ME: This four-acre site is a former gasification plant with coal tar contamination in the subsurface. The contaminated soils were covered in place by a parking lot, and a supermarket now thrives on the site.

Brickyard Shopping Center, Chicago, IL: This fifty-acre site was once a clay pit that had been mined to a depth of 70 feet. After mining operations ended, the pit was filled with refuse. To accommodate a two-building structure that houses 110 retail stores, the ground was dynamically compacted, and spread footer foundations were used to support the buildings.

Denver Radium Operable Unit (OU) 9, Denver, CO: The area of concern is a 17-acre parcel that was contaminated with radionuclides and heavy metals. The radionuclides were excavated and disposed of at a permitted off-site facility. The metals-contaminated soils were consolidated into an on-site excavation and covered. To remediate the site and allow for retail development, the metals were placed into four separate excavations. These excavations were placed with sufficient separation between them tp allow for utility corridors to be placed in clean fill between them. The excavations were completed at the surrounding grade, and covered with an asphalt parking lot. Downgradient groundwater monitoring wells were also completed at grade.

H. Brown Company, Grand Rapids, MI: This site contained heavy metals as a result of former battery recycling operations. The remedy involved placing three-feet of clean soil on top of the contaminated soil and covering the clean soil with buildings and asphalt parking lots. The clean soil layer allowed for placement of utilities without intrusion into the underlying contaminated soils. The buildings and parking lot act as covers. The developer has assumed responsibility for long-term groundwater monitoring and the maintenance of the buildings and asphalted areas.

John F. Kennedy Library, Boston, MA: Built over part of the Columbus Point landfill, the Point was created by 50 years of dumping of refuse. It was closed in the 1950s. Before building could begin, underground fires had to be extinguished. The building itself is constructed on piles driven into the bedrock.

Lorentz Barrel & Drum Company, San Jose, CA: The 6.7-acre drum recycling site was contaminated by releases of VOCs, heavy metals, PCBs, and other materials. The principal chemicals of concern were the VOCs in the soil and groundwater. The remedy was to install a pump-and-treat system for the groundwater, remove and dispose of debris and PCB-contaminated soils off site, construct an SVE system, and install an asphalt concrete cover. The SVE and pump-and-treat systems are expected to operate for some time. San Jose State University and EPA are discussing the purchase of the covered property for use as a parking lot for nearby sports facilities.

Mid-Atlantic Wood Preservers, Harman, MD: A 3.2-acre property was contaminated with chromated copper arsenate. Highly contaminated soil was removed. However, elevated levels of chromium and arsenic are still present. The remedy involved covering the entire site with asphalt, for use as a parking lot by an adjacent trucking company. The company has assumed responsibility for the long-term groundwater monitoring program, and for maintaining the asphalt in good condition.

North Albany Demolition Landfill, Albany, NY: The approximately 45-acre North Albany Landfill was used primarily for disposal of demolition debris and excess soils, but municipal solid waste was also disposed there. Little sorting and compaction was performed on the material placed in the fill, which is estimated to be between 4.6 and 9.2 meters thick. Groundwater occurs at approximately the original grade. The planned development is a public works garage/office building and a maintenance building. The site investigation suggested the use of dynamic compaction where buildings would be placed.

Ohio River Park, Neville Island, PA: The Ohio River Park site consists of approximately 32 acres on the western end of Neville Island, roughly 10 miles downstream of the City of Pittsburgh. The Remedial Investigation (RI) determined that there were three areas of primary soil contamination. One is approximately seven acres and the other two are approximately one-half acre each. The principal contaminants were coal tars, pesticides, organic chemicals, and metals.
The remedy, which was installed in 1998 and 1999, involved covering the three concentrated waste areas with a Subtitle C type cover, covering areas not including concentrated waste with an erosion protection cover, providing for runon and runoff control, and installing a passive gas collection system. In addition, groundwater monitoring wells were placed through the cover. The

owner covered a large portion of the covered area with up to eight feet of clean fill and built a golf driving range with a removable dome roof. In addition, a sports complex containing indoor ice rinks and a restaurant, and parking lots and sidewalks were built.

Peterson/Puritan site, Lincoln and Cumberland, RI: This site covers approximately 980 acres along the Blackstone River in a mixed industrial and residential area. It consists of two operable units (OUs), the first includes the industrial park and the second a closed industrial landfill. The primary chemicals of concern at OU1 are chlorinated solvents, VOCs and arsenic. In addition to excavation, the remedy has included the following on-site treatment: groundwater extraction involving air stripping and granular activated carbon filtering, soil vapor extraction (SVE), *in situ* oxidation to immobilize arsenic in the soil and reduce groundwater contamination, and a program of natural attenuation of groundwater. A concrete pad was placed in the tank farm area to allow access for vehicles and carts. An asphalt bed was placed in a treatment area, increasing the size of the parking and truck facility. A bituminous concrete cover covers the area containing the SVE system, thereby protecting it while allowing for additional parking and access for servicing the treatment system. This remedy allowed the industrial park to remain in operation during and after the remediation. The landfill (OU2) has been fenced and is still under investigation. The city has used a small portion of the site that lies along the river opposite OU2 for a bicycle path.

Raymark Industries, Inc., Stratford, CT: This 34-acre site was found to contain organic compounds, asbestos, and heavy metals contamination. The site also has product floating on the groundwater. The remedy was to consolidate hot spots and contaminated soil on site and to partially stabilize the material using cement. The landfilled material was compacted using both soil preloading and dynamic compaction. The contractor drove 277 steel pilings up to 100 feet deep, to provide a foundation platform for future development. The pilings include special fittings at the points where they extend through the cover. The remedy also includes groundwater source extraction wells, a soil vapor collection system, and monitoring wells. Many of the monitoring wells were placed within the covered area, and access was provided to service them.

Rosen Brothers Scrap Yard Dump, Cortland, NY: Prior to 1970, this 20-acre site was used to manufacture small metal items. From 1971 to 1985, it was used as a scrap metal processing and disposal facility. The soil is contaminated with VOCs and heavy metals, and the site contains a former three-acre lagoon that has been partially filled with construction debris and municipal and industrial wastes. The remedy is to consolidate material from hot spots into the lagoon area, cover it, and install a soil cover over the rest of the site to prevent contact with residual contamination. The city has installed an asphalt cover, underlain with a geomembrane, over five-acres of the site. This area is for a planned rail spur to contain a rail to truck transport facility. The location of the remainder of the site is amenable to commercial and other types of redevelopment. However, the balance of the remedy has not yet been completed.

Sears Roebuck Freight Terminal, Chicago, IL: This 61-acre former landfill and railway loading dock was created from refuse and river dredge material. Dynamic compaction was used to prepare the site for construction. The loading dock structure was demolished and fed through a rock crusher to provide an 18-inch crushed rock layer over the compacted material. The developers built a 461,291 square foot warehouse and a 45,000 square foot office building on this material.

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Solidification/Stabilization for Remediation of Wood Preserving Sites: Treatment for Dioxins, PCP, Creosote, and Metals

Author: Edward R. Bates
E. Sahle-Demessie
Douglas W. Grosse
National Risk Management Research Laboratory
U.S. Environmental Protection Agency

Abstract

This article discusses the use of solidification/stabilization (S/S) to treat soils contaminated with organic and inorganic chemicals at wood preserving sites. Solidification is defined for this article as making a material into a free standing solid. Stabilization is defined as making the contaminants of concern non mobile as determined from a leaching test. S/S then combines both properties. For more information on S/S in general the reader should refer to other publications (Conner, 1990; USEPA 1993a; Wiles, 1989) as this article addresses only wood preserving sites and assumes basic knowledge of S/S processes. For a more general discussion of wood preserving sites and some other remedial options, the reader may wish to refer to a previous EPA publication (EPA, 1992a).

This article includes data from the successful remediation of a site with mixed organic/inorganic contaminants, remediation of a site with organic contaminants, and detailed treatability study results from four sites for which successful formulations were developed. Included are pre and post treatment soil characterization data, site names, vendor names (in some cases), treatment formulas used (generic and proprietary), costs, recommendations and citations to more detailed references. The data presented indicate that Dioxins, pentachlorophenol (PCP), creosote polycyclic aromatic hydrocarbons (PAHs) and metals can be treated at moderate cost by the use of S/S technology.

Introduction

Solidification/stabilization (S/S) immobilizes contaminants rather than removing the contaminants. Solidification is defined for this article as making a material into a free standing solid. Stabilization is defined as making the contaminants of concern non mobile as determined from a leaching test. S/S then combines both properties. The remediation and treatability studies described in this article all used Portland Cement as part of the reagent mix producing a solid monolithic, treated product. For a general description of S/S processes and applications, the reader may wish to refer to other publications (Connor, 1990, USEPA 1993a; Wiles, 1989).

Remediation of the Selma Pressure Treating Site

In 1990 the United States Environmental Protection Agency (US EPA) conducted a successful Superfund Innovative Technology Evaluation (SITE) Demonstration of an innovative S/S technology at the Selma Pressure Treating (SPT) site in Selma, California (national priority listed Superfund site). The technology developed by Silicate Technology Corporation of Scottsdale, Arizona (now known as STC, Inc.) stabilized soil contaminated with PCP and chromated copper arsenate (CCA)(Bates, et al, 1991; U.S. EPA, 1992b).

Following this successful field test the remediation of the SPT site was bid and awarded. In 1993-1994 the site was remediated by Chem Waste Management using the STC technology. PCP and CCA were the target contaminants. A previously published article provides more details on the design, construction, and cost of this innovative remediation (Bates and Lau, 1995). Exhibit 1 summarizes the soil characteristics before and after remediation. Dioxins/furans were not designated target contaminants during this remediation, however, several months following the remediation, EPA did arrange to have archived samples from the remediation analyzed for total and leachable dioxins/furans. These results are presented in Exhibit 2 with PCP concentration measurements made at that time. The data in Exhibits 1 and 2 document substantial reductions in the mobility of both the inorganic and organic contaminants of concern including dioxin. Referring to Exhibit 2 and the synthetic precipitation leach procedure (SPLP, SW846, MTD 1312) the data show more than a 99 percent reduction in the mobility of both PCP and dioxin.

Treatability Studies

Following successful remediation of the SPT site, the EPA National Risk Management Research Laboratory (NRMRL) became involved in assessing the applicability of a number of technologies for possible application to the remediation of wood preserving sites. Consequently, a number of treatability studies were conducted including S/S tests using formulations on soils from several Superfund sites including:

McCormick and Baxter (MCB), Stockton, California;
American Creosote Works (ACW), Jackson, Tennessee;
Texarkana Wood Treating (TWT), Texarkana, Texas; and
RAB Valley Wood Preserving Site (RAB) near Panama, Oklahoma.

The primary objective for all the S/S studies was to develop formulations that could treat all contaminants of concern, which included dioxins, PCP, and creosote PAHs to meet all treatability criteria. For the ACW site a subsequent remedial design treatability study also focused on minimizing the formula cost while still meeting the treatment criteria. For most tests the treatment criteria (targets)were established in advance and are shown in Exhibits 4 through 8, which also depict the treatment results for each site. The reader should be aware that two to three rounds of treatability tests were conducted for each site in order to develop cost effective formulations that could meet all the chemical and physical treatment criteria. Although toxicity characteristic leaching procedure tests (TCLP, SW846, MTD 1311) were run on successful formulations, the primary test used to assess environmental mobility was the SPLP test. The SPLP test more closely represents potential leaching in the proposed on-site placement for treated material resulting from precipitation because the SPLP leaching fluid consists of a mixture of inorganic acids in water and was formulated to simulate acid precipitation.

Formulations Used - Exhibit 3 describes the formulations developed and used in these studies that met all treatment criteria. Two to three rounds (or tiers) of treatability tests using generally three to six formulations per round were conducted for each site-specific treatability test. Exhibit 3 presents only the formulations that were able to meet treatability study objectives. However, much can also be learned from formulations that failed. The reader may wish to reference the cited documents for more information on performance of all formulations tested. Generally, the performance criteria most difficult to meet were low leachability of PCP and low permeability properties ($1x10^{-6}$cm/sec).

Exhibit 3 shows six successful formulations: two for the ACW site, one proprietary to STC and one generic; two for the TWT site, one proprietary to OHM and one generic; and one proprietary to STC for both the McCormick Baxter and RAB Valley sites. The cost of the S/S formula to treat one ton of raw soil ranged from $39 to $66, with an average cost of approximately $53. These are the costs for the chemical reagent in the formulations only. Transportation and all other site-specific costs such as excavation, mixing, replacement on-site (or disposal off-site), performance verification testing, installation of final cover, design and oversight costs, and any other site-specific remediation cost are not included. These other costs are site and design specific and influenced by the volume of soil and the specific treatment criteria. In the authors' experience the total of all these site specific costs may range from $30 to more than $100 per ton of raw soil (excluding the cost of the treatment formula).

Exhibit 3 includes four proprietary formulations by STC and OHM, but also includes two generic formulations containing no proprietary materials. Proprietary formulation names are included only for the purpose of describing the work performed. Exhibit 3 also includes the dilution factor due to reagent addition, which ranged from 1.2 to 1.35. These dilution factors were used in determining the percent reduction of contaminants in the leaching tests. The actual measured concentration of a contaminant in a leachate was multiplied by the dilution factor of the reagents added, to produce an adjusted (not shown in Exhibits) after treatment contaminant concentration. This adjusted contaminant concentration was then compared to the leachate from the untreated soil to produce a percent reduction so that no credit was given for the effects of dilution.

<u>Stabilization of PCP</u> - Of all the target contaminants treated, PCP was the most difficult to stabilize and meet treatment criteria. Exhibit 4 provides the results from four treatability tests in which PCP was successfully stabilized. However, the reader should be aware that there were also many formulations tested that failed to adequately stabilize PCP. For example, the entire first round of formulas tested for the TWT site failed to meet the PCP criterion of 200 μg/L or less in SPLP extracts. This was in spite of the fact that formulations that had been successful on ACW soils were included in the first round of the TWT test. This illustrates the important point that each site is unique and it is essential to conduct treatability tests for each specific site. Formulations that were demonstrated to work well on other sites may not work well

on a new site.

Exhibit 4 contains leachate data for both TCLP and SPLP test methods. (Reference U.S. EPA 1995a for Leaching Method Descriptions). The final leachate pH is provided in addition to the PCP concentration. Data in Exhibit 4 clearly illustrate that leachate results for the two leaching methods can differ dramatically. In the authors' experience, the SPLP method usually extracts far more PCP than the TCLP method. This holds true for both the untreated and the treated soil. The difference often approaches or exceeds a factor of ten. Further, it can be argued that the SPLP method more closely approximates leaching conditions in the field resulting from precipitation because the SPLP leaching fluid consists of a mixture of inorganic acids in water and was formulated to simulate acid precipitation. Thus, the selection of the leaching method may have a substantial impact on assessing the risk to surface or groundwater posed by leaching of either untreated or treated material. However, it should be noted that not all PCP in soil has the same leaching potential. Examination of untreated soil leachates reveals that sometimes lower total concentrations of PCP in soil yield higher leachate concentrations. This may be due in part to the fact that PCP is a weak acid with solubility dependent partly on the degree of protonation and that solubility may be equilibrium controlled. Thus, other chemicals in the soil, such as humic acids may affect the solubility of the PCP. It also may be that the PCP is more tightly adsorbed to organic constituents in some soils and thus not easily extracted by the leaching fluid. Overall Exhibit 4 indicates that PCP in soil was successfully treated by S/S, by at least one formulation, to below target level concentrations at four sites. Percent reductions generally ranged from 97 to over 99 (85% in one case), after adjusting to eliminate any effect of dilution by the treatment reagents. Note that in exhibits 4,5, and 6 the pH of the final leaching solution is alkaline impacting the solubility of the contaminants.

<u>Stabilization of Dioxins</u> - The results from tests to stabilize dioxins in soils from the four wood preserving sites are presented in Exhibit 5. Data for both TCLP and SPLP are provided along with the pH of the final leachate solutions. The total values of dioxins in soils from the four sites ranged significantly. The dioxins were a contaminant in the PCP wood preserving solutions. In the authors' experience, the range of 9 to 50 μg/L 2,3,7,8 TCDD toxicity equivalents (TCDD-TEQ) represents most wood preserving sites where PCP was used. An explanation for calculating dioxin TEQ values is presented in a previous EPA publication (U.S. EPA 1989).

Similar to PCP, the dioxins in the untreated soil appear to be much more soluble in the SPLP leachate than in the TCLP leachate. However for dioxins, the factor often approaches or exceeds two orders of magnitude (TWT, MCB, RAB) for the untreated soil. In the treated soil the differences are not clear or consistent. For example, the data for the MCB and RAB sites show higher dioxin concentrations in the TCLP extract while the TWT formulations contained slightly higher dioxin concentrations in the SPLP extract for one formulation and are unclear regarding the second formulation.

Overall, the data in Exhibit 5 indicate successful stabilization of dioxins as measured by SPLP extracts with reductions ranging from 95 to over 99 percent, after adjusting for dilution by reagents. Target concentration levels were met for dioxins in SPLP leaches for all sites by use of at least one of the formulations. The data for TCLP extracts are more limited and no general pattern is evident. For the TWT formulas, dioxins in the TCLP extracts were below detection limits both before and after treatment; MCB shows a 72% decrease following treatment; and RAB shows a substantial increase following treatment. It is interesting to note that the same treatment formula was used for the MCB and RAB soils. This again demonstrates the need for site-specific treatability tests, since site-specific soil characteristics can produce substantially different impacts on performance of a treatment formulation, and the impact of specific soil characteristics on treatment performance are not predictable.

Stabilization of PAHs - A summary of PAH data from the treatability tests is provided in Exhibit 6. Data are provided as a benzo(a)pyrene potency estimate [B(a)P potency estimate] and on the sum of all detected PAHs. An explanation on calculation of the benzo(a)pyrene potency estimates is provided in a previous EPA publication (U.S. EPA 1993b). The references cited in Exhibit 6 provide extensive data showing performance on each individual detected PAH.

B(a)P potency estimates are often used to obtain an overall assessment of the risk from PAH compounds. The principal observation on B(a)P potency estimates in Exhibit 6 is that these compounds were only slightly leachable before treatment and are less leachable after treatment, due to their low water solubility; concentrations were often below detection limits. There appears to be a slight, but consistent, tendency for the SPLP extraction procedure to produce higher concentrations from the untreated soil than was the case for the TCLP extraction procedure. In all cases the SPLP extract after treatment met the treatability criteria of having less than a 10 μg/L B(a)P potency estimate.

Since B(a)P potency estimates were at such low levels, the total (sum) of all detected PAHs are also included in Exhibit 6. Generally, the TCLP test procedure produced slightly higher concentrations of total detected PAHs than the SPLP for untreated soils (5 of 6 cases) while SPLP produced slightly higher concentrations in treated samples (3 of 4 cases). However, the principal message from looking at total detectable PAHs is that S/S treatment successfully reduced the total detected PAHs by over 90% in leachates, in all except one case which was 84%. However, SPLP leachates met target levels for all three sites for which target levels had been established.

Stabilization of Metals - Stabilization of metals was not a primary goal of the treatability tests discussed in this article. However, the results for metal treatment are presented in Exhibit 7 because leachable metal data were collected for three of the sites. However, the reader is cautioned not to draw too many conclusions from these data as the concentrations are quite low, both before and after treatment, and no emphasis was placed on developing formulations for metal stabilization in these particular tests. The data in Exhibit 1, which was a full scale remediation that targeted metals, is considered more indicative of the S/S to treat metals at wood preserving sites than the data presented in Exhibit 7.

Physical Properties of Treated Soils - Exhibit 8 summarizes the principle physical properties achieved in the treatability tests. The treatability criteria of over 100 psi unconfined compressive strength and a permeability of less than $1x10^{-6}$ cm/sec were achieved by all formulations listed. The reader is cautioned, however, on two points. First, these criteria were set for the treatability tests and do not necessarily reflect the final goals for site remediation. Second, not all of the formulations tested were able to meet these criteria. Many failed to meet one, or both; however, the data do indicate that it was possible to develop formulations for each of these four sites that could meet these treatment criteria.

Case Study - Remediation of the American Creosote Works Site

The ACW site encompasses 60 acres of marshy flood plain along the Deer River just southwest of Jackson, Tennessee. The facility treated wood from the 1930's to 1981 using both creosote and PCP.

Surface soils in an approximate eight acre main process and drip tracks area, consisting primarily of sands and silts, were contaminated by creosote, PCP, and dioxins. The main process area is underlain by a confining clay layer at a depth of approximately two to five feet limiting the depth to which soils were contaminated.

In 1996 the USEPA completed a focused risk assessment for the ACW site. Based on a future industrial use scenario and a defined risk of $1X10^{-4}$, soil action levels were defined for contaminants of concern as shown in Exhibit 9. Later that same year the USEPA, with concurrence from the State of Tennessee, signed a Record of Decision which called for remediation by excavation, ex-situ treatment by S/S, and replacement of treated soil under a cap. Following completion of the remedial design treatability study in 1997, the USEPA, in cooperation with the State of Tennessee, developed a performance based remedial action design and bid package in 1998 for the main processing area. In 1999 the State of Tennessee bid the project and awarded the contract to the IT Group (as IT/OHM Corporation) and the remediation project commenced in the spring of 1999. As of the end of December 1999, excavation, treatment, and on-site disposal of treated soils was complete and construction of the cap over the treated material was well advanced. Vendor records show that 46,700 cubic yards (80,700 tons) of contaminated soil were excavated, treated, and replaced into the excavation area. The S/S treatment specifications are shown in Exhibit 10, while the major remediation cost elements are shown in Exhibit 11. Note that the bid cost to excavate, treat, and replace soils was $44.25 per cubic yard (measured as untreated soil in place before treatment) and the total bid costs for all activities averaged over the estimated 45,000 cubic yards came to just over $64 per cubic yard. The treatment formulation developed by IT/OHM Corporation and used for this successful treatment of dioxins, PCP and creosote was 1.3% powdered carbon, 5% Portland cement, and 4.5% fly ash, all determined as weight percents of the untreated soil. This project demonstrated that a highly contaminated wood preserving site containing dioxins, PCP, and creosote, can be remediated at moderate cost by using S/S technology.

Conclusion

During two full scale remediations and various treatability tests on several wood preserving sites, it has been documented that S/S formulations can be developed that meet all physical properties and chemical stabilization (immobilization) goals. The cost for the chemical formulations in the treatability tests ranged from $39 to

$66 (chemicals only). Complete costs for remediation are highly dependent on site-specific factors, but could be expected to range from $40 to $100 per ton ($60-$120 per cubic yard) of untreated soil.

TCLP and SPLP leaching tests often produce dramatic differences in concentrations of contaminants in leachates for both untreated and treated soil samples. For both PCP and dioxins, the SPLP leach procedure produced higher concentrations in leachates than did the TCLP leach procedure, thus careful consideration should be given to selection of the leaching procedure to be used in evaluating leaching properties of either treated or untreated soils. In the authors opinion, the SPLP appeared to be a better test method to measure the effectiveness of the S/S treatment technology. The concentrations of contaminants of concern in SPLP leachates for S/S treated soils were generally 95 to 99% less than in SPLP leachates from untreated soils.

Following development of successful formulations during treatability tests for the ACW site in Jackson, Tennessee, this site remediation was bid by the State of Tennessee. In 1999 a contract was awarded for remediation of this site including S/S of an estimated 45,000 cubic yards of highly contaminated soil. The bid price for excavation, S/S treatment, and replacement (including reagent costs and performance sampling) was $44.25 per cubic yard while total project bid costs including the draining, collection, treatment, and disposal of a water and creosote NAPL and placement of a cap came to slightly over $64 per cubic yard if divided by the 45,000 cubic yards of contaminated soil. By the end of December 1999, excavation, treatment, and on site disposal of treated soils was complete with vendor records showing 46,700 cubic yards (80,700 tons) of contaminated soil successfully treated.

Exhibit 1 Remediation of the SPT Site①

Parameter	Measurement Method②	Untreated mg/Kg (mg/L)	Action Level③ mg/Kg (mg/L)	Treatment Criteria④ mg/Kg (mg/L)	Actual Performance mg/Kg (mg/L)		
					Samples⑤	Mean	High
As /Total	7060	1500	25	-	-	-	-

As TCLP	1311 & 6010	10	5.0	5.0	543	<0.1	0.2
PCP Total	8040	3000	17	-	-	-	-
PCP TCLP	1311	3.1	0.300	0.300	543	<0.1	0.21
PCP SPLP	1312	39	-	-	-	<0.1	-
Cr Total	6010	2000	3910	-	-	-	-
Cr(Total) via TCLP	1311 & 6010	1.0	0.5	0.5	543	<0.1	0.3
Cr Hexavalent via TCLP	1311 & 7197	<0.1	0.5	0.5	543	<0.1	0.1
Cu Total	6010	1500	31800	-	-	-	-
Cu via TCLP	1311 & 6010	5.0	10.0	10.0	543	<0.1	1.1
Permeability	ASTM D5084	-	-	$<1X10^{-7}$ cm/sec	>300	All Passed	
Unconfined Compressive Strength	ASTM D2166	-	-	>15 psi at 5 days 100 psi at 28 days	>300	All Passed	

① Bates and Lau, 1995
② All methods per EPA 1995 (SW846) except ASTM.
③ Action level is the contaminant level in untreated soil, at or above which, treatment (action) is judged to be necessary.
④ Treatment criteria is the targeted value to be achieved by treatment.
⑤ Total number of samples collected and analyzed.

Exhibit 2 Dioxin and PCP Analyses on Archived Samples from Remediation of the SPT Site (Area C)①

Parameter	Measurement Method②	Mean③ Untreated	Mean③ Treated
Dioxin/Furan (TCDD-TEQ)			
Total	8280	12 μg/Kg (ppb)	-
TCLP	1311, 8290	28 pg/L (ppq)	<0.025 pg/L (ppq)
SPLP	1312, 8290	144 pg/L (ppq)	<0.01 pg/L (ppq)
PCP			
Total	8270	1100 mg/Kg (ppm)	-
TCLP	1311, 8270	3.1 mg/L (ppm)	<0.1 mg/L (ppm)
SPLP	1312, 8270	38.5 mg/L (ppm)	<0.1 mg/L (ppm)

① EPA, 1996a
② All methods per EPA 1995 (SW846)
③ Average of all samples analyzed.

Exhibit 3 Stabilization Formulas for Treatability Tests ①

Reagent	Site Name					
Wt/Wt of Untreated Soil	ACW⑥		TWT⑦		MCB⑧	RAB⑧
Formula Cost② $	39	62	66	54	50	50
Vendor Name③	STC	STC	OHM	OHM	STC	STC
Untreated Soil	1.0	1.0	1.0	1.0	1.0	1.0
Type 1 Portland Cement	0.2	-	0.1	0.2	0.08	0.08
Class F Fly Ash	0.1	-	0.1	0.1	-	-
Activated Carbon	0.02	-	0.02	0.05	-	-
OHM AR-8④	-	-	0.02	-	-	-
STC P-1⑤	-	0.2	-	-	-	-
STC P-4⑤	-	0.06	-	-	0.12	0.12
Water Added	?	?	0.15	0.2	?	?

Dilution Factor⑨ (Water Excluded)	1.32	1.26	1.24	1.35	1.2	1.2

① Weight ratio of reagent to untreated soil
② Cost of Formula to Treat one Ton of Raw Soil
③ OHM = OH Materials, Findley, Ohio
STC = STC, Inc., Scottsdale, Arizona
④ Proprietary OHM Reagent
⑤ Proprietary STC Reagent
⑥ EPA, 1997 b., Tier 1
⑦ EPA, 1997 a., Tier 2
⑧ EPA, 1998, Vendor C, Round 2
⑨ Weight of untreated soil plus reagents divided by the weight of untreated soil

Exhibit 4 Stabilization of Pentachlorophenol in Treatability Tests

Reagent	Site Name					
	ACW⑤		TWT⑥		MCB⑦	RAB⑦
Formula Cost $/Ton Raw Soil	39	62	66	54	50	50
Untreated						
Total mg/kg	200	200	270	270	347	1210
TCLP μg/L (pH)	--	--	690 (5.0)	690 (5.0)	360 (5.0)	2400 (5.2)
SPLP μg/L (pH)	8200(7.0)	8200 (7.0)	7200 (7.2)	7200(7.2)	13000(6.8)	3900 (7.0)

Treated						
TCLP μg/L (pH)	-	-	5.1 (6.4)	77 (8.1)	<1.0 (5.9)	21 (6.6)
SPLP μg/L (pH)	120(11.8)	12 (11.8)	67 (12.2)	150(12.5)	<1.0(11.2)	24 (11.2)
Target SPLP μg/L	200	200	200	200	-	-
% Reduction④ TCLP	-	-	99	85	>99	99
SPLP	98	>99	99	97	>99	>99

① EPA, 1997 a., Tier 2

② EPA, 1997 b., Tier 1

③ EPA, 1998, Vendor C, Round 2

④ Percent Reduction values have been adjusted to eliminate the effect of dilution by reagents added (see dilution factor Exhibit 3)

Exhibit 5 Stabilization of Dioxins① in Treatability Tests

Reagent	Site Name					
	ACW②		TWT③		MCB④	RAB④
Formula Cost $/Ton Raw Soil	39	62	66	54	50	50
Untreated						
Total µg/kg	50	50	8.75	8.75	14	10
TCLP pg/L (pH)	9.8 (5.0)	9.8 (5.0)	<14 (5.0)	<14 (5.0)	110 (5.0)	23 (5.2)
SPLP pg/L (pH)	320 (7.0)	320 (7.0)	6200 (7.2)	6200(7.2)	9800(6.8)	460 (7.0)
Treated						
TCLP pg/L (ppq) (pH)	-	-	<17 (6.4)	<17 (8.1)	26 (5.9)	530 (6.6)
SPLP pg/L (ppq) (pH)	12 (11.8)	14 (11.8)	29 (12.2)	12 (12.5)	11 (11.2)	17 (11.2)
Target SPLP pg/L (ppq)	30	30	30	30	-	-
% Reduction⑤ TCLP	-	-	NC	NC	72	Increase
SPLP	95	95	>99	>99	>99	96

① All concentrations expressed as equivalents of 2,3,7,8-TCDD (EPA 1989)
② EPA, 1997 a., Tier 1
③ EPA, 1997 b., Tier 2
④ EPA, 1998, Vendor C, Round 2
⑤ Percent Reduction values have been adjusted to eliminate the effect of dilution by reagents added (see dilution factor Exhibit 3)
NC = Not Calculated

Exhibit 6 Stabilization of PAHs① in Treatability Tests

Treatment Characteristic	**Site Name**					
	ACW②		**TWT③**		**MCB④**	**RAB④**
Formula Cost $/Ton Raw Soil	39	62	66	54	50	50
Untreated						
Total mg/kg	29	29	36	36	55	75
TCLP µg/L (pH)	2.8 (5.0)	<2.8 (5.0)	<0.9(5.0)	<0.9(5.0)	<2.8(5.0)	<2.8 (5.2)
SPLP µg/L (pH)	2.8 (5.0)	2.8 (7.0)	11 (7.2)	11 (7.2)	14 (6.8)	<14 (7.0)
Treated						
TCLP µg/L (pH)	-	-	<3.6 (6.4)	3.6 (8.1)	<2.8(5.9)	<2.8 (6.6)
SPLP µg/L (pH)	<2.8(11.8)	<2.8(11.8)	<1.0(12.2)	<0.8(12.5)	<2.8(11.2)	<5.5(11.2)
Target SPLP µg/L	10	10	10	10	-	-
<u>% Reduction⑤</u> TCLP	-	-	NC	Increase	NC	NC
SPLP	NC	NC	89	>90	>76	NC
<u>Total All Detected PAHs</u> Untreated TCLP µg/L	850	850	2100	2100	110	920
Treated TCLP µg/L	-	-	70	60	<1.0	66
Untreated SPLP µg/L	510	510	1400	1400	190	690
Treated SPLP µg/L	1.2	<1.0	105	168	1.3	54

%Reduction⑤ TCLP	-	-	96	96	99	91
SPLP	>99	>99	91	84	99	91

① All concentrations expressed as Benzo(a)Pyrene potency estimate(EPA 1993b), except as noted
② EPA, 1997 a., Tier 1
③ EPA, 1997 b., Tier 2
④ EPA, 1998, Vendor C, Round 2
⑤ Percent reduction values have been adjusted to eliminate the effect of dilution by reagents added (see dilution factor Exhibit 3)
NC = Not calculated

Exhibit 7 Stabilization of Metals① µg/L in Treatability Tests

Treatment Characteristic	Site Name					
	ACW④			MCB⑤		RAB⑤	
Formula Cost $/Ton Raw Soil	Untreated	39	62	Untreated	50	Untreated	50
TCLP② (pH)	-	-	-	5.0	5.9	5.2	6.6
Arsenic	-	-	-	191	64	<20	<20
Chromium	-	-	-	<20	<20	<20	<20
Copper	-	-	-	610	62	26	<20
Lead	-	-	-	<10	29	198	31
Zinc	-	-	-	1190	441	3690	9
SPLP③ (pH)	7.0	11.8	11.8	6.8	11.2	7.0	11.2
Arsenic	<20	<20	<20	189	<20	<20	<20
Chromium	<20	60	70	27	26	<20	<20
Copper	22	<20	<20	211	27	<20	<20
Lead	24	<10	14	37	<10	15	<10
Zinc	418	<50	<50	579	<50	666	<50

① Metals were not a target for treatment in these studies, thus results should not be interpreted as the best achievable
② EPA SW 846 Method 1311

③ EPA SW 846 Method 1312
④ EPA 1997 a., Tier 1
⑤ EPA 1998, Vendor C, Round 2

Exhibit 8 Physical Properties of Treated Soils① in Treatability Tests

Property	Site Name					
	ACW③		TWT④		MCB⑤	RAB⑤
Formula Cost $/Ton Raw Soil	39	62	66	54	50	50
Unconfirmed Compressive Strength (psi)	1435	1240	340	620	170	100
Goal (psi)	>100	>100	>100	>100	-	-
Permeability (cm/sec)	$1.1x10^{-6}$	$4.1x10^{-7}$	$1.4x10^{-7}$	$5.6x10^{-7}$	$2.2x10^{-7}$	$3.1x10^{-7}$
Goal (cm/sec)	$<1x10^{-6}$	$<1x10^{-6}$	$<1x10^{-6}$	$<1x10^{-6}$	-	--
Dilution Factor②	1.32	1.26	1.24	1.35	1.2	1.2

① All values after 28 day cure
② Weight of Reagent plus soil divided by weight of untreated soil. Water added not included
③ EPA, 1997 a., Tier 1
④ EPA, 1997 b., Tier 2
⑤ EPA, 1998, Vendor C, Round 2

Exhibit 9 Soil Action Level Goals① as Determined for the American Creosote Site, Jackson, Tennessee②

Chemical	Remedial Action Goal③
Arsenic	225
Benzo(a)pyrene	41.5
Dibenzo(a,h,)anthracene	55.0
Pentachlorophenol	3,000
Dioxins TCDD-TEQ	0.00225

1) Level of contaminant in soils at, or above which, remedial action is required.
2) Source EPA 1996b
3) mg/kg - based on lifetime cancer risk future adult worker, $1X10^{-4}$ risk.

Exhibit 10 Solidification/Stabilization Specifications for Remediation of the American Creosote Site, Jackson, Tennessee

Leaching Properties①			
Parameter	**Average All Treated**	**Maximum Any Batch②**	**Method**
Arsenic	<50 μg/L	<75 μg/L	SW846,7061
PAHs (B(a)P Potency Estimate	<10 μg/L	<15 μg/L	SW846,8270
Dibenzo(a,h) Anthracene	<4.4 μg/L	< 6.6 μg/L	SW846,8270
PCP	<200 μg/L	<300 μg/L	SW846,8270
Dioxins TCDD-TEQ	<30 pg/L	< 45 pg/L	SW846,8290
Physical Properties			
Parameter	**Average All Treated**	**Maximum Any Batch**	**Method**
Permeability	$<1x10^{-6}$cm/sec	$<1x10^{-5}$cm/sec	ASTM D5084

Leaching Properties①			
UCS	>100 psi	>80psi	ASTM D1633
Volume Increase	<35 percent		

1) Synthetic precipitation leach procedure, EPA SW846, Method 1312
2) Batch size 500 cubic yards

Exhibit 11 Major Bid Cost Components of the Remedial Action at the American Creosote Site, Jackson, Tennessee

Item	Cost Per Unit	Total K$
MOB and Documents	-	142
Demolition/Debris	-	34
NAPL Recovery	System	124
Cutoff Wall	$9 Lin. Ft.②	20
Drainage Trenches	$14.90 cy	75
Excavate, Treat and Replace Soil	$44.25 cy③	1996
Water Treatment	$ 0.68 gal④	20
Creosote Disposal	$ 3.05 gal④	47
CAP (GCL① plus 2 ft. soil)	$ 50,460 Acre	363
Site Restoration and DEMOB	-	55
Other	-	10
Total		2,886

① Geosynthetic Clay Liner Linear Foot
② Linear Foot
③ Cubic Yard
④ Gallon U.S.

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Washington DC 20460

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Reusing Superfund Sites

In California's Silicon Valley, Netscape Communications opens a new office campus – allowing the software giant to expand its World Headquarters, and the local community to enjoy the benefits of 1,600 software development jobs. Across the country in Virginia, two parks are added to the York County recreational system – providing thousands of residents with a new place to play softball and soccer.

Farther to the south, a critical maintenance and repair center is built for the Dade County, Florida, rail system – ensuring fast and reliable train service for over 50,000 daily commuters in the Miami metropolitan area. Up in the Mountain Northwest, outdoor enthusiasts come from miles around to enjoy a 2,500-acre wetlands area in Montana's Warm Springs Ponds – which also provides an important habitat for migrating Canada geese and a breeding ground for dozens of songbird species.

And in West Dallas, Texas, an abandoned strip mall is renovated and the first major supermarket ever built in the area opens for business. In addition to fulfilling a critical need for the residents of this inner-city neighborhood, the new supermarket serves as a catalyst to bring even more development to this low income community, including the building of public service facilities and hundreds of new homes.

Trout fishing at the Silver Bow Creek/Warm Springs Pond site (Butte, Montana)

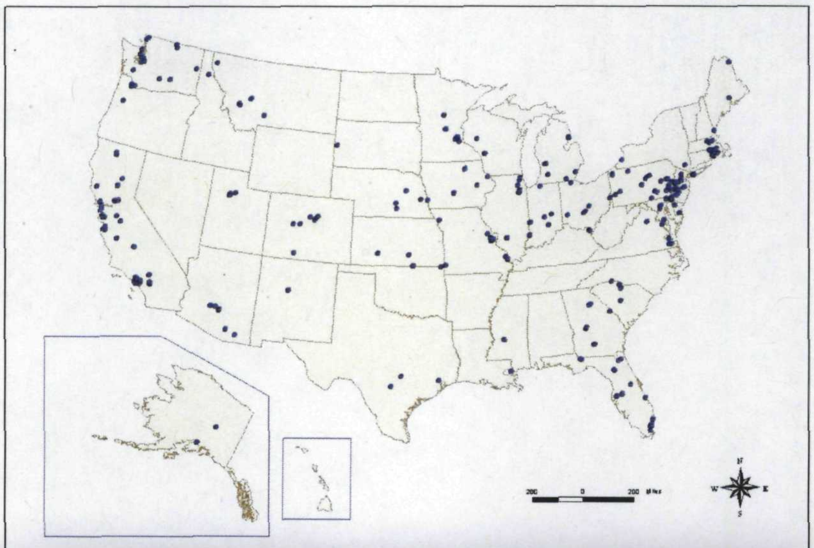
Children's soccer at the Chisman Creek site (York County, Virginia)

Netscape World Headquarters at the Fairchild Semiconductor site (Mountain View, California)

New supermarket at the RSR Corp. site (West Dallas, Texas)

Commuter trains maintained at the Miami Drum Services site (Dade County, Florida)

Five very different success stories from five different areas of the country. But they have one surprising thing in common. The Netscape World Headquarters, the county recreational facilities, the maintenance center for the regional rail system, the wildlife habitat, and the new inner city supermarket – all were built on cleaned up Superfund sites.



Over 240 sites have been reused and many more are expected to be in use soon.

Many people still think of Superfund sites as permanent toxic wastelands in the middle of their communities. There are vivid memories of more than 500 families having to leave their homes when the entire town of Times Beach, Missouri, had to be closed because of the discovery of dioxin. And in Love Canal, New York, more than 900 families had to be relocated when hazardous wastes leached from an industrial landfill contaminating nearby homes. Superfund evokes images of workers in "moon suits" and areas fenced off with large "Danger–Keep Out" signs.

That was the 1980s. Two decades later, much has changed. In Times Beach, 265,000 tons of dioxin-contaminated soil was dug up and incinerated. Thanks to new habitat management practices, Times Beach is now an extensive bird sanctuary and migratory bird waterway. At Love Canal, cleanup activities included demolition of the contaminated houses and construction of a specially designed system that permanently entombs the toxic materials. As a result, all contamination is safely contained. Families are now moving back into the area and more than 200 new homes have been sold.

Bird sanctuaries. Revitalized neighborhoods. These are the new images of Superfund. Other images include Jack Nicklaus teeing off at a golf course that he designed at a closed copper smelter in Montana. Or a Home Depot opening at a site that was once a radium processing plant – bringing new jobs and income to a disadvantaged community near downtown Denver.

Areas that were once dangerous are now being cleaned up and turned into office parks, playing fields, industrial centers, shopping centers, residential areas, tourist centers, and wetlands. Sites that were once abandoned or underused have now become valuable community resources. Areas that once helped to pull the local economy down are now generating new tax revenue and serving as catalysts for broader revitalization.

There have been more than 240 success stories at Superfund sites in all areas of the country – over 130 of them involving totally new uses for a site. But this is just the beginning. These successes will be repeated at hundreds of other Superfund sites in the next few years. One could be at a site in your community.

How Superfund Sites Have Been Safely and Productively Reused

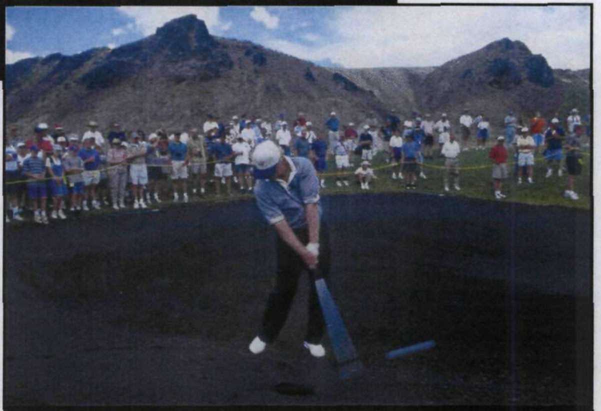
The stories of successful reuse differ because communities differ. And the reuse of each Superfund site begins and ends with the needs of the particular community in which the site is located.

Golf and Smelter Slag? Nicklaus Shows How It "Works"

It wasn't Jack Nicklaus who first decided to build the Old Works Golf Course at a shut-down copper smelting facility in Anaconda, Montana. It was the people of Anaconda working together with their local government, the U.S. Environmental Protection Agency (EPA), and the owner of the site, the Atlantic Richfield Company (ARCO).

Anaconda–
Then: Shut-down copper smelter

> *"This community is amazing and deserves an incredible amount of credit for making this happen. . . We took something that was entirely a negative, costing too much money and taking too much time, and turned it into something positive for the community."*
>
> Sandy Stash, ARCO's Montana facilities manager



Now: Jack Nicklaus in "sland" trap

The Anaconda Smelter was the backbone of the local economy for a century. When it shut down in 1980, hundreds of people were out of work. The smelter also left behind an environmental legacy of more than 1.5 million cubic yards of soil, slag, and flue dust contaminated with heavy metals such as arsenic, cadmium, copper, lead, and zinc. People were worried that Anaconda would turn into an economic ghost town.

Rather than suffer this fate, the Anaconda community, ARCO, and EPA formed a partnership – not only to clean up the site – but to preserve its historic significance and allow for redevelopment.

They considered a number of options, but one day, Gene Vuckovich, the Anaconda city and county manager, asked: "Why don't you make a golf course out of it?" His proposal was first met with "a few chuckles" and some skepticism, but in time, the partnership agreed.

A key component of the success in reusing the site as a golf course was the participation of Jack Nicklaus. As Anaconda city and county manager Vuckovich put it: "I think we interviewed seven of the ten top golf course designers in the country and we chose Jack Nicklaus. We didn't want just any old course, we wanted a world class course."

As designer, Nicklaus took advantage of the areas's spectacular mountain vistas and preserved many of the unique historic characteristics of the former smelting site. He used one of those characteristics to create the most distinctive aspect of the course. Nicklaus decided not to fill the bunkers with ordinary white sand, but instead with black "sland" – an inert and harmless sand-like slag left behind by the smelter's furnaces. Besides providing players with the unique challenge of hitting their wayward balls out of "sland" traps, these black bunkers add to the striking visual appeal of the golf course.

"We had an opportunity out here to either do something with the land, or not do something with the land. Just give me the worst site, and we'll make something out of it, because you can take land and do something with it if you have a little bit of imagination."

Jack Nicklaus,
designer of the Old Works Golf Course

In the end, the partnership between the people of Anaconda, ARCO, EPA, and Nicklaus created a course that *Golf Journal* praised as "world class . . . with 18 fascinating holes."

Cleanup of the Anaconda Smelter site paved the way for construction of a world class golf course.

Internet Communicators Replace Ground Contaminators

One thousand miles to the southwest in Mountain View, California, there was a different community with a different need. So that community came up with a different reuse for a former Superfund site.

"History may not repeat itself, but addresses in the Valley do. In the '60s and '70s this was the site of Fairchild Electronics, which put the "Silicon" into Silicon Valley. Fairchild was bought out, and in '95 the site became home to then start-up Netscape. Netscape's headquarters remain here – a Superfund cleanup site, by the way."

Washington Post

Mountain View is not a depressed community in need of economic revitalization. Located in the heart of Silicon Valley, Mountain View is at the center of America's high-tech economic boom. Real estate in Mountain View is among the most valuable in the country.

All the more reason not to allow 56 acres of that precious real estate to lie idle. The Fairchild Semiconductor Superfund site was once the home of more than a dozen computer firms that used solvents daily in their manufacturing process. Hundreds of gallons of these solvents were spilled into the soil and groundwater over a 20-year period. In 1981, the State of California discovered contamination in the underlying aquifer that provided drinking water for 270,000 residents.

To clean up and redevelop the Fairchild site, a partnership was formed between the Mountain View community, EPA, the State of California, the City of Mountain View, and Keenan-Lovewell Ventures, a local real estate developer. To ensure public safety, it was necessary to excavate and treat more than 1,700 cubic yards of contaminated soil. The cleanup also involved removing several underground storage tanks, and constructing groundwater treatment plants on the property.

As the cleanup proceeded, Keenan-Lovewell began plans to build office developments at the former Fairchild site. The first occupant was high-tech giant, Netscape Communications. Netscape used this property to add a new facility to its World Headquarters – an office complex that resembles a park or a college campus more than the workplace of 1,600 top executives, programmers, marketers, and testers. Complete with cascading fountains and acres of lush greenery, this once-contaminated industrial site now adds beauty to the Mountain View community while also adding substantial income to the local economy.

These are the stories of Anaconda and Mountain View. And their stories are being repeated at communities all over the country. Properties that once lay idle – drains on the local economies – are now being put back into productive use. Areas that were once dangerous and off-limits are now places where people can safely work and play. These are only some of the benefits for a community that decides to redevelop and reuse a Superfund site.

Fairchild Semiconductor–
Then: Excavating contaminated soil

Now: New campus of Netscape's World Headquarters

A *Welcome Change for a Southern* Town

Woolfolk Chemical Plant, Georgia

Woolfolk Chemical Plant began operations in 1920. During World War II, the U.S. Chemical Warfare Service used the plant to manufacture arsenic trichloride, a key ingredient of poison gas. Later, the plant produced lawn, garden, and agricultural pesticides. In the 1980s, the State of Georgia discovered that chemicals had seeped from the plant into the surrounding soil and groundwater. EPA determined that the contamination posed a threat to the town's 8,000 residents and would require immediate cleanup.

EPA worked closely with Canadyne-Georgia, the plant operator, to remove 3,700 cubic yards of arsenic-laden soil, along with contaminated buildings and debris. Following the cleanup, EPA, Canadyne-Georgia, and the local community met to discuss the best use of these properties. At the community's request, a contaminated antebellum farmhouse was cleaned up and remodeled into a tourist welcome center and office space for the Fort Valley Chamber of Commerce. Also, several contaminated homes were torn down to make way for a new community library. In addition to attracting new business to the community, the reuse of this toxic waste site has rekindled civic pride.

Once-contaminated antebellum farmhouse now reused as a Welcome Center

Are These Sites Safe?

Yes, they are. The Environmental Protection Agency's first priority at any Superfund site is to protect human health and the environment. In fact, EPA is required by law to clean up a site so that it protects human health and the environment before that site can be reused.

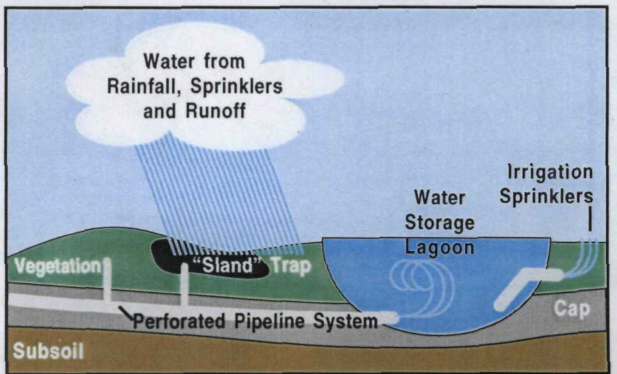
EPA takes careful and thorough measures to make sure that each site is safe before it is returned to use. There is no one approach that fits every site. Rather, an individual, step-by-step strategy is developed for each site to make certain that the cleanup, when complete, protects human health and the environment. At each stage, EPA consults with the neighboring community.

Here are the steps that EPA takes to make sure a site is safe:

1. EPA thoroughly investigates contamination problems at the site. The investigation is designed to tell EPA whether human health or the environment is threatened by contamination, and if so, what the nature and extent of the contamination is.
2. EPA meets with the site owner, the community, and other interested parties to find out what they can reasonably anticipate the future use of the site to be.
3. Based on its investigation, EPA selects a cleanup strategy that is tailored to the individual site and takes account of anticipated future uses. Before proceeding, EPA asks the community to comment on this strategy.
4. Site cleanup begins and is not considered complete until the area is safe for the intended use.
5. After cleanup, EPA monitors a site to guard against any problems that might arise.

The Anaconda site provides a good example of how site cleanup can protect human health and the environment while also accommodating future use. When the community decided it wanted to reuse the site as a golf course, EPA and ARCO used a variety of techniques to make the site safe. The EPA/ARCO partnership treated and contained approximately 316,500 cubic yards of flue dust at the former smelter using a cement/silica-based stabilization technique that transformed the dust into an inert solid. The 250-acre area of the golf course was covered with a thick clay and limestone cap topped by 18-20 inches of soil to support the golf course's vegetation.

In addition, the cleanup partners installed a state-of-the-art irrigation system. Water from sprinklers, rainfall, and runoff now filters down through the vegetation and traps where the water collects in a perforated underground pipeline. The underground pipe drains into storage ponds. A computerized irrigation system then takes the captured water in the ponds and reuses it for watering the fairways and greens. Situated beneath both the topsoil and the pipeline, the clay and limestone cap blocks any further penetration of water into underlying soils. This unique and complex system ensures that anyone playing golf or walking on the surrounding hiking trails is protected from contamination.

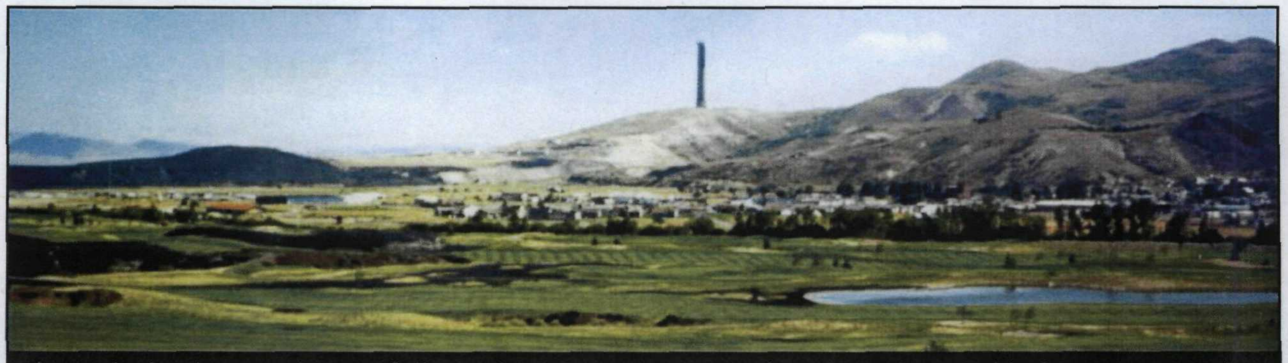


Protecting the golf course at Anaconda. Infiltration from irrigation and rainfall is recycled to support the vegetation on the fairways. The clay and limestone cap prevents the recycled water from coming into contact with any remaining contaminants.

There are as many ways to clean up a Superfund site as there are types of sites. EPA tailors the techniques and technologies to the individual problems posed by different areas of a site. Here are some of the cleanup techniques that EPA uses, among others, to make sure that all areas of a site are safe:

- **Removal:** Moving contaminants from the site to a facility that can safely handle the waste.
- **Treatment:** Processing the waste at the site to remove the contaminants from soil, sediment, or groundwater.
- **Recycling:** Treating or converting toxic waste material to make it safe and reusing it for other purposes.
- **Containment:** Placing covers over toxic waste deposits or installing barriers around them to prevent migration and to keep people from coming into contact with the waste.
- **Thermal Treatment:** Using elevated temperatures to render contaminants harmless by increasing their volatility; immobilizing them; or destroying them though burning, decomposition, or detonation.
- **Solidification:** Physically binding or enclosing toxic contaminants within a solid mass like cement.
- **Stabilization:** Inducing chemical reactions between a stabilizing agent (such as lime, Portland cement, fly ash, or kiln dust) and the contaminants to reduce their mobility.
- **Bioremediation:** Breaking down toxic contaminants by using natural microorganisms.
- **Chemical Transformation:** Detoxifying contaminants by transforming their chemical structure.
- **Natural Attenuation:** Using natural biotransformation processes such as dilution, dispersion, volatilization, biodegradation, adsorption, and chemical reactions to reduce contaminant concentrations to acceptable levels.

At the Anaconda Smelter site, EPA and ARCO applied several of these cleanup techniques to make certain that the area was safe before it was reused. In different areas of the site, wastes were removed, recycled, treated, or solidified. To protect people and keep animals from coming into contact with wastes remaining on-site, the golf course was constructed atop a thick containment cap. For future protection of the groundwater, the entire course was lined with clay and limestone, and a complex drainage system was put in place.



Anaconda after cleanup and reuse – Golfers on the ninth tee can now take aim at the smokestack of the former copper smelter

How Communities Have Benefited From Reusing Superfund Sites

More High-Tech Development in Mountain View

The benefits to Mountain View in redeveloping the Fairchild site were immediate. The office campus at the former Superfund site is an expansion of Netscape's World Headquarters. The high-tech executives and employees who work at the Netscape campus collectively earn more than $153 million annually – infusing over $122 million of personal spending into the economy and providing more than $11 million in local and state taxes.

However, the benefits to Mountain View in redeveloping the Fairchild site do not stop with Netscape. Other firms are either leasing space or building their own office developments on the former Superfund site. The firms read like a Who's Who of the "old" and "new" economies: America Online, Veritas Software, Hewlett-Packard, Open TV, Nokia, Micro Focus, Synopsys, and KPMG Peat Marwick. By 1999, all the available office space had been leased and most of the remaining property was at some stage of development.

A New Sense of Pride in Anaconda

In Anaconda, the benefits of reuse are harder to measure, but just as important. Anaconda was historically a one-factory town and that factory closed down. Unemployment was high and many in the community worried that their town would not survive.

The Old Works Golf Course not only provides a new place for the residents of Anaconda to exercise and have fun – but has also created a new sense of pride in the community. What's more, the golf course is becoming a tourist magnet. People come from miles around because they have heard about the unique and beautiful Jack Nicklaus-designed course. They come to play golf – and find out that the area also offers excellent skiing, fishing, hiking, and hunting. So they come back.

"I'm amazed at what they've done. There was nothing living out there before. It was desolate. There was nothing out there."

Gene Colucci,
lifelong Anaconda resident

More than just golf –
Hikers on a trail that highlights Anaconda's smelting heritage

As the recreational opportunities have increased, new jobs have been generated. The new opportunities have also led to a rise in property values around the Old Works Golf Course and an increase in business investments. What's more, this attention to the recreational opportunities of the area has created a renewed respect for its ecology. The once-barren landscape is slowly being restored to its former beauty. Trout once again fill Warm Springs Creek, and the plant and animal life are flourishing.

New jobs. New recreational opportunities. Higher property values. More income to the community. A new sense of pride. These are just some of the benefits of reusing Superfund sites.

New Uses for Sites Around the Country

Sites can be reused in many ways. Most are put into commercial use after cleanup; others are reused for recreational, ecological, residential, public service or agricultural purposes. Often a cleaned-up site will be home to more than one type of reuse. For example, there may be an area of retail stores with neighboring ball fields. These multi-use sites can bring a great variety of economic and quality-of-life benefits to communities.

Benefits of Commercial Reuse

- 31,987 jobs
- Over $1.3 billion in annual income

Commercial Use.

Netscape's transformation of the Fairchild site into a high-tech office campus is a good illustration of commercial use, but it is only one of many examples. Former Superfund sites (many in economically-troubled areas) are now the location of

From Wasteland to Wetlands

Silver Bow Creek/Warm Springs Pond, Montana

[Ecological/Recreational Uses]

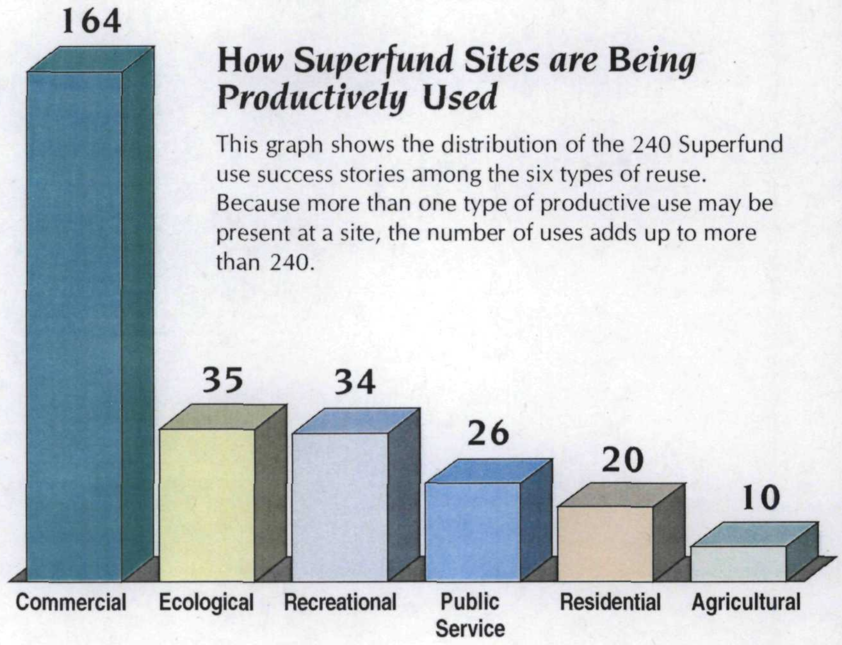
Years of copper mining had created a desolate wasteland on this 2,500-acre site. For 65 years miners dumped wastes into four nearby streams that carried contamination from 19 million tons of tailings and other mining wastes into the headwaters of the Clark Fork River. In an attempt to slow the harmful effect of the tailings on the river, the Anaconda Copper Company dug three collection ponds, which in turn became severely polluted.

EPA worked with the Atlantic Richfield Company (ARCO) to clean up the area. EPA and ARCO removed more than 450,000 cubic yards of sediment from the ponds and installed a comprehensive water treatment system.

Today, the wetlands at Warm Springs Pond are an important habitat for migrating Canada geese and breeding area for dozens of species of songbirds. The wetlands also harbor more than 230 types of resident or migratory wildlife. What's more, this restored site provides the community with bike paths, numerous fishing sites, and even an area where dogs can be trained.

Ponds once choked with mining wastes are now a fish and wildlife habitat retail stores, small businesses, franchises, family-run restaurants, industrial parks, shopping centers, and manufacturing plants. In fact, 164 sites are in some form of commercial use.

Recreational Use. The Jack Nicklaus-designed golf course at the former Anaconda smelter may have received the most attention, but there are 33 other sites where communities have developed properties for recreational use. Besides golf courses, communities have created playgrounds, parks, boat launches, campgrounds, ski slopes, and playing fields for soccer, baseball, and softball.



How Superfund Sites are Being Productively Used

This graph shows the distribution of the 240 Superfund use success stories among the six types of reuse. Because more than one type of productive use may be present at a site, the number of uses adds up to more than 240.

> ***Over 60,000 acres have been returned to recreational and ecological use***

Ecological Use. The once-notorious Times Beach is now a bird sanctuary – thanks to a decision by the State of Missouri and several local interest groups to increase the amount of green space along the Meremac River and develop the site as a park. At 34 other sites, there has been a similar focus on ecological use. New wetlands, wildlife sanctuaries, and wilderness areas have been created in places that were once contaminated and barren. Rivers, lakes, bayous, bays, and streams have been restored to their natural condition.

Public Service Use. In Florida, the Miami Drum Services site has been redeveloped as the William Lehman Operations and Maintenance Center – providing a crucial repair facility used by the Dade County rail system to effectively serve over 50,000 commuters a day. In nearby Georgia, a portion of the Woolfolk Chemical Plant has been restored as a public library. Similar public services are provided at an additional 24 sites. Other types of public service uses include visitors' centers, schools, and many different types of public works facilities.

Residential Use. Following the successful cleanup at Love Canal, more than 200 new homes have been built on this formerly desolate landscape. At 19 other sites, communities are developing once-contaminated properties as single-family homes or using them for apartments, condominiums, or assisted-care housing.

Agricultural Use. At ten sites, the land is being used for activities such as growing crops and providing pasture for livestock. For example, when the Silver Mountain Mine in Washington closed, it left behind 7,000 tons of cyanide-laced mine tailings and a basin filled with 20,000 gallons of cyanide-contaminated water. A partnership between EPA, the State of Washington, the local community, and a local rancher resulted in the cleanup and containment of the cyanide contamination which made it possible to once again use portions of the site as grazing land for cattle.

One New Use Leads to Another

In Anaconda, the golf course may be categorized as recreational use, but simply calling it "recreational" tells only part of the story. Golfers who come to the Old Works pay a variety of charges, such as "greens" fees, rentals, and concessions. Also, since many of those golfers come from out of town, they stay at local motels and eat at local restaurants. All this generates income for the community.

So this recreational use also provides new commercial opportunities. And, in the case of Anaconda, these new recreational and commercial opportunities caused the community to have a new respect for the area's natural surroundings.

In Mountain View, the commercial redevelopment of the former Fairchild site is just one part of a larger plan by the city to link a nearby residential community with the high-tech job center that now occupies the former Superfund site. Plans are underway to build light rail stations, parks, biking trails, and open spaces so that there will be connections (most of them walkable) between where the residents of Mountain View live, work, and play.

Each community decides how far and how wide the benefits of reusing a Superfund site will extend. The particular uses will depend on the needs and desires of your community.

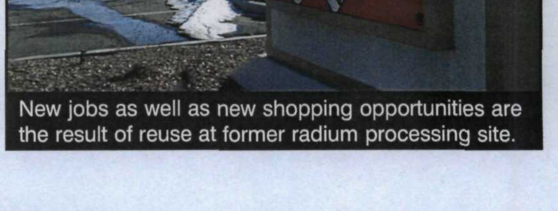
Former Site Attracts Retail Giant

Denver Radium, Colorado

The Denver Radium site was contaminated with radioactive soil and debris by a radium processing plant that began operations in the early 1900s. Later property owners mishandled these by-products that contained radium-226, arsenic, zinc, and lead by using them as fill or foundation materials. The site was eventually abandoned in the 1980s.

In 1983, EPA began cleanup, excavating tons of radioactive waste. Contaminated buildings and materials were removed and metals-contaminated soil was covered with a protective cap.

In 1996, Home Depot opened a store on the once-contaminated property. The reuse of the Denver Radium site has resulted in many benefits for this largely low income and minority area, including more than 110 permanent jobs, $1.9 million in total annual income, and substantial increases in public revenue and surrounding property values.



New jobs as well as new shopping opportunities are the result of reuse at former radium processing site.

Many Uses For A Former Hazardous Waste Site

RSR Corp. (Murph Metals) Superfund Site

[Residential/Commercial Uses]

For over 50 years, the RSR Corporation operated a lead smelter and disposed of battery material on a site in West Dallas, Texas. The smelter sent lead-contaminated dust into the surrounding community, casting a toxic shadow over homes and businesses within a one-mile radius. Approximately 17,000 people lived in the vicinity of the smelter – a primarily low income and minority population. Within a half mile of the smelter, 10 percent of children under the age of six had lead in their blood at levels that were considered unacceptable when the testing was done in 1983. If today's standards were used, almost 90 percent of the children would have been considered to have unacceptable blood lead levels.

Strong community involvement has played a major role in the ongoing cleanup and reuse of this site – including the appointment of a bilingual team to encourage citizen participation in all decisions.

Cleanup activities involved the demolition, decontamination, and removal of various structures and buildings, including 167 multi-family public housing buildings. Today, blood lead levels in West Dallas are below national averages.

Location of future homes

The Dallas Housing Authority is making a major push to provide affordable housing for the low-income community surrounding the former RSR Corp. Superfund site. Hundreds of new homes have already been built – with hundreds more expected in the future.


Children's play room at the Dallas Housing Authority Headquarters built on the former RSR site


A new public housing duplex


Interior of a new home

5 9 0300

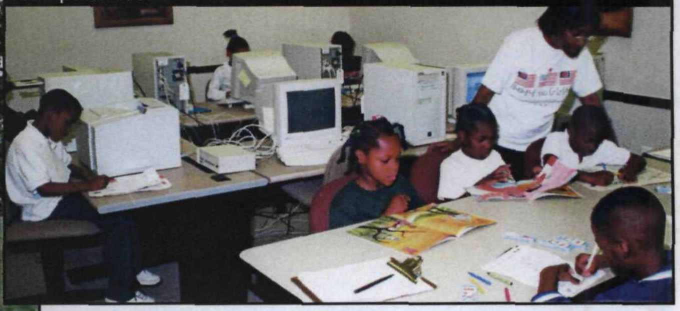
The initiation of cleanup activities at the RSR site has been a catalyst for bringing new development into this impoverished neighborhood. In 1995, the community, EPA, and the Dallas Housing Authority formed a partnership to foster the site's reuse. That same year, a Carnival Food Store opened in a formerly-abandoned section of a strip mall – the first major supermarket development in the West Dallas area.

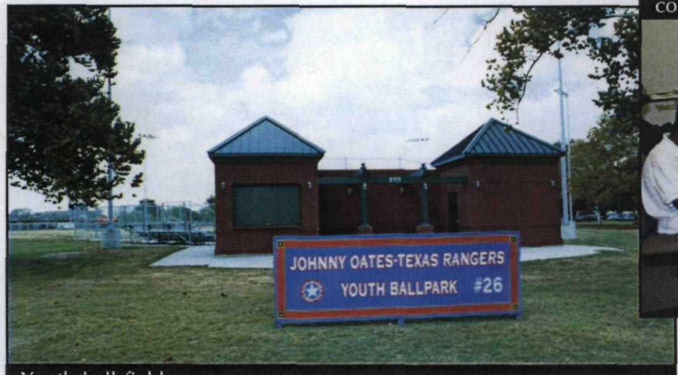
The Carnival store is only one of many new developments in this low income area. The Lakewest Multi-Purpose Center (started in 1998) houses a YMCA, a Headstart facility, the Parkway Medical Clinic, and a local branch of the Dallas police. People affiliated with the Texas Rangers baseball team donated a new ballfield, which was built in 1999. And the Dallas Housing Authority is proceeding with a major low-income housing project that includes both the renovation of existing units and construction of over 1,000 new homes. Hundreds of these homes have already been built.

Future developments include Goodwill Industries, which is currently in the planning and design stage of a multi-million dollar facility. Much work still needs to be done, but the future looks bright for this once-contaminated inner-city neighborhood.

Carnival Food Store


Lakewest Multi-Purpose Center, which includes a children's computer room





Youth ball field

How EPA Can Help Communities

On July 23, 1999, EPA announced a national effort (called the Superfund Redevelopment Initiative) to help communities return Superfund sites to productive use. With this Initiative, EPA has put in place a coordinated national program to make certain that communities have the tools and information needed for the reuse of Superfund sites. As always, EPA's first priority is to make sure that all cleanups protect human health and the environment. Without compromising cleanup standards, EPA can help communities and other interested parties to realize the enormous potential of reusing Superfund sites.


Partnership turns former Anaconda smelter into a recreational resort

While the rewards of reuse are great, the challenges of starting on the road to reuse can sometimes seem daunting. Interested communities will sometimes find that the road contains a confusing tangle of technical and legal issues, which they have neither the expertise nor resources to unravel. What's more, there may be substantial costs at the beginning – with returns on the investment not expected for a number of years.

EPA is available to assist communities on the road to reuse. Some of the ways EPA can help include providing assistance in developing partnerships, finding the seed money, understanding technical issues, and overcoming legal barriers.

> *"From the beginning, everybody wanted to make this a win-win-win situation. It made for a very enjoyable project. I give a lot of credit to the community and to ARCO."*
>
> Charlie Coleman,
> EPA Project Manager for the Anaconda site

Developing Partnerships

Partnerships have been key to the reuse of Superfund sites. In Mountain View, a partnership between the community, the State of California, EPA, and a local real estate developer turned acres of contaminated land into a beautiful high-tech campus. In Anaconda, a partnership between the community, EPA, ARCO, and Jack Nicklaus turned a town that many thought was economically and environmentally dead into a revitalized vacation spot with a world class golf course and year-round opportunities for camping, hiking, fishing, and skiing.

These reuse stories clearly demonstrate that partnerships with local businesses, large corporations, state governments, and local officials are essential to the success of Superfund reuse projects. For example, owners of the sites may have the financial resources – and legal obligation – to both clean up a site and set it on the road to reuse. Local developers may have the knowledge – and financial interest – to make certain that a site is reused in a way that is most economically viable. And local officials have a vested interest to make certain that the new use fits the needs and desires of their community.

Partnerships have been key to reuse – and a crucial partner for successful reuse has been EPA. One way EPA helps communities develop partnerships for reuse is by supporting the formation of Community Advisory Groups (CAGs). CAGs are committees made up of citizens with diverse community interests that provide a public forum for discussing community concerns about Superfund sites – including how the community wants to reuse a site.

Once EPA understands a community's concerns, it can help that community find the right partners for a particular site. For example, the U.S. Soccer Foundation is interested in building soccer fields around the country to help promote the sport. Because many Superfund sites can safely support soccer fields (and plans for local developers to build the fields can be easily integrated into cleanups), EPA has entered into a partnership with the Foundation. If a community is interested in reusing all or a portion of a site for soccer fields, EPA can provide a referral to the U.S. Soccer Foundation.

Outdoor Activities on a Former *Dump*

Chisman Creek, Virginia

[Recreational/Ecological Uses]

For 17 years, a local contractor used the abandoned sand and gravel pits on the Chisman Creek property to dump more than 500,000 tons of fly ash from Virginia Power's Yorktown Station. In 1980, complaints of discolored well water prompted state agencies to investigate. Results of the sampling showed heavy metal contamination in Chisman Creek, in the groundwater under the disposal areas, and in various on-site ponds.

A 12-member Stewardship Committee, composed of both professionals and local residents, was organized to oversee the cleanup and redevelopment of the site. The committee decided that a sports park would be the perfect reuse solution. The transformation of the site resulted in a number of benefits to the community. Chisman Creek Park has two lighted softball fields, restrooms, and a parking lot. It supports a 42-team softball league in the summer and is the home of the youth soccer program in the fall. The adjacent Wolf Trap Park features four soccer fields, restrooms, a parking lot, two ponds, and the County's Memorial Tree Grove.

The successful partnership of EPA, York County, and Virginia Power, working together to coordinate the cleanup and redevelopment of the Chisman Creek site, earned an *Environmental Achievement Award* from the National Environmental Awards Council. And the Consulting Engineers Council of Pennsylvania recognized the engineering firm that designed the drainage system, clay cap, and recreational facilities with the *Grand Conceptor* award.

Soccer, softball, and children in place of fly ash and contamination

Finding the Seed Money

When EPA began cleanup operations at the Avtex Fibers site in Front Royal, Virginia, a partnership was formed by the community, private development firms, government agencies, and one of the owners of the site, the FMC Corporation. This partnership conducted a number of workshops to determine how the community of Front Royal wanted to use the site. The community determined that portions of the site should be used for various commercial, recreational, and ecological purposes. One of the recreational goals emphasized by the community, and later put in the Master Plan for Avtex Fibers, was to reuse a portion of the site for soccer fields. So when EPA announced the Superfund Redevelopment Initiative at the Avtex Fibers site in 1999, the audience included both officials from the U.S. Soccer Foundation and children from Front Royal who loved to play soccer.

The Avtex Fibers site provides an excellent example of another way EPA can help a community on the road to reuse. Avtex Fibers is one of a number of pilot sites where EPA has provided up to $100,000 in financial aid for reuse assessment and public outreach to help determine a site's future use. At other sites, the reuse planning and outreach may be financed by companies which have accepted responsibility for the contamination at the site. EPA will consider the results of the assessment and outreach efforts when selecting a cleanup remedy.

Activities that EPA will fund under the pilot program to help determine the future use of a site

- Reuse assessments and reuse plans
- Facilitation services
- Coordination among government, community members, and organizations
- Public outreach
- Training and workshops
- Citizen advisory groups
- Technical assistance

In 1999, EPA selected ten sites from around the country as pilots. The pilot sites serve as workshops where EPA, in partnership with the community and other interested parties, can improve the techniques for making cleanups consistent with the intended uses of the site. EPA chose an additional 40 pilots in 2000 and 19 more in 2002.

Understanding the Technical Issues

Many Superfund sites present communities with issues that require expertise in chemistry, engineering, geology, toxicology, and law. Add in the issue of site reuse, and the community will also need expertise in architecture, financing, construction, and public planning.

EPA makes it possible for communities to hire the experts they need. In Mountain View, EPA helped out with two technical assistance grants (TAGs). TAGs provide up to $50,000 so that a community can hire technical experts to help its citizens understand and contribute their ideas on a wide variety of issues, including reuse.

EPA also sponsors the Technical Outreach Services for Communities (TOSC) program to help communities cope with hazardous substance issues. TOSC is a no-cost, non-advocacy program run by EPA's five university-based Hazardous Substance Research Centers.

Overcoming Legal Barriers

There are many ways EPA can help a community with the often-complicated legal issues that surround Superfund site reuse. Many real estate firms are afraid to develop a Superfund site because of the possibility that the firm could be found liable for the enormous costs of cleanup – even for conditions that existed before anyone at the firm became involved with the site.

At the Fairchild site, EPA entered into a Prospective Purchaser Agreement (PPA) with a local real estate developer, Keenan-Lovewell Ventures. A PPA is an agreement where EPA conditionally releases a buyer from Superfund liability for contamination that existed before the buyer began work on the site. In return, the buyer agrees to help EPA with its mission of protecting human health and the environment. The PPA requires the buyer to: avoid any activities that would disturb the cleanup; provide EPA with access to the site so that EPA can monitor the success of the cleanup; and, in many cases, help with the cleanup itself. At Fairchild, the PPA provided Keenan-Lovewell with the assurance that it could develop the property without fear of being found liable for conditions that existed before the firm began work.

Superfund Redevelopment Pilots

EPA Assists Communities on Future Site Use

In 1999, EPA gave a jump-start to ten pilot communities from all regions of the country to help them assess future uses of a Superfund site. The jump-start came in the form of financing or services from EPA or the parties who accepted responsibility for contamination at the site. Support was provided to a wide range of communities for a variety of reuse projects. EPA's assistance for all of the pilots included personnel, facilitation, or funding of up to $100,000 to develop reuse assessments and reuse plans, for public outreach, and for technical assistance. To learn about the background of each of these communities and sites, go to http://www.epa.gov/superfund/programs/recycle/pilot/round1.htm. All of these pilots are now developing reuse options and plans or the construction of planned facilities has already begun. A year later, EPA selected 40 additional Pilot communities with Superfund sites to receive financing or other services to help them assess future productive uses for their sites. Read about these pilots at http://www.epa.gov/superfund/programs/recycle/pilot/p_facts/index.htm.

In 2002, EPA provided 19 more local governments with assistance in planning for the future reuse of Superfund sites. Some of this assistance was in the form of in-kind services from teams experienced in the redevelopment of Superfund properties. These teams work with the communities to help them analyze the range of realistic reuse opportunities for the Superfund sites in their area and the complex economic, physical, and social infrastructure challenges that can impede Superfund reuse efforts.

Through a collaborative approach that involves the public, EPA, potentially responsible parties, and other organizations such as State entities, non-profits, and historical societies, the assistance teams support community efforts to identify feasible reuse scenarios and resources to help achieve those ends. Services can include market research, site analysis, public meeting facilitation, public outreach assistance, site conceptual designs, and reuse planning assistance. Teams sometimes serve as liaison between EPA and communities. Information on these 19 communities can be found at http://www.epa.gov/superfund/programs/recycle/pilot/02_pilots.htm.

In Anaconda, both the local community and ARCO played active roles in helping EPA plan the cleanup and redevelopment of the vacant smelter site as the Old Works Golf Course. For its part, EPA helped orchestrate an agreement that transferred ownership of the golf course from ARCO to Deer Lodge County and included a number of conditions that have helped put Anaconda on the road to recovery. One of those conditions requires ARCO to maintain the systems that have been put in place to stop any remaining contamination from migrating to the golf course area. Another condition mandates that Deer Lodge County use all non-operating revenues from the golf course to support the continued economic growth of the Anaconda area.

Tools for Managing Liability

- **Comfort Letters**
  EPA clarifies the level of interest the government has in pursuing cleanup enforcement at a site or portion of a site
- **Prospective Purchaser Agreements**
  EPA provides property purchasers with a promise that the government will not sue them for existing contamination
- **Discretionary Policies**
  EPA clarifies how the Agency intends to respond to particular parties or specific circumstances

"This project – probably more than anything else – speaks to the resilience of this community. This community went through one of the toughest shutdowns when the smelter was shut down. It was literally an industry that had been here for generations. I think what this project says is that this community was not going to let that get them down or being named a Superfund site was going to get them down
. . . . This project would not have become a reality if the people of Anaconda had not been – the people of Anaconda."

Sandy Stash,
ARCO's Montana facilities manager

A *Public/Private Partnership Benefits Denver*

Denver Radium, Colorado

EPA and Home Depot, Inc. agreed that the company would participate in the cleanup of contaminated soil in exchange for limits on liability. With the two parties working together early in the process, cleanup activities were tailored to accommodate construction of a new Home Depot store on the site. EPA and Home Depot built electric and other utility corridors into the protective cap, which ensures the integrity of the cap, protects utility workers, and saves Home Depot money in future maintenance of its facility.

The cooperation among EPA, Home Depot, the community, and the state helped to make the cleanup and reuse of the Denver Radium site a success.

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Industri-Plex: Realizing Possibilities

The Industri-Plex Superfund site was caused by wastes from a 245-acre industrial park in Woburn, Massachusetts, 12 miles north of Boston. The site is now an acclaimed model of successful reuse because EPA, State and local governments, the community, and private developers worked together to transform one of the nation's worst hazardous waste sites into a vital commercial and community asset.

Since 1853, the Industri-Plex site had been the home of various chemical manufacturing operations that contaminated the soil and groundwater. Industrial activities ceased at the site in 1969, and the property was sold for development. In the late 1970s, the community protested when development activities caused strong odors from unearthed wastes. These activities ended in 1980. In 1983, Industri-Plex was added to the National Priorities List (NPL).

In 1989, EPA and the Massachusetts Department of Environmental Protection (MA DEP) reached a settlement with 25 current and former property owners and operators at the Industri-Plex site to clean up the site. The cleanup established redevelopment as an explicit goal, in addition to protecting human health and the environment. It also included institutional controls (ICs), which are legal restrictions on the use of the property. EPA, MA DEP, and the responsible parties created a 'Custodial Trust' to hold title to, manage, and sell 120 undeveloped acres at the site, and to promote the redevelopment of the Industri-Plex site and its surrounding areas.

Today, the site is the location of new businesses, including a busy Target store, an office park, a transportation center, a Marriott Residence Inn, open grassy areas and wetlands, and a major highway exchange with access roads – all adding to the economic vitality of the Woburn community. The reuse of Industri-Plex provides as many as 4,300 permanent jobs, approximately $147 million in annual income associated with those jobs, and a $4.6 million potential increase in residential property values within two miles of the site.

The town of Woburn was in the spotlight when its distressing experience with the famous Wells G & H site, adjacent to Industri-Plex, was the subject of the book and movie "A Civil Action." However, the success of the redevelopment that transformed the Industri-Plex site from a Superfund stigma to a symbol of pride won the hearts of this community. Woburn Mayor Robert Dever put it this way "the transformation of this 245-acre site has restored Woburn's pride, hope, and economic future...People realize that the stigma is not forever and that communities can go forward."

For more information on the cleanup and reuse of the Industri-Plex site, watch the video, *Superfund Redevelopment: Realizing Possibilities*, available at http://www.clu-in.org/studio/video.cfm. It is also available on the Reusing Superfund Sites CD and can be ordered in VHS format by contacting Melissa Friedland at 703-603-8864 or friedland.melissa@epa.gov. The video tells the story of the site and introduces the viewer to the key players in its cleanup and redevelopment.

A Target retail store is one of the many redevelopment successes at the Industri-Plex site.

Where Communities Can Find Out More About Reuse

As Charlie Coleman, the EPA Project Manager for the Anaconda site, put it: Superfund reuse is "win-win-win." All the parties came out ahead in the Anaconda agreement – and this same all-around success is possible whenever a Superfund site is reused. Reuse helps to protect human health and the environment. It makes land productive (and sometimes beautiful) again. And reuse gives communities a new resource to enhance the ways they live, work, and play.

There have been more than 240 Superfund site use success stories. Hundreds more are expected in the next few years. To help your community become one of these success stories, here is where you can find out more information about the subjects discussed in this brochure:

General Sources of Information on Superfund Reuse

The Superfund Redevelopment Initiative website is at:
http://www.epa.gov/superfund/programs/recycle/index.htm

For questions about reuse, either call the Superfund Hotline at **1-800-424-9346** or send an e-mail to **reuse.info@epa.gov**.

Sources of Specific Information on Topics Discussed in This Brochure

How Superfund Sites Have Been Safely and Productively Reused:
http://www.epa.gov/superfund/programs/recycle/success/index.htm

Are These Sites Safe:
http://www.frtr.gov/matrix2/top_page.html

How Communities Have Benefited From Reusing Superfund Sites:
http://www.epa.gov/superfund/programs/recycle/overview/benefits.htm

How EPA Can Help Communities:
http://www.epa.gov/superfund/programs/recycle/communit/help.htm

Reusing Superfund Sites

"We had an opportunity out here to either do something with the land, or not do something with the land. Just give me the worst site, and we'll make something out of it, because you can take land and do something with it if you have a little bit of imagination."

Jack Nicklaus
(at the opening of the Old Works Golf Course, which Nicklaus designed over a cleaned up Superfund site)

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EM Feature

Applying Solidification/Stabilization Treatment to Brownfield Projects

by Charles M. Wilk

Long used in treating radioactive and hazardous wastes, solidification/stabilization (S/S) is also an increasingly popular treatment in the remediation of contaminated land, particularly brownfield redevelopment, since the treated wastes can often be left on site to improve the property for subsequent construction. This article discusses the application of S/S treatment to various wastes, the tests used to study and verify treatment, and the basics of implementing S/S treatment in the field. It also presents examples of S/S treatment at four brownfield sites: a former wood preserving facility, a manufactured gas plant, an electric generating station, and a shopping mall development.

INTRODUCTION

Solidification/stabilization (S/S) is a widely used treatment for the management and disposal of a broad range of contaminated media and wastes, particularly those contaminated with substances classified as "hazardous" in the United States. The treatment involves mixing a binding reagent into the contaminated media or waste. The treatment protects human health and the environment by immobilizing contaminants within the treated material. Immobilization within the treated material prevents migration of the contaminants to human, animal, and plant receptors. S/S treatment has been used to treat radioactive wastes since the 1950s and hazardous waste since the 1970s.[1] S/S continues as a cornerstone treatment for the management of radioactive and hazardous waste, site remediation, and brownfield redevelopment.

The U.S. Environmental Protection Agency (EPA) considers S/S an established treatment technology and a key treatment in the management of industrial hazardous wastes. These wastes are regulated in the United States under the Resource Conservation and Recovery Act (RCRA). RCRA hazardous wastes are grouped into two classes: RCRA-listed and RCRA-characteristic. RCRA-listed hazardous wastes are wastes produced by industry that are generally known to be hazardous. These wastes are "listed" in RCRA regulations and must be treated, stored, and disposed of according to RCRA hazardous waste management regulations. RCRA-listed wastes destined for land disposal are required to be treated in order to reduce the risks posed by the wastes after land disposal. EPA has identified S/S as the best demonstrated available technology (BDAT) for 57 RCRA-listed hazardous wastes.[2] RCRA-characteristic wastes are less routinely produced wastes that are found to be hazardous due to a characteristic of the waste. For RCRA-characteristic wastes, S/S can often be used to eliminate the hazardous characteristic. Once the hazardous characteristic has been addressed, the resulting treated waste can be reused or disposed of at lower cost.

S/S treatment is used to treat contaminated media during the remediation of contaminated properties. The permitting requirements for hazardous waste management facilities under RCRA include requirements for owners of these facilities to remediate previously contaminated areas at the facility. These are known as RCRA corrective actions and S/S can be applied to address these contaminated areas. However, the best-known and documented remediation program in the United States is conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLA program is used to remediate abandoned or uncontrolled properties where hazardous substances have been released and pose a danger to human health and the environment. Because the program is funded by a tax collected from petroleum and chemical manufacturers, and by potentially responsible parties that caused the contamination, it is commonly called the "Superfund" program. S/S is the most frequently selected treatment for controlling the sources of environmental contamination at Superfund remediation sites; 25% of selected remedies for Superfund sites include the use of S/S (see Figure 1).[3]

A more recent development in U.S. remediation programs is the advent of brownfield initiatives. Brownfields are previously used industrial or urban properties that have not been redeveloped because of potential environmental contamination and the associated liabilities. However, new initiatives in U.S. liability law and funding are encouraging the remediation

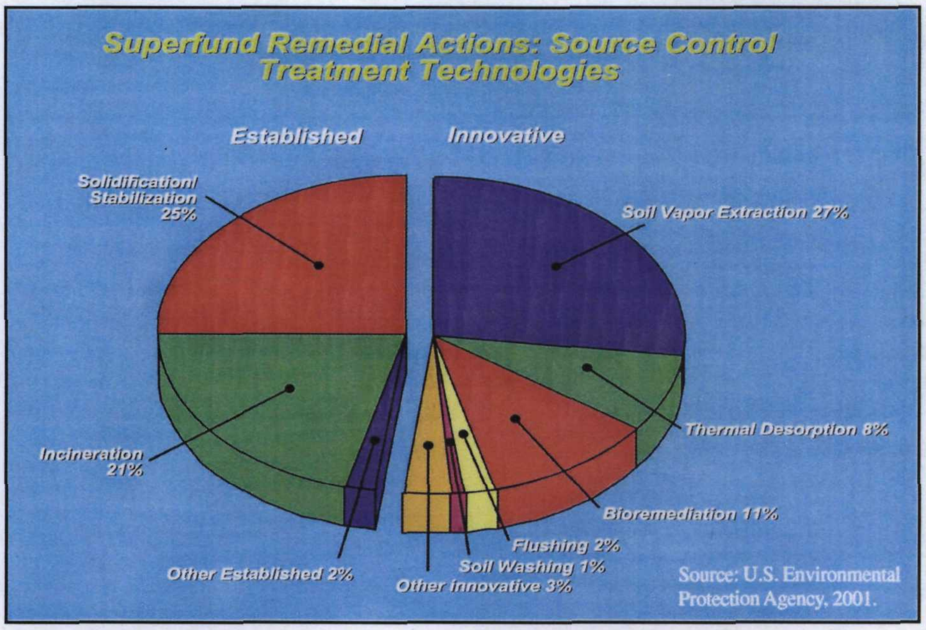

Figure 1. Frequency of S/S treatment use compared to other technologies at U.S. Superfund sites where sources of contamination have been addressed.[3]

and reuse of brownfield sites. The benefits to society are considerable and include the reduction of urban sprawl and preservation of fertile farmland. S/S treatment is increasingly being used to address contamination at brownfield sites as developers are realizing that S/S not only deals with the contamination, but it also allows the treated material to be reused, resulting in significant cost savings.

S/S is an effective treatment for a wide variety of organic and inorganic contaminants present in contaminated soil, sludge, and sediment (see Table 1).[4] The ability to treat various contaminants within the same media is a key reason why S/S is so frequently used in remediation. Adding to the versatility of S/S treatment is the fact that contaminated material can be treated in situ (i.e., in place) or ex-situ as already segregated waste or excavated material. The effectiveness and increasingly extensive use of S/S treatment for industrial hazardous waste and remediation makes it important that environmental professionals understand the physical, chemical, and regulatory aspects of the technology, as well as how to apply the technology in the field.

Table 1. Effectiveness of S/S on general contaminant groups for soil and sludge.[4]

	Contaminant Groups	Effectiveness Soil/Sludge
Organic	Halogenated volatiles	❑
	Nonhalogenated volatiles	❑
	Halogenated semivolatiles	■
	Nonhalogenated semivolatiles and nonvolatiles	■
	PCBs	▼
	Pesticides	▼
	Dioxins/furans	▼
	Organic cyanides	▼
	Organic corrosives	▼
Inorganic	Volatile metals	■
	Nonvolatile metals	■
	Asbestos	■
	Radioactive materials	■
	Inorganic corrosives	■
	Inorganic cyanides	■
Reactive	Oxidizers	■
	Reducers	■

■ = Demonstrated Effectiveness: successful treatability test at some scale completed;
▼ = Potential Effectiveness: expert opinion that technology will work;
❑ = No Expected Effectiveness: expert opinion that technology will not/does not work.

HOW S/S WORKS

Although the terms "solidification" and "stabilization" sound similar, they describe different effects that the binding reagents create to immobilize hazardous constituents. Solidification refers to changes in the physical properties of a waste. They include an increase in compressive strength, a decrease in permeability, and encapsulation of hazardous constituents. Stabilization refers to the chemical changes to the hazardous constituents in a waste, including converting the constituents into a less soluble, mobile, or toxic form. S/S treatment involves mixing a binding reagent into the contaminated media or waste. Binding reagents commonly used include Portland cement, cement kiln dust (CKD), lime, lime kiln dust (LKD), limestone, fly ash, slag, gypsum and phosphate mixtures, and a number of proprietary reagents. Due to the great variation of waste constituents and media, a mix design should be conducted on each subject waste. Most mix designs are a blend of the inorganic binding reagents listed above. Binding reagents that are organic have also been tried. These include asphalt, thermoplastic, and urea-formaldehyde. Organic binding reagents are rarely used in commercial scale due to their high cost compared to inorganic binders.[5]

Effects of Binding Reagents on Waste

Portland cement is a generic material principally used in concrete for construction. This material is also a versatile S/S binding

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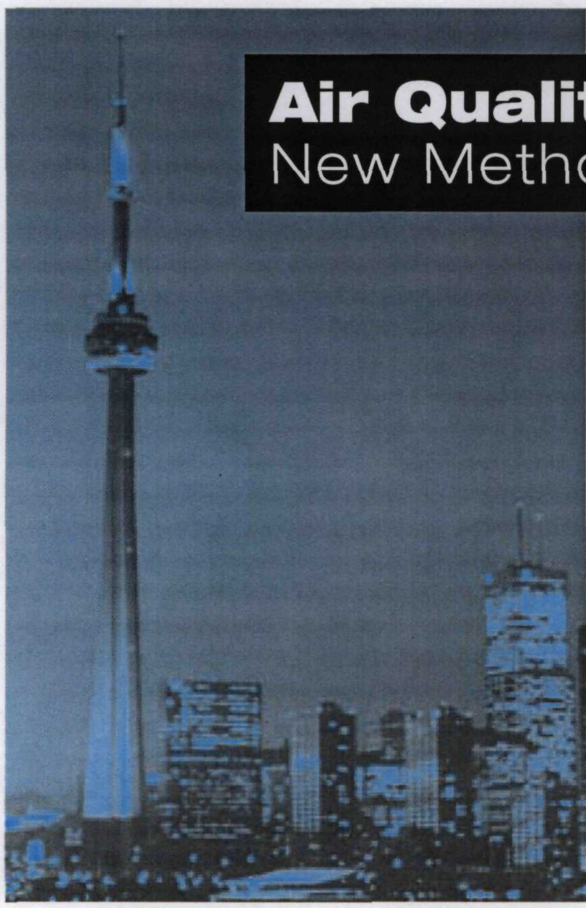
reagent with the ability to both solidify and stabilize a wide variety of wastes. Portland cement-based mix designs have been popular S/S treatments and have been applied to a greater variety of wastes than any other S/S binding reagent.[1] Cement is frequently selected for the reagent's ability to (1) chemically bind free liquids, (2) reduce the permeability of the waste form, (3) encapsulate waste particles surrounding them with an impermeable coating, (4) chemically fix hazardous constituents by reducing their solubility, and (5) facilitate the reduction of the toxicity of some contaminants. This is accomplished by physical changes to the waste form and, often, chemical changes to the hazardous constituents themselves. Cement-based S/S has been used to treat wastes that have either or both inorganic and organic hazardous constituents. Mix designs often include byproducts or additives in addition to Portland cement.[6] Fly ash is often used to capitalize on the pozzolanic[7] effect of this material when mixed with hydrating Portland cement. CKD and slag have minor cementitious properties and are sometimes used for economy. Lime and LKD can be used to adjust pH or to drive off water by using the high heat of hydration produced by these S/S binders. Limestone can be used for pH adjustment and bulking.

Treatment of Free Liquids. Land disposal of liquid waste or solid-form waste with a free liquid portion is prohibited by RCRA land disposal restrictions. S/S is often used to solidify liquids so that the waste can be land disposed. RCRA requires that free liquids be chemically bound.[8] Portland cement is often used as the S/S binding reagent for these wastes since cement reacts with water, chemically binding the water in cement hydration products. An unconfined compressive strength of at least 0.34 MPa (50 psi) is specified to verify that wastes treated for free liquids have had the liquids bound chemically rather than absorbed.[8] This specification is more easily met with the use of cement than other reagents, since the main use of cement in construction is the attainment of compressive strength.

Treatment of Inorganic Contaminants. The most popular use of S/S is treating wastes contaminated with inorganic hazardous constituents. Generally, for inorganic-contaminated wastes, the hazard resides in the heavy metals content. Heavy metals-contaminated wastes are frequently determined to be RCRA-characteristic wastes due to the leaching potential of the heavy metals. These wastes have failed the toxicity characteristic leaching procedure (TCLP).



Frequently, S/S treatment is used to reduce the leaching potential of the hazardous constituent from the waste. After treatment, the waste no longer exhibits the hazardous characteristic (i.e., hazardous constituent leaching) and can be disposed as nonhazardous waste. Many RCRA-listed wastes require treatment to the maximum extent practical to reduce their potential hazards when land disposed. S/S treatment is used on RCRA-listed wastes to comply with this requirement. In the case of remediation projects, S/S is often the only reasonably available technology to treat the large volumes of heavy metals-contaminated soil, sludge, or sediment resulting from these operations. Cement is uniquely suited for use as an S/S reagent for metal contaminants because it reduces the mobility of inorganic compounds by (1) formation of insoluble hydroxides, carbonates, or silicates; (2) substitution of the metal into a mineral structure; and (3) physical encapsulation.[9-11] S/S treatment can also reduce the toxicity of some heavy metals by changes in valence state.[1,6]

Treatment of Organic Contaminants. Treatment of wastes contaminated by organic hazardous constituents generally relies on cement's ability to solidify the waste. Treatment by solidification relies on changes to the physical properties of the waste. These changes may include binding free water in a waste into cement hydration products, creating waste with more physical integrity, such as a granular solid or monolith, and reducing the hydraulic conductivity of the waste. Cement-based S/S treatment has been effective in the treatment for a variety of hazardous constituents, including halogenated and nonhalogenated semivolatiles and nonvolatiles, metals, polychlorinated biphenyls (PCBs), pesticides, organic cyanides, and organic corrosives. Treatment of certain organics may require additional attention. Large concentrations of oils and greases (>20%) may prevent the hydration of cement by coating the cement particle with oil or grease, thus preventing water from coming into contact with the particle. Some organics can affect the setting time of cement and should be carefully evaluated. Additives and field techniques can often moderate these undesirable effects. Binding reagents such as quicklime can produce a significant amount of heat quickly when mixed with water. The hydration reaction is exothermic. This fast evolution of the heat can pose challenges in the S/S treatment of materials contaminated with volatile organic compounds (VOCs) and other compounds, such as PCBs.[12] Air collection and treatment devices may be necessary to avoid transfer of the VOCs from the waste to the atmosphere.

Physical and Chemical Tests

Most S/S projects require treatability studies and final performance testing of the treated waste. These tests can be placed into two groups: physical and chemical. EPA's publication *Stabilization/Solidification of CERCLA and RCRA Wastes*[8] provides descriptions of the various tests used in the United States. It is important to note that the only tests that are required by regulation or policy in the United States are TCLP and the unconfined compressive strength test. Furthermore, these tests are applicable by regulation or policy only in limited circumstances. Regulators generally select the appropriate physical and/or chemical tests for a specific project using best professional judgment based on the contaminants and media (soil, sludge, or sediment) and the planned use of the site.

Physical Tests. The commonly specified physical tests in project performance standards include the paint filter test (pass/fail), hydraulic conductivity ($<1X10^{-5}$ cm/sec), and unconfined compressive strength (0.34 MPa (>50 psi)).[8,13]

Chemical Tests. The most commonly specified chemical test is the TCLP, which is frequently applied because it has some relationship to regulations written into the RCRA program. However, there has been considerable discussion about the appropriateness of applying the TCLP to S/S-treated waste when this treated waste is managed other than in a municipal landfill. The TCLP relies on extracting the sample waste with a diluted organic acid (acetic acid), thus simulating conditions of codisposed organic waste, such as in a municipal landfill. Many S/S-treated wastes are disposed in monofills or treated and left onsite. The TCLP may not be the best simulation of these disposal scenarios. To address this concern, EPA has begun to apply the synthetic precipitation leaching procedure (SPLP) in lieu of the TCLP. The SPLP (EPA Method 1312-SW846) is designed to simulate waste exposure to acid rain. This procedure is similar to the TCLP, except that a weak solution of inorganic acids (sulfuric and nitric acids) is used. Ultimately, project managers and regulators should consider the final disposal environment of the treated waste to determine the appropriate test to use.

EXAMPLE PROJECTS

S/S has been used to treat wastes ranging from common industrial wastes to Superfund site debris. Currently, there is great interest in brownfield redevelopment. The examples below describe the use of S/S treatment at four brownfield sites. In each case, the treated material was beneficially reused onsite or at another location. Reuse of treated material saved developers significant costs, while providing for site redevelopment that is protective of human health and the environment.

Figure 2. In situ S/S treatment at a former wood preserving facility in Port Newark, NJ.

Former Wood Treating Facility

Two types of mixing techniques were used to treat soils contaminated by wood preserving operations at a former wood treating facility in Port Newark, NJ (see Figure 2).[14,15] Approximately

Figure 3. Close-up view of in situ blender at Port Newark, NJ.

Figure 4. S/S treatment at a former MGP site in Cambridge, MA.

3.2 ha of soils at the site were contaminated with arsenic, chromium, and polycyclic aromatic hydrocarbons (PAHs). In situ soil mixing was used to treat 17,000 m^3 of soil from 0.6 m to 3.7 m. This treatment involved (1) pre-excavation of contaminated material, (2) placement of the stockpiled material back into the excavated area in lifts, and (3) S/S treatment of each lift with an in situ blender head (see Figure 3). Performance standards set for the treatment of the soil included attaining a minimum of 0.17 MPa unconfined compressive strength. S/S-treated soils exceeded this requirement. Another 20,000 m^3 of contaminated soil was treated ex situ using a pugmill to mix Portland cement into contaminated soil. Contaminated soil mixed with the pugmill was placed on top of the in situ treated soils in a 0.6-m layer. This layer was carefully compacted to have the similar structural properties as soil-cement. This soil-cement-like layer achieved unconfined compressive strengths of greater than 1.7 MPa, providing an excellent base for pavement placed over the entire site. The mix design for both of these mixing techniques called for an addition rate of 8% Portland cement by wet weight of the soil. Future use of the site is as a shipping container storage area.

Former Manufactured Gas Plant Site

The second example is the former location of a manufactured gas plant (MGP) in Cambridge, MA, which heated coal and oil to produce gas for lighting and heating. Byproducts from this process include coal tars and other organic compounds that behave as dense nonaqueous phase liquids (DNAPLs) and light nonaqueous phase liquids (LNAPLs) when in groundwater. Experts estimate that there are more than 4000 medium–large former MGP sites in the United States. Cement-based S/S treatment can be an effective means to address contamination at former MGP sites. At this site, cement was mixed into the soil while the soil remained in place by using a specialty auger system (see Figure 4).[16] As the auger penetrates the soil, cement grout is pumped through the mixing shaft and exits through jets located on the auger flighting, mixing cement into the contaminated soil. An overlapping drilling (auger) pattern is used to ensure complete mixing and treatment of the area. Approximately 79,000 m^3 of contaminated soil to a depth 6.5 m was treated at the site. S/S not only successfully treated the soil for MGP contaminants, but also improved the physical properties of the soil for property redevelopment. Redevelopment at this site includes a parking structure, office and retail space, and a hotel.

Former Electric Generating Station

An area in Boston, MA, which included a series of abandoned warehouses, had been used for residential, light industrial, commercial, and bus maintenance.[17] These old buildings are now being renovated for offices or torn down to construct new residences and revitalize the community. The centerpiece of this new area is the Central Power Station. The Central Power Station, built in 1890, was an engineering marvel at the time. When first opened, the plant was considered to be the biggest electric generating plant in the world and powered the first subway system in the United States. The plant has not generated electricity in 90 years and has been vacant since the 1950s.

In 1994, during renovation of the abutting building, free-floating oil was discovered in the sewer. Various underground storage tanks and oil/water separators were known to exist on both properties. Cleanup efforts from the abutting property were futile as pump and treat efforts brought more oil onto this site. In 1997, oil was found on the Central Power Station site during site assessment activities conducted by the abutting property owner. In addition, lead was found in the soils from the ash fill from the power station. In 1999, the current owner purchased the property from the Metropolitan Boston Transit Authority and designed a remediation of the entire contaminant plume located on both properties. The objective of the remediation was to integrate the remediation into the

Figure 5. Ex situ S/S treatment of lead- and arsenic-contaminated soils in Boston, MA.

Figure 6. S/S treatment of harbor dredge in Newark, NJ.

redevelopment. This was accomplished by minimizing off-site disposal costs by treating the materials on site for reuse during construction.

Cement-based S/S treatment was used to address lead- and petroleum-contaminated soils at the site. Remediation of the contaminated soils involved recovery of free product through tank structure removal and pumping, along with cement-based S/S of contaminated soils and fill. A portable S/S treatment plant was mobilized to the site. Approximately 2140 m^3 of material was excavated at the site. Rather than disposing of the contaminated material off-site, the material was treated and reused at the site (see Figure 5). Off-site transportation and disposal would have cost the property owner an additional $500,000 above and beyond the estimated treatment costs. Additional savings of $30,000 were realized through the reuse of the material as pavement base for a planned parking lot on the property. As a result of the S/S treatment, petroleum and lead in the soil were successfully treated and contained at the site.

Reuse of New York Harbor Sediments

Newly effective federal regulations restrict the ocean disposal of sediments dredged from the harbors of New York and Newark, NJ. The New York Port Authority is faced with a critical situation: find land-based disposal/uses for tens of millions of cubic meters of sediments or lose standing as a commercial port for ocean-going ships. One of the technologies now being employed to manage the sediments is Portland cement-based S/S treatment.[18] Millions of cubic meters of the sediments have undergone cement-based S/S treatment. This treatment immobilizes heavy metals, dioxins, PCBs, and other organic contaminants in the sediment.

The treatment changes the sediment from an environmental liability into a valuable structural fill. Dredged sediment was transported by barge to a pier. At the pier, cement was mixed into the sediment while it remained in the barge (see Figure 6). The mixing method used an excavator-mounted mixing head. The treated material was removed from the barge and used as structural fill. This structural fill has already been used at two properties: an old municipal landfill in Port Newark, NJ, and the location of a coal gasification facility (later a wood preservation facility), called the Seaboard site. Treated sediment was used as structural fill to cover approximately 8 ha of the Newark landfill. Covering the landfill with competent structural fill allowed redevelopment of

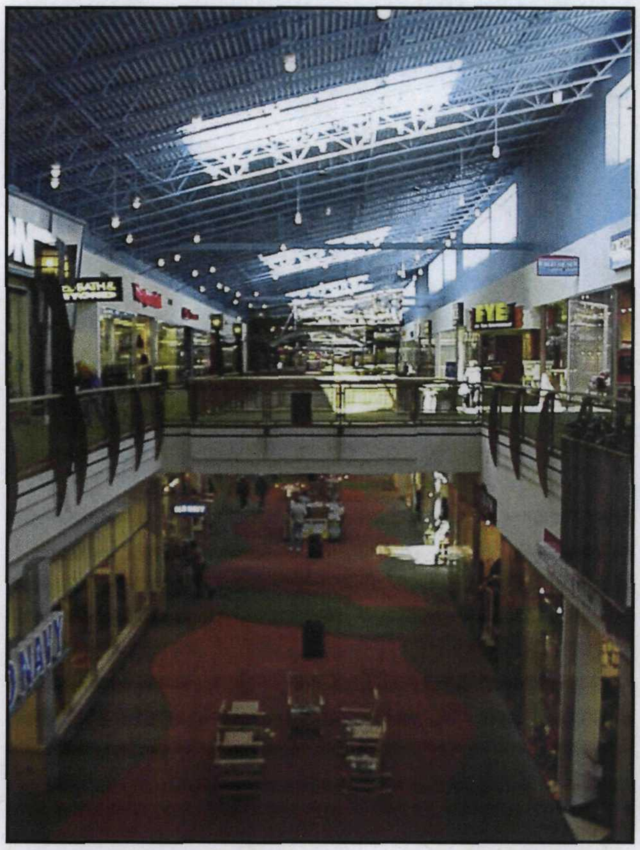


Figure 7. Brownfield redevelopment at Jersey Gardens Mall, NJ.

the landfill property into a shopping mall (see Figure 7). The 65-ha Seaboard site has been designated for brownfield redevelopment. More than 1.1 million m^3 of treated sediments already covers this site.

Beginning in May 2001, approximately 2.3 million m^3 of New York- and Newark-dredged sediment was processed into structural fill. A large-scale stationary pugmill was used to mix Portland cement into the sediment at a cement addition rate of 8%. This structural fill was used to cap a property and develop a golf course in Bayonne. Ocean disposal of some New York harbor dredge sediment continues to be banned. Treatment by S/S to create fill material for reuse in upland locations is expected to be a viable option for millions of cubic meters of dredged material in the future.

CONCLUSION

As the examples above demonstrate, solidification/stabilization technology can be used to treat a wide range of hazardous constituents within the same media or waste. This versatility is a key reason for the high frequency of use of S/S technology in remediation. In addition to protecting human health and the environment by immobilizing contaminants within the treated material, S/S-treated soils have improved construction characteristics, allowing the soil to be reused at the redevelopment site. Given its advantages, S/S treatment can be expected to continue being a valuable tool in waste management, remediation, and brownfield redevelopment.

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About the Author

Charles M. Wilk, LEHP, QEP, is program manager for waste management at the Portland Cement Association in Skokie, IL. He provides technical assistance on S/S treatment and has eight years of experience working with the U.S. Environmental Protection Agency on both the RCRA and CERCLA programs. He is a Licensed Environmental Health Practitioner by the State of Illinois and a Qualified Environmental Professional. He can be reached via phone at 1-847-972-9072 or e-mail: *cwilk@cement.org.*

JEFF MILLER
1ST DISTRICT, FLORIDA

COMMITTEE ON ARMED SERVICES
SUBCOMMITTEE ON TERRORISM, UNCONVENTIONAL THREATS, AND CAPABILITIES
SUBCOMMITTEE ON READINESS

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CHAIRMAN

Congress of the United States
House of Representatives
Washington, DC 20515

324 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-4136

DISTRICT OFFICES:
3400 BAYOU BOULEVARD
SUITE 12
PENSACOLA, FL 32503
(850) 479-1183

348 S.W. MIRACLE STRIP PARKWAY
UNIT 24
FORT WALTON BEACH, FL 32548
(850) 664-1266

http://jeffmiller.house.gov

September 15, 2005

5 9 317

L'Tonya Spencer
Environmental Protection Agency
Superfund Remedial and Technical Services
61 Forsyth Street, SW
Atlanta, GA 30303

Dear Ms. L'Tonya Spencer:

As a response to the Environmental Protection Agency's (EPA) proposed remedy for the Escambia Treating Company (ETC) Superfund Site OU1 located in Pensacola, Florida, I am submitting these comments for the public record to encourage the EPA to implement a more thorough clean up plan for the contaminated area.

The EPA chose Alternative 2 (Capping /Containment) as the preferred alternative to achieve substantial risk reduction of the main threats. Alternative 2 excavates a small amount of toxic soil and then "caps and contains" the remaining contaminated soils on the ETC site. This remedy was clearly chosen with cost in mind instead of public health and safety. The $25 million dollar price tag is expensive and is not the best cost-benefit alternative proposed by the EPA for this site. Our community deserves better.

The findings of the 1998 ETC human health risk assessment indicates that cancer risk at the ETC site is greater than the EPA's acceptable target range for future residential use. With a transformation of the site into a commerce park that will include a variety of businesses, such as offices, showrooms, warehouses, and light manufacturing, the toxic soils must be excavated and treated. The burial of these toxins in the ground is unacceptable as tens of thousands of people will be working and visiting the future business site.

Permanent remedies for soil decontamination need to be made a priority. The remedies should be written with an emphasis on health standards so that the area can prosper again economically. The EPA should strive to reduce the toxic contaminants in the area to residential-zoning quality standards. To that end, the current draft proposal to excavate, solidify, and bury pollutants onsite should be abandoned and other alternatives to decontaminate the area must be considered.

In conclusion, the Environmental Protection Agency should be ashamed of its proposal to the residents of Pensacola. A new proposal must place the appropriate emphasis on quality health standards. This is a priority to Pensacola residents and is of utmost importance to me. I look forward to working with the Agency to ensure that the Escambia Treating Company area is restored to an active, integrated community.

Thank you for your attention to these concerns.

With warm personal regards, I am

Sincerely,

Jeff Miller
Member of Congress

United States Senate
WASHINGTON, DC 20510-0905

BILL NELSON
FLORIDA

September 19, 2005

The Honorable Stephen L. Johnson
Administrator
The Environmental Protection Agency
Ariel Rios Building, 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Administrator Johnson:

The people of Pensacola have been plagued by the Escambia Treating Company Superfund site for decades and they have been waiting for years for a remediation plan to cleanup the site and remove the mountain of dioxin threatening the health and safety of the area. Unfortunately, the remediation plan the Environmental Protection Agency (EPA) has proposed is inadequate for either of these purposes and must be improved before any plan is implemented.

As you know, the health hazards posed by the Escambia Treating Company site were so severe that the EPA funded a relocation of 358 households in the neighborhood surrounding the site in 1997. This relocation was only the third such relocation in Superfund history. Recent soil samples in another neighboring neighborhood, Clarinda Triangle, showed the dioxin levels exceed those in the 358-household area already evacuated as part of the initial cleanup. The Clarinda Triangle residents also will be given the option to move out at EPA's expense. Clearly, mount dioxin remains a danger to Pensacola and merely burying and capping the contaminated soil on the site will not do enough to protect the residents. The aquifer will remain vulnerable to leaks from the dioxin-laden soil at the Escambia Treating Company site if the soil is not detoxified or removed from the site. Doing cleanup on the cheap could lead to an even costlier and more dangerous situation in the future. Let's finally get this right.

I look forward to working with you to ensure the health and safety of the residents of Pensacola.

Sincerely,

Bill Nelson

Technology Vendors

09/22/2005 12:03 AM

To: LaTonya Spencer/R4/USEPA/US@EPA
Subject: Escambia Treating Company Site - Operable Unit 1 – Soils

I have been an environmental consultant for approximately 16 years in Pensacola. Recently I have utilized an oxidation/biodegradation product/process that has shown tremendous ability to cleanup petroleum contamination. The product/process will work on any contaminant organic in nature. Mr. Bill Lundy, of Deep Earth Technologies, Inc. had a meeting with Mr. Keith Wilkins, the Director of Neighborhood and Environmental Services in Escambia County and came to the conclusion that Operable Unit 1 (OU-1) could be cleaned up utilizing oxidation for approximately the same cost as the EPA proposed cleanup plan. It seems that if this is possible, it would definitely be worth investigating. Please review the attached information which talks about the product and OU-1. The attached was follow up information provided to Mr. Wilkins after the August 25 meeting. Please consider all options before you make a final choice. Thank you for your time.

Advanced BioSystems
2653 Del Mar Drive
Gulf Breeze, Florida 32563
(850) 240-1926
dfolga@bellsouth.net

September16, 2005

Mr. W. David Keefer
Remedial Project Manager
U.S. EPA Region 4
Atlanta Federal Center
61 Forsyth Street SW (SRTS/C)
Atlanta, Georgia 30303

Dear Mr. Keefer:

While the public comment period is still open, I would like to take this opportunity to provide information for a solution for the Escambia Wood Treating Company Superfund Site in Pensacola, Florida. Advanced BioSystems (ABS), based in Lafayette, Louisiana, believes that we have an alternative that could meet EPA requirements, remediate on-site, and keep the cost of clean-up under the $25 million proposed in Alternative #2 (Soil Excavation, with Capping/Containment of Contaminated Soils).

If Alternative #2 is implemented at the site, ABS believes a problem will still exist. The site will be monitored for decades and the chances of leaking will need to be addressed at some point in the future. We feel there will be a continued liability of the material being stored. Other sites have proven this point. The Rollins Facility in Baton Rouge is leaking and bankrupt. The Laidlaw / Safety Kleen facility in Pinewood, SC leaks and is also bankrupt. The issue is the validity of storage versus the validity of remediation of the material.

ABS technology was developed in the early 1980's at ITT. From 1983 to 1998, Mr. Chuck Davis, ABS founder and CEO, was the Director of Environmental and Capital Programs for the second largest wood treating company in the world, ITT Rayonier. ABS was formed in 1998 to bring this technology and acquired knowledge, which had been developed and implemented while Mr. Davis held this senior environmental position at ITT Rayonier, to the general marketplace. In partnership with Dr. Ralph Portier and Louisiana State University, ABS has developed the patented "IMBR" *technology, which has been successfully used in countless sites in this country and* around the world. The Southern Wood Piedmont site, a RCRA site, in Baldwin, Florida was one of the first remediation sites in the mid-1990's. It was the first system developed and permitted for the purpose of addressing the overall conditions of major wood treating sites. At that time, Mr. Davis worked with the Florida DEP and with EPA Region IV to install and operate this state of the art system. During the first year of operation, the project was recognized by the "International Paper and Forest Products Institute" as the winner of the prestigious International Award for Advancements in the "Energy and Environment Award" category for environmental innovation and performance achievement.

At the Escambia Treating Company site, we understand that some of the soil has been previously excavated. This soil can be treated in a manner that will address the dioxin question in a speedy and technically applicable manner when the soil is returned to the site. By running the soil under a UV light at a certain wave length, the ring structure is quickly broken, which allows the biology to work very quickly to mineralize the contaminants at the site. While Pentachlorophenol is the more difficult of the contaminants to be found at wood treating sites, it is very degradable. The ABS system can be installed in place, using ABS Bioplugs, to any depth for on-site remediation. The system will provide total coverage for treatment and can deal with the total range of contaminants at the wood treating site in a very expeditious manner. For these in-place materials, the Bioplugs will be installed where material is found and the ground water can be treated to drinking water standards and then re-infiltrated for use in the treatment process. Our solution will also provide treatment to the source material that is not the driver of the groundwater issues.

Biologically, the Escambia Treating Company site is not a difficult site. By treating the materials in place, the cost is minimal compared to off-site treatment. ABS is willing to perform a treatability study to demonstrate the efficacy and then to work with the proper agencies on a partial pay-as-you-go performance based approach. It is very possible to treat the materials to industrial standards over a period of five to ten years.

As previously stated, ABS believes that the clean up can be achieved for less that the $25 million price now being discussed for Alternative #2. ABS is willing to meet with all interested parties (EPA project management, Florida DEP, the local Pensacola and Escambia County governments) to provide a presentation and answer any questions concerning our technology and systems. We are very willing to visit Atlanta, Pensacola, or Tallahassee to discuss the project with EPA officials and/or interested parties. Our belief is that this project has very achievable goals with our technology and would be of great benefit to the Pensacola/Escambia community. We look forward to the chance to outline, in detail, our complete project implementation plan, as well as a budget estimate.

You will find additional attachments which provide more detailed information concerning this subject matter. I appreciate your time and attention.

Thank you.

Regards,

Richard M. Folga

cc: Ms. L'Tonya Spencer, US EPA Region 4
Ms. Nancy Murchinson, Florida Department of Environmental Protection
Mr. Matt Dimitroff, City of Pensacola
Mr. Keith Williams, Escambia County
Mr. Peter Shuba, Escambia County

Response – EPA has considered both chemical oxidation and bioremediation in the Feasibility Study and the costs were substantially higher than the Capping/Containment remedy. It should be noted that the cost estimate for the Capping/Containment remedy is only about $12 million which includes the costs to excavate the contaminated soils, construct the containment cell, backfill the contaminated soils into the cell, solidify/stabilize the Principal Threat waste, and construct a cap over the cell. This equals about $21 per cubic yard of contaminated soil. The $25 million cost in the Feasibility Study includes the residential relocation costs, contractor fees, engineering & administration costs, and an additional 25% for contingency. From the ABS website (http://www.tmdh.com), the cost for the ABS bio remediation is $10 to $80 per cubic yard of soil treated. Averaging the cost range would equal $45 per cubic yard for the biological treatment of the soils which is more than double the cost of complete Capping/Containment remedy. The ABS treatment costs listed on the webpage do not include the UV light treatment mentioned in the ABS comment letter, the soil handling costs associated with the UV light treatment, placing the 250,000 cubic yards of stockpiled soil back into the excavations after treatment, or restoring the site for redevelopment.

It should also be pointed out that neither chemical oxidation nor bioremediation treatment technologies will treat the metals in the soil. The soils contaminated with metals exceeding the site cleanup goals would still have to be treated using solidification/stabilization or offsite disposal. Therefore, it is very likely that the treating the soils using either chemical oxidation or bioremediation treatment technologies would be much more expensive compared to the Capping/Containment remedy proposed by EPA.

EPA has recently reviewed the information packet sent by ABS which included a description of ABS treatment technology and some test results. Some of the data looks quite impressive while some leaves questions open. What is critical in any bioremediation approach at a site such as the ETC site is not the reduction of total PAHs or total organics, but rather the risk reduction which is dependent on the reduction of carcinogenic PAHs and dioxins. The data reviewed by EPA did not consistently indicate substantial reduction of carcinogenic PAHs and did not address reduction of dioxins at all. Thus, EPA's overall evaluation is that more proof is needed to demonstrate that the technology is effective, especially for achieving a dioxin cleanup goal of 0.03 ppb. It should also be noted that even under the best circumstances, it would take several years (the ABS comment letter states 5 to 10 years) for the ABS Bioplugs to seed the soil and mineralize the organic contaminants in the soil. During those years the site could not be redeveloped. Also, the soils contaminated with metals above the site cleanup goals would still require treatment or offsite disposal after the treatment of the organic contaminants is complete.