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EPA Superfund
Record of Decision Amendment:

Whitehouse Oil Pits
Whitehouse, FL
9/24/1998

AMENDED
RECORD OF DECISION

WHITEHOUSE WASTE OIL PITS SITE

Jacksonville, Duval County, Florida

Prepared by:

U.S. Environmental Protection Agency

Region 4

Atlanta, Georgia

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WHITEHOUSE WASTE OIL PITS

1. DECLARATION

SITE NAME AND LOCATION

Whitehouse Waste Oil Pits Site
Jacksonville, Duval County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Whitehouse Waste Oil Pits site in Jacksonville, Florida, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, 42 U.S.C 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for this site.

The Florida Department of Environmental Protection (FDEP) has provided input as the support agency for the site in accordance with 40 CFR 300.430. Although FDEP has indicated support for the overall approach of the selected remedy, FDEP is unwilling to concur with this AROD because FDEP disagrees with the remediation goal selected for naphthalene in groundwater.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Amended Record of Decision (the 1998 AROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The amended remedy selected in this 1998 AROD addresses all contaminated media at the site by containing the on-site waste sludge, contaminated soil, wetlands, sediment, and groundwater. The function of the remedy is to isolate the Whitehouse Waste Oil Pits site as a source of groundwater and surface water contamination and reduce the risks associated with exposure to the contaminated materials. The major components of the selected remedy include the following:

- In situ stabilization/solidification treatment of Lifts 1 and 2 with incorporation of a geogrid to enhance structural stability;
- Installation of a vertical barrier (slurry wall or geosynthetic sheet pile wall) to isolate and contain contaminated soil, sludge, wetlands, sediment, and groundwater;
- Installation of a lime curtain inside the containment system to adjust groundwater pH;

- Construction of a low permeability cap over the contained area which meets Resource Conservation and Recovery Act (RCRA) closure requirements under 40 CFR 264.228(a)(2);
- Realignment of the McGirts Creek tributary to optimize the area of groundwater containment;
- Extension of the municipal water supply to residents along Machelle Drive and Chaffee Road and plugging of private supply wells;
- Installation of a permanent security fence around the containment area and installation and maintenance of appropriate stormwater management controls;
- Monitored natural attenuation of contaminated groundwater outside the containment system;
- Sampling of off-site surface soil and downstream surface water and sediment during design to determine if additional measures are necessary;
- Imposition of deed restrictions to control future land and groundwater use.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. Although this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site, because treatment of the principal threat of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The acidity of the sludge and the variety of contaminants precluded effective treatment of the source materials, while the anticipated volume of residuals generated by treatment of the groundwater rendered cost-effective treatment of groundwater impracticable.

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

[signature] 9/24/98

Richard D. Green, Director
Waste Management Division
U.S. EPA Region 4

Date

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Whitehouse Waste Oil Pits

2. Decision Summary

1.0 Site Name, Location, and Description

The Whitehouse Waste Oil Pits site is an abandoned waste oil sludge disposal facility located in the community of Whitehouse approximately 10 miles west of downtown Jacksonville, Duval County, Florida. The site occupies seven acres west of Chaffee Road approximately four tenths of a mile north of U.S. Highway 90 (see Site Location Map, Figure 1).

The site is located adjacent to a wetland area and suburban residential development. The nearest residence is about 200 ft. from the southwestern site boundary. A northeast tributary of McGirts Creek flows in a southwesterly direction along the site's northern boundary. The site consists of 7 waste pits which, due to previous berming and capping operations, have elevated the ground surface at the site some five to nine feet above the original elevations. The existing overall surface of the site is relatively level. Vegetation generally ranges from sparse grass and weed cover to saplings and young pines up to approximately 20 feet in height. The site is currently fenced.

2.0 Site History and Enforcement Activities

The Whitehouse site was operated as a repository for waste oil sludge and acidic oil re-refinery by-products by Allied Petro-Products, Inc. (Allied). From approximately 1956 to 1968, Allied excavated and filled seven unlined pits, currently identified as Pits 1 through 7. Allied ceased operations in 1968 and filed for bankruptcy. From a review of information presented in the EPA's Hazardous Waste Site Investigation Report in 1979 and as later confirmed during subsequent investigations, what has been previously designated as Pit 6 was actually two pits located close together. For purposes of consistency, these two pits will be referred to together as Pit 6. The pit locations are shown on the Site Layout, Figure 2.

In 1968, the dike surrounding Pit 7 ruptured, and the contents spilled onto adjacent private property and into McGirts Creek. In 1976, the EPA Region 4 Emergency Response Branch responded to a waste oil spill from one of the other pits. One of the dikes failed during repair work by the City of Jacksonville, and up to 200,000 gallons of waste oil overflowed into the adjacent land and creek. The City of Jacksonville constructed a treatment system to drain the liquid from the pits, and the City subsequently attempted to stabilize the pits with construction debris, automobile shredder waste, scrap lumber, trees, and wood chips. The pits were then covered with Fullers Earth and local clay, and surface water diversion ditches were constructed. The City capped the pits with clay and topsoil in 1979 under the supervision of the Florida Department of Environmental Regulation (FDER), predecessor agency to FDEP.

Figure 1. Site Location Map

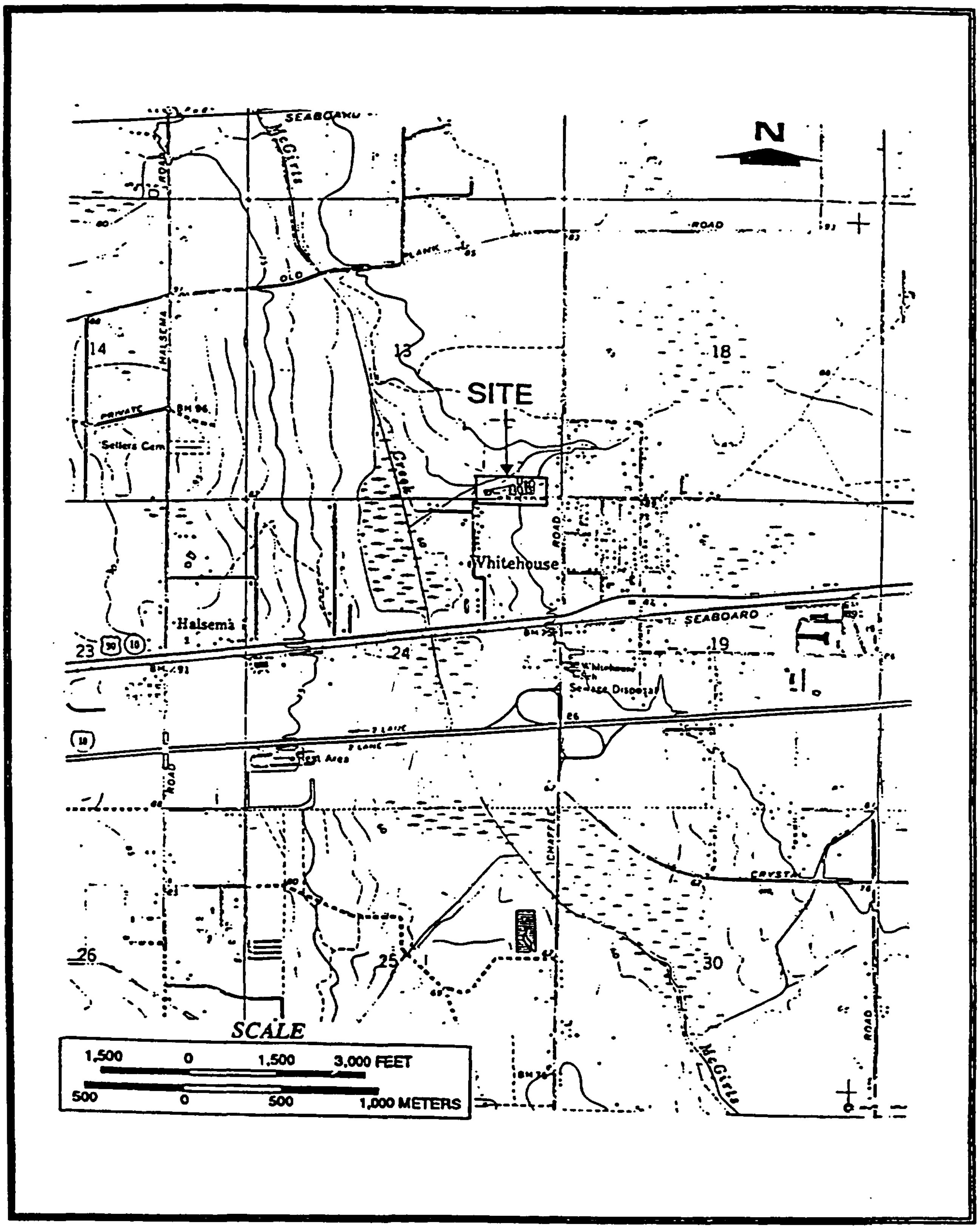
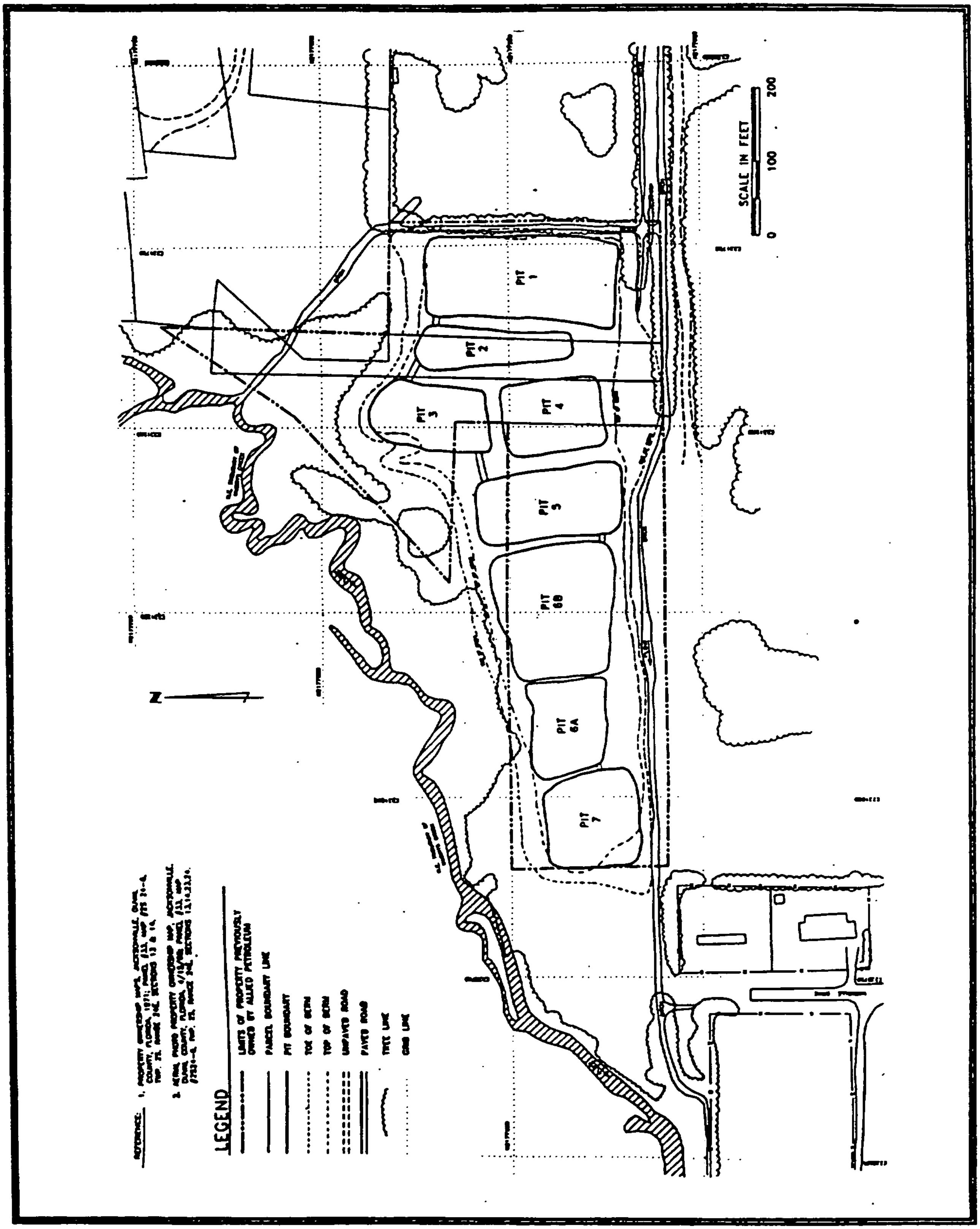


Figure 2. Site Layout



The site was proposed for listing on the National Priorities List (NPL) on October 23, 1981, after monitoring results indicated the migration of site contaminants to surface water and groundwater. The site's listing on the NPL was finalized on September 8, 1983. In 1983, FDER completed a Remedial Investigation (RI) under a cooperative agreement with EPA. The RI characterized site wastes and the extent of contamination. In 1985, EPA completed a Feasibility Study (FS) which evaluated remedial alternatives for the site. Based on the findings of the RI/FS, EPA issued a ROD on May 30, 1985, which consisted of the following components:

- installation of a slurry wall around the site, keyed into the aquitard, isolating the waste;
- recovery and treatment of contaminated groundwater within the walled area, thus contributing to waste isolation;
- removal of contaminated sediment from the northeast tributary of McGirts Creek and placement within the isolation area; and
- construction of a surface cap over the site to reduce the inflow of water into the walled area.

With the passage of SARA in 1986, EPA re-evaluated the containment remedy in the 1985 ROD in search of alternatives that provided treatment which would permanently and significantly reduce the mobility, toxicity and volume of hazardous substances at the site. As part of this evaluation, EPA conducted additional studies between 1988 and 1991. These studies included a Baseline Risk Assessment, a Supplemental Feasibility Study, and a Treatability Study in 1991 to examine a treatment train of soil washing, biological treatment, and stabilization. The studies led to EPA's issuance of an AROD on June 16, 1992 (the 1992 AROD), which included the following elements:

- excavation of contaminated waste pits;
- separation of construction debris, stumps, etc. from contaminated soil and steam cleaning prior to off-site disposal;
- volume reduction by soil washing;
- biotreatment to biologically degrade wash water contaminants;
- stabilization/solidification (S/S) of biotreated material exceeding cleanup criteria;
- on-site desposal of washed soils and S/S of contaminant fines and sludge;
- extraction and treatment of contaminated groundwater using activated carbon and chemical precipitation, with discharge to the northeast tributary of McGirts Creek;
- installation and maintenance of a 6 inch vegetative cover over the excavated area;
- installation and maintenance of a fence around the site during remedial activities;
- institutional controls, including deed restrictions.

Following signature of the 1992 AROD, EPA issued Special Notice Letters to initiate negotiations with the potentially responsible parties (PRPs). Because a settlement could not be reached, EPA proceeded with a fund-lead design. During the design, EPA determined that additional investigatory work was needed to define the nature and quantities of waste material in the pits. In April 1994, EPA and a group of PRPs signed an Administrative Order on Consent (AOC) for conducting the additional studies.

Based on the results of the additional investigatory work, EPA concluded that additional treatability and feasibility studies were needed, so the AOC was modified in January 1995 to incorporate the additional requirements. After completing these additional studies, the PRPs published the final Supplemental Treatability and Feasibility Study (STFS) in July 1997.

3.0 Reasons for the ROD Amendment

The results of the additional investigatory work and treatability studies conducted at the site indicate that the remedy outlined in the 1992 AROD will not be effective in addressing contamination at the Whitehouse site. Most of the components of the treatment train identified for source materials will not work. Lead concentrations and pH levels encountered in the waste sludge would be toxic to bacteria, rendering biological treatment ineffective. Furthermore, the debris in the pits and the fine grained soil would limit the usefulness of the soil washing step. Treatability studies of the remaining component of the 1992 AROD treatment train, stabilization/solidification (S/S), concluded that conventional S/S was only feasible for Lift 2 materials. Tests showed that conventional S/S of Lifts 3 and 4 could immobilize lead, but remedial goals for organic contaminants could not be achieved. Though a proprietary S/S process showed promise in immobilizing both lead and organic contaminants in Lift 4 material, the sample used for the study had an unrepresentatively low lead concentration. The merits of applying this proprietary S/S technology are considered in more detail in the evaluation of Alternative 6.

Further analysis of earlier treatability studies conducted during the design of the original 1985 remedy revealed that the 1992 AROD groundwater remedy should not be implemented. The tests showed that, due to the high concentration of metals in the groundwater, chemical precipitation would result in the generation of approximately 87 tons of wet sludge per day, containing approximately 6 tons of solids which would require dewatering and disposal as a hazardous waste. The disposal of this material is estimated to increase the cost of the 1992 AROD remedy by 100%. In addition, treatability tests of the selected activated carbon technology showed almost immediate breakthrough of organic contaminants, rendering this component of the groundwater remedy ineffective.

Based on these findings, EPA has determined that the 1992 AROD must be modified to incorporate elements of the contingency remedy in the 1992 AROD, as well as elements of the original 1985 ROD.

4.0 Highlights of Community Participation

In accordance with Sections 113 and 117 of CERCLA, as amended, EPA has conducted community involvement activities at the Whitehouse site to solicit community input and to ensure that the public remains informed about site activities. EPA's Proposed Plan Fact Sheet for this amended remedy was mailed to the public on December 10, 1997, and a copy of the Administrative Record was made available in the information repository at the Whitehouse Elementary School. Public notices were published in *The Florida Times-Union* in Jacksonville, Florida, on December 12 and 13, 1997, advising the public of the availability of the administrative record and the date of the upcoming public meeting. EPA held a public meeting on December 16, 1997, at the Whitehouse Elementary School in Jacksonville, Florida, to answer questions and receive comments on the Agency's preferred alternative. A public comment period was also held from December 12, 1997 to January 12, 1998. No written comments were received during the public comment period. EPA's responses to significant oral comments received during the public meeting are included in the Responsiveness Summary in Section 3 of this Amended ROD.

5.0 Scope and Role of the Response Action

Contamination from the Whitehouse site has impacted soil, groundwater, sediment, wetlands, and surface water. Although each of these contaminated media is often addressed in separate phases, EPA has historically selected response actions for all contaminated media at the Whitehouse site in a single decision document. EPA first issued a ROD in 1985 selecting containment of the pit areas and adjacent wetlands and extraction and treatment of contaminated groundwater. In 1992, EPA amended the original ROD to change the remedy for source materials to a combination of soil washing, bioremediation, and stabilization/solidification (S/S), with the groundwater remedy remaining basically unchanged. However, EPA has determined that changes are needed to the overall site remediation strategy outlined in the 1992 ROD based on the results of the additional investigatory work and a supplemental treatability and feasibility study. Therefore, this 1998 AROD outlines EPA's amended remedy for addressing the principal threats posed by contaminated sludge, soil, and groundwater.

6.0 Summary of Site Characteristics

6.1 Surface Water Hydrology

The site is located in the McGirts Creek drainage basin. The primary surface water feature near the site is the northeast tributary of McGirts Creek, which is the approximate northern boundary of the site. Discharge of groundwater into the tributary provides a base flow for the creek. The National Wetlands Inventory published by the U.S. Department of Interior identifies a broad-leaf deciduous wetland area along the northeast tributary. Local surface drainage ultimately flows toward the southwest to McGirts Creek approximately 1,200 feet from the site. Previous berming and capping operations have raised the ground surface of the site by some five to nine feet above the original elevations. The present surface drainage at the site is toward the northwest to the northeast tributary of McGirts Creek, which also receives flow from site drainage ditches on the east and south of the site. Wastewater from the pits has at times been released into the adjacent wetland area and the McGirts Creek tributary due to failure of the berms, resulting in contamination of surface water and sediment. Although a temporary cap was constructed over the pits in the late 1970s, seeps through the pit berms are still evident, and sludge has "boiled" up through the surface cap.

6.2 Hydrogeology

The site is underlain by a shallow aquifer system consisting of several zones and a deeper Floridan aquifer system. The total thickness of the shallow system is approximately 150 feet. The total thickness of the Floridan system is greater than 2,000 feet.

6.2.1 Shallow System

The shallow aquifer system is composed of undifferentiated Holocene and Pleistocene age sediments deposited during the formation of marine terraces and beach ridges. The Holocene and Pleistocene deposits consist primarily of fine to medium grained loose quartz sands, iron oxides and sandy clay beds containing mollusk shell material. Underlying Pliocene and upper Miocene deposits consist of sand, shell, sandy clay, marl, and limestone. The shallow aquifer system can be subdivided into five zones: a shallow surficial unconfined zone; a more silty and/or naturally cemented surficial unconfined zone; a lower surficial unconfined zone; a semi-confining zone; and a limestone unit.

The shallow surficial unconfined zone consists of fine sand with a trace of silt, is generally saturated at depths of greater than about 1.5 to 5 feet below natural ground surface, and generally has a total thickness of about 12 to 20 feet. At the site, flow in the shallow surficial unconfined zone of the shallow aquifer is generally toward the west-northwest to the tributary of McGirts Creek. Underlying the shallow surficial unconfined zone is a stratum of relatively dense, occasionally cemented silty fine sand with a thickness ranging from about 9 to 14 feet. This silty zone partially separates flow in the shallow and lower portions of the unconfined surficial aquifer.

The lower portion of the unconfined surficial aquifer, underlying the more silty zone, consists of fine to medium sand with a trace to some silt and ranges from about 9 to 15 feet in thickness, extending to depths of between about 30 and 35 feet beneath the site. Flow in the lower portion of the surficial aquifer is generally toward the southwest to McGirts Creek.

The semi-confining zone, underlying the lower portion of the surficial unconfined aquifer, has a thickness ranging from about 73 to greater than 118 feet and consists generally of fine sand with some silt to silty sand with lenses and layers of clayey sand and sandy clay. Based on the results of field and laboratory testing presented in the 1987 Preliminary RA Design, the semi-confining strata have coefficients of vertical hydraulic conductivity ranging from about 2.5×10^{-8} to 2×10^{-5} centimeters per second (cm/sec). The overall effective horizontal coefficient of hydraulic conductivity for the confining strata is approximately 6×10^{-6} cm/sec and the overall effective vertical coefficient of hydraulic conductivity is approximately 5×10^{-7} cm/sec.

The limestone unit, known locally as the "rock" aquifer, is typically encountered at depths of between about 110 and 130 feet and comprises the major water producing zone for domestic use in the area. Most residents along Machelle Drive located down-gradient of the site have tapped this aquifer with private wells as their primary drinking water supply. Beneath the site, flow in the "rock" aquifer is generally toward the south-southwest.

6.2.2 Floridan System

The Floridan aquifer consists of carbonate deposits and supplies water to large volume users throughout most of Florida. The Floridan aquifer is separated from the shallow aquifer system by the confining beds of the Hawthorn Group. The Hawthorn Group has a typical total thickness of about 350 feet in the area of the site.

6.3 Summary of Previous Site Investigations

Prior to issuance of the 1992 AROD, the following site investigations were completed for the site:

- site investigations carried out by EPA in 1977 and 1979 presented in a Hazardous Waste Site Investigation Report, dated August 1979
- a Site Assessment conducted by FDER, dated December 1983
- a Feasibility Study conducted by Ecology & Environment, Inc., dated June 1985
- a Preliminary Remedial Action Design Analysis conducted by Environmental Science and Engineering, Inc. (ESE), dated March 1987
- Supplement Number One to the Preliminary Design Analysis by ESE, dated March 1988
- a Final Risk Assessment conducted by Ebasco Services Inc., dated September 1991
- a Final Treatability Study conducted by Ebasco, dated September 1991
- a Revised Final Supplemental Feasibility Study Analysis conducted by Ebasco Services Inc., dated October 1991

6.3.1 Results of Previous Groundwater Studies

Since 1968, seven groundwater sampling programs have been conducted at the site (1977, 1979, 1983, 1984, 1986, 1988, 1990). The following subsections present a number of conclusions concerning the nature and extent of the groundwater impacts at the site drawn from the results of the previous studies.

6.3.1.1 Surficial Unconfined Aquifer

Previous groundwater investigations have identified site-related contamination in both the shallow surficial unconfined aquifer and the lower portion of the surficial unconfined aquifer (i.e. depths of less than 20 feet, and 20 to 40 feet, respectively).

For the lower portion of the surficial unconfined aquifer, contaminant levels exceeding clean-up goals were detected within the area generally bounded by the site drainage ditches, to the east and south, and by the tributary of McGirts Creek, to the north and west. The number of detected target parameters in the lower surficial unconfined aquifer with concentrations exceeding the clean-up goals decreased from five inorganic parameters and six organic parameters in 1983 to one inorganic parameter (manganese) in 1990.

For the upper portion of the surficial unconfined aquifer, contaminant levels greatly exceeding clean-up goals were detected within the area noted above for the lower portion of the surficial unconfined aquifer and levels slightly exceeding the clean-up goals were detected in an area located on the north side of the tributary of McGirts Creek. The number of target parameters with concentrations exceeding clean-up goals decreased from five inorganic parameters and three organic parameters in 1983 to four inorganic parameters (chromium, lead, manganese, and selenium) and one organic parameter (naphthalene), with much lower concentrations, in 1990. However, the 1990 sampling did not include any of the wells located in the area of previous highest contamination between the site and the tributary of McGirts Creek.

6.3.1.2 Aquitard and "Rock" Aquifer

The "rock" aquifer is secure from contamination from the site due to the presence of over 73 feet of semi-confining strata (referred to as the aquitard) separating the surficial unconfined aquifer from the "rock" aquifer. The overall effective coefficient of vertical hydraulic conductivity of the aquitard is approximately 5×10^{-7} cm/s. Based on previous monitoring results for double-cased aquitard wells, double-cased "rock" aquifer wells, and local domestic wells, there is no evidence that the site has had any significant impact on the groundwater quality of either the aquitard or the "rock" aquifer.

Based on the indicated hydraulic conductivity and the hydraulic gradient between the surficial and "rock" aquifers (reported in the 1985 FS), it would theoretically take in excess of 400 years for any site contaminants to impact the "rock" aquifer, provided that the semi-confining strata were not artificially breached in the area of the site.

6.3.1.3 Summary

Based on a review of the previous studies, as discussed above, the following summary statements may be made concerning groundwater quality impacts attributable to the Site:

- major site groundwater impacts are generally limited to the surficial unconfined aquifer;
- in the surficial unconfined aquifer, the number of target parameters with concentrations exceeding clean-up goals is apparently decreasing over time as are the magnitudes of the exceedances (the 1990 sampling indicated only four of the twelve inorganic target parameters and one of the fourteen organic target parameters present at concentrations exceeding the clean-up criteria); and
- from the sampling conducted in 1990, large exceedances of the clean-up goals are present only within the shallow portion of the surficial unconfined aquifer (i.e. depths of less than 20 feet) and were generally limited to an area bounded by the site drainage ditches and the tributary of McGirts creek.

6.3.2 Previous Treatability Studies

Two treatability studies were conducted prior to issuance of the 1992 AROD. The first study was performed to support the development of the Remedial Design of the 1985 ROD. The second treatability study was performed to support the development of the 1992 AROD.

6.3.2.1 1987 Remedial Action Design

A treatability study for groundwater treatment was undertaken as a component of the 1987 Remedial Action Design conducted by ESE. The main purpose of the groundwater extraction component of the remedy was to establish and maintain an inward groundwater gradient for the containment system, thus preventing the outward leakage of contaminants. A total extraction rate of only 40 gallons per minute (gpm) was determined to be sufficient to produce the desired gradient. The treatment system for the extracted groundwater presented in the 1985 ROD consisted of: physical/chemical removal of metals through pH adjustment and flocculation/sedimentation, landfill disposal of the generated sludge, air stripping of volatile organics from the supernatant, activated carbon treatment of the stripper gasses followed by atmospheric release, and activated carbon treatment of the stripped water to remove semi- and non-volatile organics followed by discharge to the tributary of McGirts Creek. Because the selected remedy involved containment of the waste/soil materials rather than treatment, no treatability testing of waste/soil was carried out.

The groundwater treatability testing was conducted on large samples of site groundwater which were collected from shallow monitoring well S-18 (located in the area between the former oil pits and the tributary of McGirts Creek which had been identified as having the highest detected contaminant concentrations based on the results of previous sampling carried out in 1983). As discussed in the following paragraphs, numerous problems were encountered in supporting the design of the treatment system presented in the 1985 ROD.

To support the design of the air stripping component of the treatment system, the groundwater collected from well S-18 was analyzed to determine the concentrations of volatile organic compounds (VOCs). The results indicated that insufficient concentrations of VOCs were present to warrant the inclusion of an air stripper in the design. It was considered that the low VOC levels present would be adequately treated by the activated carbon component of the system. Consequently, the air stripping component was deleted from the treatment system.

To support the design of the physical/chemical metals removal component of the system, various pH adjustment/precipitation/flocculation/sedimentation tests were carried out. Using NaOH to raise pH coupled with the addition of cationic polymers to promote flocculation resulted in mixtures in which the solids would not settle. Using lime to adjust pH, a supernatant fluid and a sludge with a low solids content could be formed, however, large quantities of lime were required and extremely large volumes of sludge were generated. Based on a groundwater treatment rate of only 40 gpm, the system would require about 2.5 tons of lime per day and would generate approximately 87 tons of wet sludge per day, containing approximately 6 tons of solids. Due to the large quantities of lime necessary and the volumes of sludge requiring off-site disposal, the operation and maintenance costs of the system were estimated to be an order of magnitude greater than the 1985 FS estimate.

To support the design of the activated carbon component of the system, testing was carried out to establish the absorptive characteristics of the organic groundwater contaminants. Initially, 50 ml of groundwater was passed through 50 mg of activated carbon. Immediate breakthrough occurred for a number of semi-volatile organic compounds. The mass of activated carbon was then doubled and groundwater was passed through in 10 ml increments to establish breakthrough characteristics. Even with double the initial amount of activated carbon, breakthrough of semi-volatile organics occurred almost immediately (after only 20 ml of groundwater had passed through the carbon). The study concluded that, based on the nature of the semi-volatile organic contaminants in the site groundwater, clean-up goals could not be achieved using activated carbon treatment.

The groundwater remedy presented in the 1992 AROD was essentially the same as that presented in the 1985 ROD with the exception that the air stripper component was eliminated. Also, because the source remedy presented in the 1992 AROD did not involve containment, groundwater extraction would not be limited to a finite volume of the surficial aquifer contained within a low permeability barrier and, as a result, much larger extraction and treatment volumes (and reagent and by-product volumes) would be anticipated.

6.3.2.2 1991 Final Treatability Study

A final treatability study for the remediation of the waste/soil at the site was conducted by Ebasco and the results were presented in a Final Treatability Study report, dated September 1991. The study focused on soil washing, bioremediation, and stabilization/solidification technologies. The proposed treatment train which formed the basis for the treatability testing entailed soil washing of selected materials (selected based primarily on grain size characteristics) to separate coarse soil particles from organic contaminants and soil fines, bioremediation of the soil fines/organic contaminant slurry produced from the soil washing, stabilization/solidification of the coarse soil materials produced from the soil washing (if required based on metals concentrations), stabilization of the biotreatment end-products, and stabilization/solidification of all remaining soil/waste materials deemed unsuitable for soil washing and/or bioremediation based on grain size and ability to support the growth of bioremediation organisms.

One soil washing/bioremediation vendor and two stabilization/solidification vendors conducted treatability testing on composite samples of soil/waste obtained from the site in conjunction with Ebasco's 1990 trenching investigation. During the trenching investigation, one trench was reportedly excavated within each oil pit and samples were collected of the most visually contaminated material encountered. Three composite samples were produced for the treatability testing by combining similar materials (based on the analytical results) from the test trenches as follows:

- Sample TR-15 was composited from material from Pits 1 and 5, and was described as having an extremely pungent odor, a pH of 1.2, and a total organic carbon content of about 32 percent;
- Sample TR-23 was composited from material from Pits 2 and 3, and was described as having a predominantly sandy texture, a pH of 4.5, and a total organic carbon content of about 7.5 percent; and
- Sample TR-47 was composited from material from Pits 4 and 7, and was described as predominantly sandy in texture with a pH of 6.8 and a total organic carbon content of about 3 percent.

The material reportedly recovered from Pit 6 was determined to be not contaminated and was therefore not included in the treatability testing.

The soil washing/bioremediation study involved soil washing with plain tap water, incubation, and long-term bioreactor aerobic treatment. These methods were found to be successful for the treatment of organics in samples TR-23 and TR-47. However, no testing of the coarse soil fraction produced from the soil washing was carried out to determine whether subsequent stabilization/ solidification would be required to address the presence of metals. Sample TR-15 was found to have an insufficient content of coarse particles for soil washing to be feasible. In addition, it was found that the low pH of sample TR-15 would result in excessive sludge generation during neutralization (which would be required prior to biotreatment) and the high lead concentrations present were found to inhibit the cultivation of bioremediation organisms. It was therefore concluded that soil washing/bioremediation was unsuitable for treatment of sample TR-15.

Stabilization/solidification treatment testing was carried out by two vendors on samples of the same three composite materials used in the soil washing/biotreatment testing (i.e. samples TR-15, TR-23, and TR-47). In addition, stabilization/solidification testing was carried out by one of the two vendors on samples of the end products from the biotreatment reactor. For all of the testing, treatment consisted of the addition of proprietary organic bonding agents and cementitious/ pozzolanic binders in various mix proportions and concentrations.

Criteria for acceptability of the treatment methods were established by Ebasco. The acceptability criteria included a minimum compressive strength requirement at 14 days (20 pounds per square inch [psi]), a maximum permeability requirement (1×10^{-6} cm/s), and maximum leachability requirements based on Toxicity Characteristic Leaching Procedure (TCLP) testing. The leachability criteria established by Ebasco were extremely low and were reportedly calculated based on risk assessment considerations. TCLP criteria for the stabilization/solidification testing were established for three metals (cadmium, chromium, and lead) and five volatile organics (benzene, ethylbenzene, toluene, total xylene, and trichloroethene).

The results of the testing indicated that, with relatively large additions of reagents (40 to 100 percent of the waste by weight resulting in volume increases of 1.2 to 1.9 times), all of the acceptability criteria could be achieved with the exception of TCLP lead. The TCLP lead criterion established by Ebasco was 0.093 mg/l. TCLP lead concentrations ranging from none detected to 2.41 mg/l were indicated for the treated waste samples and TCLP lead for the treated bioreactor end-product samples ranged from none detected to 8.17 mg/l. It should be noted that the TCLP lead criterion for clean soil from soil thermal treatment facilities presented in the Florida Administrative Code (Chapter 62-775.400, F.A.C.) is 5.0 mg/l. With the exception of the bioreactor end-product for sample TR-15, all of the treated samples passed the 62-775 F.A.C. criterion for TCLP lead.

6.4 Summary of Investigations Following the 1992 AROD

Following the issuance of the 1992 AROD, the following additional studies were undertaken by the PRPs for the site pursuant to administrative consent orders with EPA:

- additional investigatory work (AIW) conducted by Golder Associates in 1994 and reported in a Draft Report on Additional Investigatory Work (approved as final by EPA), dated November 1994
- a Supplemental Treatability and Feasibility Study conducted by Golder Associates, dated July 1997

6.4.1 Additional Investigatory Work - 1994

During the initial stages of the design for the 1992 AROD remedy, EPA determined that additional investigatory work (AIW) was necessary to better define the nature and extent of contamination in the waste pits. Therefore, under an AOC, the PRPs completely excavated and characterized the contents of Pit 5 and dug test trenches in the remaining pits.

The results of the AIW identified four primary layers or "lifts" of material in each pit. The average thickness of each lift is shown in Table 1. Lift 1 consists of topsoil and clay (cap material), with a total estimated volume from all the pits of 17,600 cubic yards (cy). Analytical results from this material indicated no exceedance of remedial goals.

Lift 2 consists of a thin layer of shredded foam rubber and plastic overlying a layer of sawdust, wood chips, dimensional lumber, debris, and some silty sand. This layer has a slight organic odor. The volume of material in Lift 2 is 8,400 cy, with an additional 2,020 cy of sawdust. Analytical results showed exceedances of remedial goals for five compounds: antimony, cadmium, lead, bis(2-ethylhexyl)phthalate, and PCB 1260. Lead levels ranged from 1,060 to 2,100 ppm, and PCB 1260 concentrations fell between 0.78 and 7.2 ppm.

Lift 3 contains a variety of oil-stained or oil-coated debris, including predominantly dimensional lumber and tree branches, with lesser amounts of plastic, carpet remnants, rubber, metal debris, tires, white goods, and empty drums. Small pockets of oil were occasionally encountered, and the layer is characterized by a moderate organic petroleum odor. The volume of Lift 3 is 13,765 cy. Contaminants exceeding remedial goals included lead ranging from 4,270 to 8,420 ppm; PCB 1260, ranging from 1.6 to 2.7 ppm; and bis(2-ethylhexyl)phthalate, ranging from 41 to 97 ppm.

Lift 4 is a black acidic sludge with a strong acrid odor. The sludge fumes on exposure to the air. This sludge has a pH of between 0.7 and 1.2. Four constituents exceeded remedial goals: lead at concentrations ranging from 24,200 to 45,000 ppm, benzene ranging from non-detect to 2.8 ppm, PCB 1260 ranging from non-detect to 5.1 ppm, and trichloroethene ranging from non-detect to 19 ppm. In an undisturbed state, the sludge is well consolidated with a stiff consistency and a low permeability. The volume of Lift 4 material is 18,275 cy, for a total volume of 60,060 cy of waste material in all the pits.

6.4.2 Supplemental Treatability and Feasibility Study - 1997

Following completion of the additional investigatory work, EPA and the PRPs negotiated a modification to the AOC in 1995 for performance of the Supplemental Treatability and Feasibility Study (STFS). The purpose of the STFS was to supplement EPA's October 1991 Revised Final Supplemental Feasibility Study (FS) and the September 1991 Treatability Study (TS) by undertaking the following activities:

	Table 1					
	Average Layer Thickness (ft.)					Pit Volume
Pit	Lift 1	Lift 2	Lift 3	Lift 4	Sawdust	(cy)
1	2.5	1.0	2.5	7.6	--	13,340
2	2.1	1.5	2.1	--	1.5	3,785
3	2.3	1.9	2.5	2.2	1.7	7,125
4	1.5	1.3	2.8	4.8	1.5	7,430
5	1.1	1.9	5.2	6.0	--	7,825
6	2.9	1.5	3.9	4.9	--	16,775
7	3.4	--	--	4.2	--	3,780
				Total Volume (cy)		60,060

- re-evaluate the 1992 AROD remedy to optimize strategies for implementation, if feasible;
- identify and evaluate new and/or alternative treatment technologies and conduct appropriate treatability studies using samples of waste and soil from the site; and
- perform limited groundwater sampling at the site, re-evaluate the groundwater remediation components of the 1992 AROD remedy to identify optimal strategies for implementation, if feasible, and estimate the costs of implementation.

6.4.2.1 STFS Treatability Studies

The treatment technologies evaluated for the three Lifts of source material included stabilization/solidification (S/S) for Lift 2, thermal treatment and S/S for Lift 3, and thermal treatment, neutralization, and S/S for Lift 4. The results of these treatability studies are summarized below and presented in more detail in the July 1997 STFS Report.

S/S treatment of Lift 2 was found to be feasible. A cost of $70 per cubic yard was estimated for S/S treatment of Lift 2. High temperature thermal treatment with a residence time of 30 minutes was found to be effective in destroying organic contaminants in Lift 3. S/S of the generated ash would be required to address lead concentrations. An associated total treatment cost of approximately $200 per cubic yard was estimated for thermal treatment of Lift 3. Conventional S/S treatment of Lift 3 was found to effectively immobilize lead, but treatment goals for organics and compressive strength could not be achieved. A treatment cost of about $160 per yard was estimated for the S/S mixture which demonstrated the best results.

Neutralization using hydrated lime was found to be feasible for reducing the acidity of Lift 4. A cost of $225 per cubic yard was estimated for ex situ neutralization of Lift 4 to achieve a final pH of between 8 and 11. However, neutralization of Lift 4 would result in a substantial volume increase. Conventional S/S treatment of Lift 4 was found to be effective in reducing lead leachability if organic binding reagents were not included in the mixture, but ineffective for lead and organics when organic binding reagents were added. A cost of about $350 per yard was estimated for the conventional S/S mixture which demonstrated the best results. Conventional S/S treatment of Lift 4 would result in a volume increase ranging from 95 to 129 percent.

S/S treatment using proprietary processes appeared promising in immobilizing organics and lead in a sample of Lift 4 collected from the site. However, the sample treated had an unrepresentatively low lead concentration (4,000 mg/kg). A treatment cost of approximately $120 per yard was estimated for full scale treatment of Lifts 2, 3, and 4 based on the following assumptions: lead concentrations in Lift 4 representative of site conditions (i.e. 24,000 to 45,000 mg/kg), and comparably favorable results as was achieved with the non-representative sample. Estimates of volume increases for the proprietary S/S treatment of source materials ranged from 28 to 36 percent.

6.4.2.2 STFS Groundwater Investigation

To evaluate the feasibility of the groundwater remedy included in the 1992 AROD, a limited groundwater study was performed as part of the STFS. Monitor wells were sampled from three distinct zones in the underlying groundwater: the shallow unconfined surficial aquifer, the lower unconfined surficial aquifer, and the deeper "rock" aquifer. The maximum detected concentration for each contaminant exceeding remedial goals in each zone is shown in Table 2. Although a few contaminants have been detected above cleanup goals in the "rock" aquifer, annual sampling of private wells along Machelle Drive by the Florida Department of Health has indicated no contamination above drinking water standards.

Table 2
Groundwater Contaminant Concentrations

Compound	Maximum Concentration (ug/l)	Compound	Maximum Concentration (ug/l)
Shallow		*Intermediate*	
Cadmium	39	Chromium	2,500
Chromium	4,000	Manganese	1,200
Lead	270	Benzene	5.1
Manganese	3,500	Bis(2-ethylhexyl)phthalate	14
Nickel	2,000	Ethylbenzene	3.2
Zinc	24,000		
Benzene	12	*Deep*	
Ethylbenzene	4.7	Manganese	90
Naphthalene	12	Nickel	130
Trichloroethene	22	Bis(2-ethylhexyl)phthalate	25

7.0 Summary of Site Risks

The findings of the September 1991 Baseline Risk Assessment (BRA) for the site were presented in detail in the 1992 AROD. However, a brief summary of the human health and ecological portions of the BRA is presented below.

7.1 Human Health

The human health portion of the BRA is designed to evaluate the baseline risk posed by the site to people if no action is taken to address site contamination and to assess if actual or threatened releases of chemical contamination from the site pose health risks to exposed individuals under current or potential future conditions. The site itself is currently fenced and abandoned, and a soil cover has been placed over the waste pits. Waste sludge has oozed through the soil cover to the surface in a few places. Groundwater in the unconfined aquifer beneath and downgradient of the site is contaminated above drinking water standards. Groundwater samples from nearby private potable water supply wells completed in the "rock" aquifer have not detected contamination above drinking water standards.

7.1.1 Contaminants of Concern

The BRA identified contaminants of concern for each medium at the site based on the frequency of detection, their relationship to site activities, and other factors. Contaminants of concern for the Whitehouse site and their associated cleanup goals for soil and groundwater are shown in Table 3.

7.1.2 Exposure Assessment

The exposure assessment identified and evaluated the potential routes or pathways through which current residents, trespassers, or future residents could be exposed to site contaminants. For current exposure, it was determined that current residents may be exposed to contaminated off-site soil through recreational activities, gardening, and children at play. It was also assumed that residents could be exposed through eating vegetables grown in contaminated soil. Children and adults trespassing on the site could be exposed to on-site contaminated soil and surface water in site ditches. Although residents currently drink water from the local "rock" aquifer, analytic results of private wells indicate no contamination above drinking water standards, so this pathway was not evaluated as a current route of exposure. The specific current exposure pathways evaluated in the BRA are listed below:

1) Ingestion and dermal absorption of soil and exposed wastes
2) dermal absorption of contaminants in surface water
3) ingestion of vegetables grown in contaminated soil

Each of the current exposure pathways was also considered a potential future exposure scenario. In addition, it was assumed that in the future a resident could install a well into the shallow unconfined aquifer for both potable use and irrigation. Also, if no action was taken to address groundwater contamination in the unconfined aquifer, the deeper "rock" aquifer could become contaminated, thereby impacting existing water wells completed in that zone. The final future exposure pathways evaluated in the BRA are listed below:

1) Ingestion and dermal contact with soil
2) ingestion of vegetables grown in contaminated soil
3) inhalation of volatiles while irrigating vegetable crops

Table 3

Contaminant of Concern	Soil Cleanup Goal (mg/kg)	Groundwater Cleanup Goal (ug/l)
Inorganics		
Antimony	42	5
Arsenic	32	50
Barium	5,262	2,000
Cadmium	53	5
Chromium	526	100
Copper	3,905	1,300
Lead	400	15
Manganese	NA	50
Nickel	2,105	100
Selenium	NA	50
Vanadium	NA	150
Zinc	NA	5,000
Organics		
Acetone	NA	1,700
Benzene	0.4	1
Benzo(a)pyrene	0.1	0.2
Bis(2-ethylhexyl)phthalate	61.5	6
Chlorobenzene	42	NA
1,4-Dichlorobenzene	36	NA
Carbon Disulfide	NA	1,640
Di-N-Butyl Phthalate	7,911	NA
Ethylbenzene	NA	30
Methylene Chloride	115	NA
Methylethyl Ketone	NA	8,460
3/4-Methylphenol	NA	850
2-Methylnaphthalene	NA	67
Naphthalene	317	1,500
PCB 1260	1	NA
Phenol	47,467	10,000
Tetrachloroethene	4	NA
Toluene	2,000	40
Trichloroethene	1	3
Xylene	NA	20

Note: NA - No cleanup level established for this contaminant in this medium

4) ingestion of vegetables contaminated by groundwater
5) ingestion of groundwater
6) inhalation of volatiles during showering
7) dermal absorption of contaminants while showering
8) exposure to contaminants released from landfill waste.

7.1.3 Toxicity Assessment

The toxicity assessment evaluated possible harmful effects of exposure to contaminants of concern. For compounds which have the potential to cause cancer (carcinogenic), cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to these chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen to provide an upper-bound estimate of the excess lifetime cancer risks associated with exposure at that level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes under-estimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

References doses (RfDs) have been developed by EPA for predicting the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, that are thought to be without adverse affects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied. These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The CPFs and RfDs for the contaminants of concern at the Whitehouse site are listed in Tables 4 and 5, respectively.

7.1.4 Risk Characterization

The risk characterization combines the other components of the risk assessment to estimate the overall risk from exposure to site contamination. For carcinogenic compounds, risk is a probability that is expressed in scientific notation. For example, an excess lifetime cancer risk of $1x10^{-6}$ means that an individual has an additional 1 in 1,000,000 chance of developing cancer as a result of site-related exposure over an estimated 70 year lifetime. EPA has established a target risk range for Superfund cleanups of between $1x10^{-4}$ (1 in 10,000) and $1x10^{-6}$. For the Whitehouse site, the overall cancer risk was estimated to be $3.7x10^{-5}$, which falls within EPA's acceptable risk range.

For compounds which cause toxic effects other than cancer, EPA compares the concentration of a contaminant found at the site with a reference dose (RfD) representing the maximum amount of a chemical a person could be exposed to without experiencing harmful effects. The ratio of the actual concentration to the RfD for a particular compound is the hazard quotient. The sum of the hazard quotients of all contaminants of concern within a particular media is known as the hazard index (HI). EPA considers an HI of 1.0 to be a threshold for considering remedial action. For the Whitehouse

Table 4

Toxicologic Criteria Values for Carcinogenic Health Effects

SUBSTANCE	WEIGHT OF EVIDENCE CLASSIFICATION	ORGAN(S) AFFECTED	CANCER POTENCY FACTOR (SLOPE FACTOR) $(mg/kg/day)^{-1}$ ORAL[1/]	INHALATION	SOURCE
Cadmium	B1	Lung, Respiratory Tract	*	6.1	IRIS
Chromium	A[2/]	Lung	*	41[2/]	IRIS
Nickel	A[3/]	Respiratory Tract	*	0.84[3/]	HEAST
Methylene Chloride	B2	Lung, Liver	0.0063	0.0063	HEAST
Bromodichloromethane	B2	Liver	0.13	NA	HEAST
Tetrachloroethene	B2	Leukemia, Liver	0.051	0.0033	HEAST
Trichloroethene	B2	Lung, Liver	.011	.017	HEAST
1,4-Dichlorobenzene	B2	Liver	0.024	NA	HEAST
bis(2-ethylhexyl)phthalate	B2	Liver	.014	NA	HEAST
PCBs	B2	Liver	7.7	NA	IRIS

Notes: 1/ * = Not carcinogenic by this route
2/ Values given are for hexavalent chromium
3/ Value given is for Nickel refinery dust
NA = Not Available

Table 5

Toxicologic Criteria Values for Non-Cancer Health Effects

SUBSTANCE	ORAL EXPOSURE: RfD $(mg/kg/day)^{-1}$	ORAL EXPOSURE: UNCERTAINTY FACTOR	ORAL EXPOSURE: ORGAN(S) AFFECTED	INHALATION EXPOSURE: RfD $(mg/kg/day)^{-1}$	INHALATION EXPOSURE: UNCERTAINTY FACTOR	INHALATION EXPOSURE: ORGAN(S) AFFECTED	SOURCE
Antimony	4.0×10^{-4}	1000	Hematopetic System	NA	NA	NA	IRIS
Barium	5×10^{-2}	100	Blood	1×10^{-4}	1000	Fetotoxicity	IRIS
Cadmium	5×10^{-4} 1/	10	Kidney	NA	NA	NA	IRIS
Chromium	5×10^{-3} 2/	500	Not Defined	NA	NA	NA	IRIS
Cobalt	NA 1/	NA	NA	3.4×10^{-5}	100	Cardiac	OSHA TLV
Copper	3.7×10^{-2}	None	Gastric Irritation	NA	NA	NA	MCL
Lead	NA	NA	Developmental	NA	NA	NA	Ebasco Based on PMCL
Manganese	2×10^{-1}	100	Central Nervous System	3×10^{-9}	100	Central Nervous System	IRIS
Mercury	3×10^{-4}	10	Central Nervous System	NA	NA	NA	IRIS
Nickel	2×10^{-2} 3/	300	Reduced Organ Weight	NA	NA	NA	IRIS
Selenium	3×10^{-3}	1000	Skin, Muscles	1×10^{-3}	Skin, GI Tract	1000	HEAST
Vanadium	9×10^{-3}	1000	?	NA	NA	NA	HEAST
Zinc	2×10^{-1}	10	Anemia	NA	NA	NA	HEAST
Methylene Chloride	6×10^{-2}	100	Liver	NA	NA	NA	HEAST
Acetone	0.10	1000	Liver, Kidney	NA	NA	NA	HEAST
Carbon Disulfide	0.10	100	Fetotoxicity	NA	NA	NA	IRIS
1,2-Dichloroethenes	2×10^{-2}	1000	Liver	NA	NA	NA	HEAST
4-methyl-2-pentanone	5×10^{-1}	100	Liver, Kidney	2×10^{-1}	100	Liver, Kidney	HEAST
Tetrachloroethene	1×10^{-2}	100	Liver	NA	NA	NA	HEAST
Toluene	3×10^{-1}	100	Eye and Nose Irritation	6×10^{-1} 4/	100	Nose/Throat Irritation	HEAST
Chlorobenzene	2×10^{-2}	1000	Liver, Kidney	5×10^{-3}	10,000	Liver, Kidney	HEAST
Xylenes, Total	2	100	Hyperactivity, Decreased Body Weight, Increased Mortality	1×10^{-1} 4/	100	Nose/Throat Irritation	HEAST
Phenol	0.60	100	Fetotoxicity	NA	NA	NA	HEAST
1,4-dichlorobenzene	NA	NA	NA	7×10^{-1}	100	Liver, Kidney	HEAST
Benzoic Acid	4.0	1	Irritation	NA	NA	NA	HEAST
Di-n-butylphthalate	1.0	100	Mortality	NA	NA	NA	HEAST
Bis-(2-ethylhexyl)-phthalate	2×10^{-2}	1000	Liver	NA	NA	NA	HEAST
Naphthalene/2-methyl-naphthalene	4×10^{-3}	1000	Ocular	NA	NA	NA	IRIS
1,4-Dichlorobenzene	NA	NA	NA	7×10^{-1}	100	Kidney/Liver	HEAST

Notes: 1/ Value given is for ingestion of groundwater.
2/ Value given is for hexavalent chromium.
3/ Value given is for nickel refinery dust.
4/ Values for toluene and xylene are based on inhalation RfD concentrations from HEAST.
NA = Not Available

site, the HI for all routes of exposure is 12, due primarily to chromium and antimony, indicating the need for remedial action. A summary of the cancer and non-cancer risks for each pathway is presented in Table 6.

To evaluate the potential risks associated with lead contamination for a combined current and future exposure scenario, EPA uses the Biokinetic Uptake (IUBK) Model. This model is used in the absence of chronic toxicity values to predict blood lead levels in sensitive age group populations. The concentrations for each medium used in the model included 0.33 ug/day from surface soils, 56 ug/day from exposed wastes, 8.1 ug/day from vegetables, and 306 ug/day from shallow groundwater. The model predicted blood lead levels of 23.2 ug/dl due to the potential current exposure pathway of incidental ingestion of exposed wastes and 127 ug/dl due to potential future ingestion of shallow drinking water. Since blood lead levels exceeding 10 ug/dl have been linked to neurological effects and nervous system damage in children, the lead levels in groundwater and exposed wastes represent an unacceptable risk.

7.2 Environmental Evaluation

An environmental evaluation was performed as part of the Risk Assessment which included: 1) a review of the chemical concentrations in various media to establish the presence, concentration, and spatial variability of specific toxic chemicals, 2) an ecological survey to establish current impacts to flora/fauna, and 3) toxicity comparisons to establish a link between toxicity of the wastes and adverse ecological effects.

The ecological system of primary concern is the McGirts Creek tributary which is located two-hundred feet north of the site. A wetland area and ditch system surrounds the site and empties into this creek. This system was reportedly impacted based on past sampling and observations primarily from releases along the northeast tributary. The 1983 RI reports that an ecological survey of the northeast tributary and McGirts Creek conducted in 1980 by FDER showed that the species diversity indices upstream in the tributary and in McGirts Creek were typical of healthy stream systems. About 100 yards downstream from the site, the investigators could not find any macro-invertebrates. In McGirts Creek at U.S. Highway 90, a February 1980 biological survey by FDER found three species and a low number of taxa, suggesting that the system was under stress. Later observations in 1982 noted the presence of several small fish and dense vegetation along the banks and in the stream, which indicated that the system was improving. In 1980, samples demonstrated that chromium, lead, zinc, iron, and cadmium were present in water from the site drainage ditches.

During EPA's 1990 site investigation, the tributary adjacent to the site was dry over half its length, and the remaining portion was stagnant and shallow, with a brownish tinge. No stressed vegetation was observed, and no fish or amphibians were observed. Sediment samples were devoid of contaminants, while surface water samples indicated the presence of aluminum, barium, lead, manganese, zinc, and carbon disulfide.

A preliminary natural resource survey (PNRS) dated August 17, 1994, performed by the U.S. Department of the Interior identified areas around the site as potential habitat for the Federally-listed endangered eastern indigo snake. However, neither the PNRS nor any other investigation reports

Table 6
Summary of Risks - Combined Exposure Pathways

Exposure Route	Lifetime Cancer Risk	Major Contributors to Risk	Hazard Index	Major Contributors to Hazard Index
<u>Current Land Use</u>				
Surface Soil	1.9e-08	1,4-Dichlorobenzene (80%)	5.7e-04	Naphthalene (93%)
Exposed Waste	7.6e-06	PCB 1260 (100%)	2.6e-02	Antimony (32%) Barium (42%)
Surface Water	NA	NA	3.5e-04	Carbon Disulfide (99%)
Home-Grown Vegetables	2.7e-05	1,4-Dichlorobenzene (100%)	1.3e-01	Naphthalene (99%)
Total Current Use	**3.5e-05**		**1.6e-01**	
<u>Future Land Use</u>				
Irrigation Water (Inhalation)	6.3e-10	Trichloroethene (100%)	1.8e-05	Methylethyl Ketone (50%)
Home-Grown Vegetables	NA	NA	1.4e-02	Naphthalene (99%)
Groundwater Consumption	2.0e-06	Trichloroethene (100%)	4.8e+00	Antimony (65%) Chromium (16%)
Deep Groundwater Consumption	NA	NA	1.2e+01	Antimony (83%) Chromium (12%)
Total Future Use[1]	**2.0e-06**		**1.2e+01**	
Lifetime Risk[2]	3.7e-05		1.2e+01	

[1]The Total Future Use was calculated using worst case values, since residents would be expected to use a well completed in only one zone (either the shallow unconfined aquifer or the deep "rock" aquifer). For lifetime cancer risk, the shallow groundwater value was used. For non-cancer hazard index calculations, the risk associated with deep groundwater consumption was used.

[2]The Lifetime Risk was calculated by adding the current and future use values.

indicate that the eastern indigo snake has ever been observed at the site. The PNRS also notes that the St. Johns River, 20 miles downstream of the site, provides habitat for the shortnose sturgeon and the West Indian manatee, both of which are Federally-listed endangered species.

8.0 Description of Alternatives

Under a modified AOC with EPA, a group of PRPs completed the STFS in which the 1992 AROD remedy was evaluated against 3 groundwater alternatives and 7 source control alternatives. The groundwater alternatives are included in Alternatives 2, 3, and 4, which are described below.

8.1 Remedy from 1992 Amended ROD

The 1992 AROD source control remedy entailed excavation of the waste pits; treatment using a combination of soil washing, biotreatment, and stabilization/solidification; onsite disposal of treated soil; and installation of a vegetative cover and site fence. The groundwater remedy entails extracting groundwater from the surficial aquifer; treating extracted groundwater to remove contaminants; discharging the treated water to the tributary of McGirts Creek; off-site disposal of treatment by-products; and deed restrictions to preclude incompatible land use. The estimated net present worth cost of the 1992 AROD remedy is $18,907,480. This includes $15,443,293 in capital costs, $204,000 in annual operation and maintenance costs for the groundwater recovery system over 23 years, and $40,763 in annual groundwater monitoring costs over an assumed 30-year period.

8.2 Alternative 1 - No Action

This alternative involves no remediation activities and serves as a baseline of comparison for other alternatives. The net present worth cost of Alternative 1 is $91,898 associated with performing a review every five years as required by the CERCLA law to evaluate the effectiveness of the remedy in protecting human health and the environment. To facilitate cost comparison, a period of 30 years is assumed during which six 5-year reviews would be conducted.

8.3 Alternative 2 - Containment

This alternative consists of the containment of source materials and the majority of the contaminated groundwater plume through the installation of a vertical barrier (slurry wall or geosynthetic sheet pile wall) around the perimeter of the site encompassing the former pits and the flood plain area north of the pits and construction of a low permeability cap over the contained area which meets Resource Conservation and Recovery Act (RCRA) closure requirements under 40 CFR 264.228(a)(2). The McGirts Creek tributary will be realigned to optimize the area of groundwater containment. Deed restrictions will be sought to control future land use and groundwater use, the municipal water supply system will be extended to nearby residences, and private supply wells will be plugged. The remedy for contaminated groundwater outside the barrier will be monitored natural attenuation. It is anticipated that groundwater contaminant levels outside of the barrier will decline and meet drinking water standards within 3 to 6 years. Surface water and sediment will be evaluated during design to determine if additional measures are necessary downstream. The estimated net present worth cost of this alternative is $6,291,959. This includes $4,724,000 in capital costs, $96,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

8.4 Alternative 3 - Containment, Lime Curtain

This alternative is identical to Alternative 2 with the addition of a lime curtain inside the containment system to adjust the groundwater pH to precipitate manganese within the limits of the containment system. The lime curtain would consist of hydrated lime mixed in situ with native soil using a multiple auger mixing system. The net present worth cost of this alternative is $7,720,684. This includes $5,999,000 in capital costs, $106,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

8.5 Alternative 4 -Containment, Lime Curtain, In Situ Groundwater Neutralization

This alternative is identical to Alternative 3 with the addition of in situ neutralization of groundwater within the limits of the containment system. Neutralization would involve injecting a sodium hydroxide solution into the surficial unconfined aquifer through wells spaced on a 50-foot grid pattern. The treatment would raise groundwater pH and reduce the solubility of metallic contaminants, thereby promoting precipitation. The net present worth of this alternative is $9,392,809. This includes $7,671,125 in capital costs, $106,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

8.6 Alternative 5 - Containment, Lime Curtain, and Ex Situ Neutralization of Lift 4

This alternative is identical to Alternative 3 with the addition of excavation and neutralization of Lift 4 materials. Excavation and neutralization would take place within a "bubble building" or tension structure provided with a gas scrubbing system to preclude odor and gas emissions. The structure would be moved across the site to cover active areas as work proceeds. Lift 4 materials would be excavated, neutralized by mixing with hydrated lime, replaced into the excavation, and backfilled with the excavated materials. The net present worth cost of this alternative is $13,851,829. This includes $12,130,145 in capital costs,$106,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

8.7 Alternative 6 - Containment, Lime Curtain, and Ex Situ Stabilization of Pit Contents

This alternative is identical to Alternative 5 but with full ex situ stabilization of Lifts 2, 3, and 4 to comply with appropriate leaching criteria. Following excavation, material from all three lifts would be homogenized, neutralized, and stabilized within a "bubble building" or tension structure. The source materials would be stabilized using a proprietary process similar to that tested during the STFS, and replaced into the excavation. The net present worth of this alternative is $14,014,684. This includes $12,293,000 in capital costs, $106,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

8.8 Alternative 7 - Containment, Lime Curtain, and In Situ Stabilization of Lifts 1 and 2

This alternative is identical to Alternative 3 (containment with lime curtain) with the addition of the in situ stabilization/solidification treatment of Lifts 1 and 2 to immobilize lead in Lift 2 and provide structural stability for construction of the surface cap. Lifts 1 and 2 would be blended together and mixed with a Portland cement to a depth of about 3 feet over the entire Pit area. A geogrid would then be incorporated into the upper surface of the treated material prior to final compaction and curing to provide additional structural stability. The net present worth cost of this alternative is $8,454,670. This includes $6,732,986 in capital costs, $106,020 in annual monitoring and maintenance costs over a 30-year period, and $91,891 for conducting 5-year reviews over a 30-year period.

9.0 Comparative Analysis of Alternatives

EPA has established nine criteria for use in assessing the relative advantages and disadvantages of each alternative. The performance of each alternative (including the 1992 AROD remedy) relative to these criteria and the other alternatives is discussed below.

9.1 Overall Protection of Human Health and the Environment

With the exception of Alternatives 1 and 2 and the 1992 AROD remedy, all of the alternatives are protective of human health and the environment. Although the 1992 AROD remedy was designed to achieve protection through a combination of treatment technologies, treatability tests have demonstrated that most of the treatment components for both source materials and groundwater will not work. The Risk Assessment documented that, left in its current state (i.e. Alternative 1, no action), the site currently poses an unacceptable threat to human health and the environment. For Alternative 2, some pH impacts on groundwater and exceedance of the clean-up goal for manganese is expected. Each of the remaining alternatives would treat or isolate the source materials and eliminate risks associated with contact and exposure, and each includes extending the municipal water supply to nearby residences, thereby reducing risks through elimination of the groundwater ingestion pathway and significant reduction of contaminant migration. Alternatives 3, 4, 5, 6, and 7 would be equally protective of groundwater.

9.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternative 1 would not comply with groundwater ARARs, and Alternative 2 would continue to allow groundwater exceeding the clean-up goals for manganese and pH to leak from the containment system. Treatability tests have demonstrated that the 1992 AROD remedy would not be able to meet ARARs for groundwater. Alternatives 3, 4, 5, 6, and 7 would comply with all ARARs through a combination of treatment, containment, and natural attenuation.

Because Alternatives 1 and 2 do not meet the threshold criteria of protection of human health and the environment and compliance with ARARs, these alternatives will be dropped from further consideration. Although the 1992 AROD remedy does not meet the threshold criteria, it will be carried through the comparative analysis as required by EPA guidance.

9.3 Short Term Effectiveness

Alternatives 3, 4, and 7 pose minimal risks to workers and the public during implementation since they involve minimal disturbance of waste materials through the use of in-situ treatment technologies. Significant short-term risks to workers and the public are potentially associated with the 1992 AROD remedy and Alternatives 5 and 6, all of which involve excavation and handling of the acidic Lift 4 source materials which could potentially create acidic fumes as was experienced during the AIW.

9.4 Long Term Effectiveness and Permanence

The 1992 AROD remedy is the only alternative that is designed to achieve significant risk reduction without requiring long-term, perpetual monitoring and maintenance. However, treatability tests have shown that the critical elements of the source and groundwater remedies would not work. The other alternatives would provide substantial risk reduction to protective levels through a combination of treatment, containment, and institutional controls, but each would also require perpetual maintenance of the containment system components to ensure long-term effectiveness.

9.5 Reduction of Mobility, Toxicity, or Volume through Treatment

Alternatives 6 and 7 provide the greatest reduction in contaminant mobility through treatment via stabilization/solidification. Alternative 6 provides the greatest degree of toxicity reduction through treatment of all source materials and passive groundwater treatment via the lime curtain. Alternatives 4 and 5 would reduce toxicity through neutralization of groundwater or Lift 4 materials, respectively. Alternatives 3 and 7 would provide toxicity reduction through passive groundwater treatment only. The 1992 AROD remedy would result in substantial increases in volume through the generation of hazardous groundwater treatment sludge which would require off-site disposal. Alternatives 4, 5, and 6 would result in significant volume increases due to the neutralization and stabilization processes used, while Alternative 7 would result in a relatively minor volume increase due to stabilization. Alternative 3 would have no impact on contaminant volume.

9.6 Implementability

The 1992 AROD remedy is not technically feasible because treatability studies demonstrated that the proposed treatment technologies for both source and groundwater contamination are not effective. Alternatives 5 and 6, which involve excavation and ex situ treatment of source materials, pose significant technical challenges associated with the management of acidic fumes generated during excavation and neutralization of waste from the pits. Additional treatability testing would be required during the Remedial Design (RD) to verify the technical feasibility of stabilizing source materials using a proprietary process. The remaining alternatives utilize conventional construction methods which are widely available and easily implemented.

9.7 Cost Effectiveness

Alternative 3 has the lowest cost ($7,720,684), followed by Alternative 7 ($8,454,670) and Alternative 4 ($9,392,809). The cost of Alternative 5 ($13,851,829) and Alternative 6

($14,014,684) is very similar. The estimated cost of the 1992 AROD remedy ($18,907,480) is over 140 percent higher than the lowest cost protective remedy. Based on the treatability study results reported in the STFS, this cost could increase substantially due to the significant volume of sludge generated by the groundwater treatment system.

9.8 State Acceptance

On behalf of the State of Florida, FDEP has been the support agency throughout the history of the Whitehouse site. As such, FDEP has played an active role in all stages of the Superfund decision-making process and has participated in the development of this 1998 AROD. Although FDEP has indicated support for the overall approach of the selected remedy, FDEP is unwilling to concur with this AROD because FDEP disagrees with the groundwater remediation goal selected for naphthalene.

9.9 Community Acceptance

EPA published a Proposed Plan Fact Sheet in December 1997 outlining the alternatives EPA considered and identifying EPA's preferred alternative for addressing contamination at the Whitehouse site. A public meeting was held on December 16, 1997, to explain the alternatives EPA considered and to receive oral comments on the Proposed Plan. A copy of the transcript from this meeting is included in the Administrative Record for the site, and any significant comments have been addressed in the Responsiveness Summary section of this 1998 AROD. In addition, EPA held a 30-day comment period from December 12, 1997, through January 12, 1998, during which no written comments were received. Based on comments received from the public during the public meeting, community residents support EPA's selected remedy.

10.0 Selected Remedy

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of the alternatives using the nine criteria, and State and public comments, EPA has determined that Alternative 7 is the most appropriate amended remedy for the Whitehouse Waste Oil Pits site in Jacksonville, Florida.

10.1 Components of the Selected Remedy

Approximately 19,000 cubic yards of material in Lifts 1 and 2 shall be treated using in situ S/S to immobilize contaminants of concern in Lift 2 and provide structural stability for construction of the surface cap. Lifts 1 and 2 shall be blended together and mixed with Portland cement to a depth of about 3 feet over the entire Pit area. From the treatability study results in the STFS Appendix D, it is expected that a mix ratio of 10 percent by weight of Portland cement would be sufficient to effectively immobilize lead in Lift 2. However, although the STFS confirmed the effectiveness of the proposed mix for lead in Lift 2, it did not evaluate the immobilization of antimony, cadmium, bis-(2-ethylhexel)-phthalate, and PCB 1260, which were also above target clean-up goals in Lift 2. Therefore, additional treatability tests shall be conducted on Lift 2 during the development of the RD to confirm that the proposed mix will adequately immobilize these additional contaminants of concern. In addition, the stabilized material shall meet the performance standards identified in section

10.2 of this 1998 AROD. Prior to final compaction and curing of the stabilized material, a biaxial geogrid shall be incorporated into the upper surface of the treated material to provide additional structural stability and tensile strength. Based upon this cap design, neither industrial nor residential future use is anticipated for the capped area.

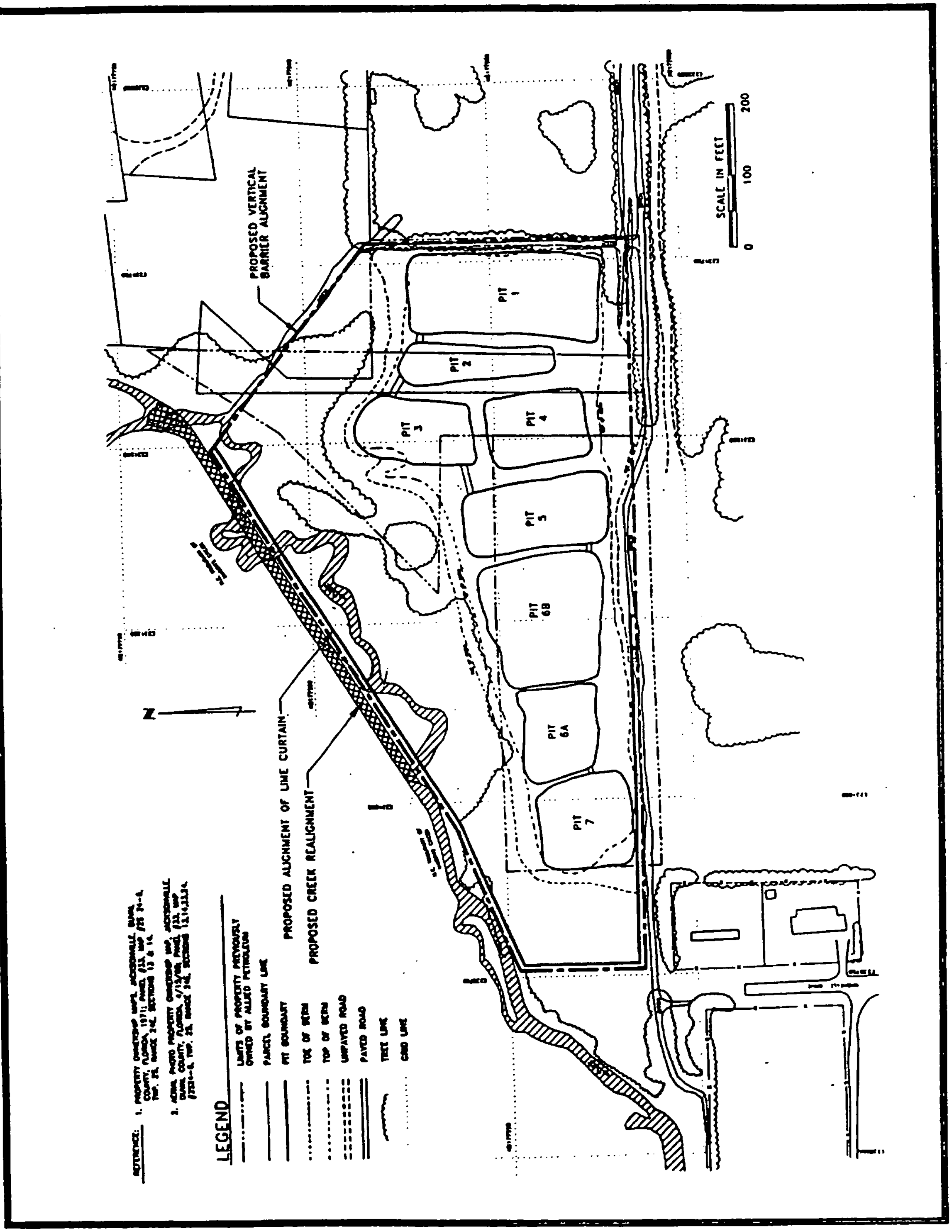
The source materials and the majority of the contaminated groundwater plume shall be contained through the installation of a vertical barrier around the perimeter of the site encompassing the former pits and the flood plain area north of the pits (see Figure 3). The vertical barrier shall extend through the full depth of the surficial unconfined aquifer and keyed into the underlying semi-confining strata (estimated to be 40 ft.). The barrier shall consist of a slurry wall (using bentonite or attapulgite clay) or a geosynthetic sheetpile wall. An analysis shall be conducted during design to determine the most effective vertical barrier. Tests of various soil-bentonite slurries during the design of the 1985 remedy were not able to achieve the desired permeability of $1x10^{-7}$ cm/sec. However, the report indicated that if sufficient bentonite is added, an appropriate off-site sand source is located, and fresh water is used to make the slurry, the permeability performance standard could be achievable. Alternatively, attapulgite clay may result in a more impermeable slurry, or a geosynthetic sheet pile may be appropriate. Regardless of what type of wall is selected, the vertical barrier shall have a maximum permittivity of $1.1x10^{-9}$ sec^{-1} (equivalent to 3 ft. thickness with a hydraulic conductivity of $1x10^{-7}$ cm/sec).

To support the design of the vertical barrier and supplement the results of the boring program previously conducted by Ardaman, additional subsurface investigation and laboratory analyses shall be conducted during the RD to confirm the depth and suitability of the confining strata underlying the site and to define the nature and vertical extent of soil and groundwater impacts along the down gradient boundary of the vertical barrier. The depth and permeability of the confining strata shall be determined as a basis for establishing the required depth of the barrier. In addition, the nature and vertical extent of soil and groundwater impacts along the down gradient alignment of the barrier will influence the required depth of the barrier, determine slurry mixture design/compatibility requirements (if a slurry wall is chosen for the barrier), and determine whether spoil from barrier construction can be used in general site grading or must be placed within the containment system.

In order to optimize the area of groundwater containment, the McGirts Creek tributary shall be realigned contingent on the results of the ecological evaluation described below. Appropriate engineering and control measures shall be implemented to reduce or eliminate the potential for flooding, accommodate habitat functions, minimize impacts on surface water quality, and control erosion. Such measures may include staging the realignment such that the existing section of creek is unaffected until final upstream and downstream connections are made, using silt curtains during construction, implementing comprehensive erosion control measures during construction (e.g. hay bales, silt fences, mulch), and incorporating long term erosion and flood control features such as recreating the meander of the creek, permanent erosion control blankets, fiber rolls/bio-logs, plant revetments, and drop structures into the realigned section.

Sampling of sediment and surface water in McGirts Creek and the tributary shall be conducted during the RD to evaluate the extent of any impacts due to the site. In addition, a limited ecological evaluation of the adjacent wetland areas and the creek (including a habitat survey) shall be conducted

Figure 3. Location of Vertical Barrier and Lime Curtain



during the RD to establish current baseline conditions and provide data to aid in decision-making with respect to the merits and potential negative aspects of realignment. If flourishing or endangered animal populations are identified in the proposed realignment area during the ecological assessment, the potential disruptive aspects of realignment may outweigh the benefits and the creek alignment might not be altered. Consequently, the surface water and sediment sampling and ecological assessment shall be conducted as an initial phase of the RD so that the vertical barrier alignment can be finalized based on the results.

A lime curtain shall be constructed on the interior of the down gradient half of the containment system to adjust the groundwater pH and precipitate manganese within the limits of the containment system (see Figure 3). The lime curtain shall be a continuous 30-inch thick wall extending from the ground surface through the full depth of the unconfined aquifer. It shall consist of hydrated lime mixed in situ with native soil using a multiple auger mixing system. Thus, the installation of the lime curtain would require no excavation or removal of potentially contaminated soil. The precipitation of metal hydroxides within the lime curtain is expected to reduce the permeability of the lime curtain over time. Therefore, wells or piezometers shall be installed upgradient of the lime curtain to monitor water levels within the containment system.

A low permeability cap shall be constructed over the contained area which meets Resource Conservation and Recovery Act (RCRA) closure requirements under 40 CFR 264.228(a)(2)(iii). The cover system shall be designed and constructed to achieve the following criteria:

- Provide long-term minimization of the migration of liquids through the contained area;
- Function with minimum maintenance;
- Promote drainage and minimize erosion or abrasion of the final cover;
- Accommodate settling and subsidence so that the cover's integrity is maintained; and
- Have a permeability equal to or less than the permeability of the vertical barrier.

In addition to minimizing the infiltration of rainwater into the containment area, the cap also prevents leachate from the pits from migrating into the adjacent wetlands and surface water and eliminates the potential for direct contact by humans and fauna with contaminated soil in the area between the pit berms and the McGirts Creek tributary.

Capping of the wetland area and realignment of the McGirts Creek tributary are activities which constitute a discharge of dredged and fill material into waters of the United States, which is regulated by Section 404 of the Clean Water Act (CWA), 33 U.S.C. Section 1344. The requirements of CWA Section 404 and the associated Section 404(b)(1) Guidelines at 40 CFR Part 230 are therefore applicable to the implementation of these activities. Nationwide Permit 38 applies to cleanup of hazardous and toxic wastes in wetlands, but does not apply to activities undertaken entirely on a CERCLA site as required by EPA. Accordingly, Nationwide Permit 38 is not applicable here. However, the General Conditions of this nationwide permit are relevant and appropriate requirements, and the remedy must meet the substantive requirements of CWA Section 404 and the Section 404(b)(1) Guidelines. The Guidelines require a hierarchical approach to mitigation measures which includes impact avoidance, impact minimization, and compensatory mitigation. Compliance with this three step process with respect to the selected remedy for the Whitehouse site is evaluated below:

Impact Avoidance

The Section 404(b)(1) Guidelines require EPA to avoid any direct or indirect impacts to wetlands if there is a practicable alternative to the proposed discharge that would have less adverse impact to the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. EPA has determined that the selected remedy may adversely impact an estimated 3 acres of the adjacent wetland area both directly and indirectly. Realignment of the McGirts Creek tributary would involve excavation of a new channel and filling of the old channel, thereby changing the surface hydrology. Capping of the wetland and portions of the McGirts Creek tributary would change the surface hydrology by reducing the infiltration of rainwater and altering the slope and elevation of areas adjacent to the wetlands. In addition, the clearing and grading operations necessary to build the cap would destroy the vegetative community and any associated habitat. Installation of the vertical barrier would alter both surface and subsurface hydrology by significantly reducing the flow of groundwater into the tributary along an estimated 800 ft. section of the creek. All of these impacts are expected to be permanent.

EPA has determined that contamination from the Whitehouse site has impacted the adjacent wetland areas. At least two spills of waste material from the pits have resulted in sediment and surface water contamination in the McGirts Creek tributary. Leachate seeps from the pit berms provide a continuing source of contamination to soil, sediment, and surface water in the wetland areas. Finally, contaminated groundwater from both sides of the McGirts Creek tributary is potentially discharging into the creek. EPA's risk assessment documents that taking no action to address contamination in soil, groundwater, and sediment would not be protective of human health and the environment and would potentially allow continuing contamination of both the adjacent wetlands and downstream wetlands. Treatability studies have documented that no treatment technology can cost-effectively treat contaminated source materials and groundwater. Therefore, EPA has determined that no practicable alternative to the selected remedy exists that would have less impact to the aquatic ecosystem without significant adverse environmental consequences.

Impact Minimization

If a discharge cannot be avoided, the Guidelines at 40 CFR Part 230.10(d) require that all appropriate and practicable steps be taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem. Subpart H of 40 CFR Part 230 sets forth the steps which can be taken to minimize the effects of fill activities. Section 230.75(d) states that habitat development and restoration techniques may be used to minimize adverse impacts and to compensate for destroyed habitat.

Compensatory Mitigation

Appropriate and practicable compensatory mitigation may be required for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been attained. The "Memorandum of Agreement between the U.S. Army Corps of Engineers and the EPA Concerning the Determination of Mitigation Under the 404(b)(1) Guidelines" (MOA) states that mitigation includes wetland restoration, enhancement, and/or creation. The evaluation of the appropriate level of mitigation requires a case-specific determination and is based solely on the values and functions of the wetland that is impacted. According to the MOA, mitigation should provide at a minimum one for one functional replacement with an adequate margin of safety to reflect the expected degree of success associated with the mitigation plan. Better characterization of the wetlands (including a functional assessment and delineation) are necessary before specific mitigation actions can be identified. Therefore, a wetlands delineation and function assessment shall be conducted during the RD, followed by the development of a mitigation plan.

Based upon comments received from FDEP and FDH, additional soil sampling shall be conducted during the RD to confirm that surface soil in adjacent residential areas outside the proposed limits of the cap meet EPA's performance standards for surface soil. A sampling plan shall be devoloped in consultation with FDEP and FDH to ensure that their concerns have been addressed. If soil or sediment contamination is encountered which represents an unacceptable threat, the contaminated material will be excavated and disposed onsite within the containment system.

The municipal water supply system shall be extended to 18 nearby residences located on Machelle Drive and Chaffee Road, and the private supply wells will be plugged. All existing deep wells at the site shall be plugged and abandoned to prevent continued impacts to the rock aquifer. Plugging of both the private supply wells and the deep wells shall be performed in accordance with St. Johns River Water Management District criteria. Deed restrictions shall be sought to control future land use and groundwater use.

A 10-foot high chain link fence shall be installed around the site on the exterior of the vertical barrier to restrict access to the containment area. The fence shall be equipped with a gate for controlled access, and warning signs and placards shall be posted at 100-foot intervals along the perimeter of the fence in accordance with Florida regulation FAC 62-730.181(3), Warning Signs at Contaminated Sites.

The remedy for contaminated groundwater outside the barrier shall be monitored natural attenuation. It is anticipated that groundwater contaminant levels outside of the barrier will decline and meet drinking water standards within 3 to 6 years for organic contaminants of concern and within 6 to 12 years for manganese. If realignment of the McGirts Creek tributary is not appropriate, the natural attenuation of all contaminants of concern could take up to 14 years. A groundwater monitoring program shall be implemented to evaluate and track water levels and contaminant levels inside and outside the containment system and in the underlying "rock" aquifer.

The net present worth cost of this alternative is $8,454,670. A detailed breakdown of these costs is shown in Table 7.

10.2 Performance Standards

The purpose of this response action is to control risks posed by direct contact with soil, sludge, sediment, and groundwater and to minimize migration of groundwater contamination through containment. The groundwater remedial goals identified in Table 8 shall be applied to groundwater outside the containment system. All contaminated soil, sludge, and sediment which exceeds the soil cleanup goals in Table 8 shall be isolated within the containment system, thereby eliminating the risk associated with direct contact, ingestion, or inhalation. With the exception of lead, the soil cleanup levels correspond to an excess lifetime cancer risk of $1x10^{-6}$ or an HQ of 1 for a residential land use. The cleanup goal for lead is based on EPA's "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities," OSWER Directive 9355.4-12, dated July 14, 1994.

Based on the guidelines provided in the EPA publication Stabilization/Solidification of CERCLA and RCRA Wastes (EPA/625/6-89/022, May 1989), and EPA's experience with the implementation of stabilization remedies at other sites, EPA has determined that the following performance standards for the S/S treatment of Lifts 1 and 2 material shall be met:

Parameter	Performance Standard	Test Method
Permeability	$\leq 10^{-6}$ cm/sec	EPA Method 9100-SW846
Unconfined Compressive Strength	$\geq$ 100 psi	ASTM D1633-96
Leachability	TBD	EPA Method 1312-SW846

The performance standard for the concentration of lead in the liquid extract generated from the Synthetic Precipitation Leaching Procedure (SPLP), EPA Method 1312, is expected to range from 15 ppb to 500 ppb based on experience at other Superfund sites. However, the final performance standard shall be determined during design after further consultation with the State and EPA's stabilization expert.

The vertical barrier shall achieve a hydraulic conductivity of $1x10^{-7}$ cm/sec (slurry wall) or a maximum permittivity of $1.1x10^{-9}$ sec^{-1} (geosynthetic sheet pile wall). The low permeabiliity layer of the surface cap shall achieve a maximum in-place saturated hydraulic conductivity of $1x10^{-7}$ cm/sec. The drainage layer shall achieve a minimum hydraulic conductivity of $1x10^{-2}$ cm/sec. To evaluate the protectiveness of the containment system, surface water monitoring shall be conducted to ensure compliance with the Florida Surface Water Quality Criteria in Table 9.

11.0 Statutory Determinations

Pursuant to CERCLA Section 121, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements, are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for

Table 7

COST ESTIMATE BREAKDOWN ($1995)

SOURCE REMEDY

ALTERNATIVE 7 – CONTAINMENT, LIME CURTAIN, PHYSICAL STABILIZATION OF LIFT 3, STABILIZATION/SOLIDIFICATION OF LIFT 2, MONITORING, AND INSTITUTIONAL CONTROLS

SUPPLEMENTAL TREATABILITY AND FEASIBILITY STUDY
WHITEHOUSE WASTE OIL PITS SUPERFUND SITE
JACKSONVILLE, FLORIDA

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST	ANNUAL COST	PRESENT WORTH	COMMENTS
Capital Costs							
Vertical Barrier							
Barrier	112,000	SF	$11	$1,232,000			
Realignment of N.E. Tributary of McGirts Creek	600	LF	$600	$360,000			
Contingency (20%)				$318,400			
Subtotal				$1,910,400		$1,910,400	
Cover System							
Cover	9	acres	$145,000	$1,305,000			
Drainage/Swales	3,000	LF	$18	$54,000			
Contingency (20%)				$271,800			
Subtotal				$1,630,800		$1,630,800	
Lime Curtain	50,000	SF	$17	$850,000			
Contingency (20%)				$170,000			
Subtotal				$1,020,000		$1,020,000	
Physical Stabilization of Lift 3							
Geogrid	19,360	SY	$4.50	$87,120			
Contingency (10%)				$8,712			
Subtotal				$95,832		$95,832	
In Situ Solidification/Stabilization of Lift 2							
Portland Cement (10 percent)	2,614	Tons	$90	$235,224			
Inject/Mix/Compact	19,360	CY	$9	$174,240			
Contingency (20%)				$81,893			
Subtotal				$491,357		$491,357	
Fencing							
Fence	3,500	LF	$20	$70,000			
Gates	2	ea	$1,500	$3,000			
Subtotal				$73,000		$73,000	
Provide Municipal Water to 18 Residences							
Extend Main Along Machelle Drive	2,500	LF	$30	$75,000			
Private Connections/Metres	18	ea	$1,500	$27,000			
Subtotal				$102,000		$102,000	

Table 7

COST ESTIMATE BREAKDOWN ($1995)

SOURCE REMEDY

ALTERNATIVE 7 - CONTAINMENT, LIME CURTAIN, PHYSICAL STABILIZATION OF LIFT 3, STABILIZATION/SOLIDIFICATION OF LIFT 2, MONITORING, AND INSTITUTIONAL CONTROLS

SUPPLEMENTAL TREATABILITY AND FEASIBILITY STUDY

WHITEHOUSE WASTE OIL PITS SUPERFUND SITE

JACKSONVILLE, FLORIDA

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST	ANNUAL COST	PRESENT WORTH	COMMENTS
Capital Costs (Cont'd)							
Monitoring Well Network							
Wells (including Pads, Casings, Protection)	18	ea	$3,500	$63,000			
Subtotal				$63,000		$63,000	
Engineering and General Contingency							
Engineering (10% of Capital)				$538,639			
Contingency (15% of Capital)				$807,958			
Subtotal				$1,346,597		$1,346,597	
Total Capital Cost						$6,732,986	
Operation & Maintenance Costs							
Maintenance of Containment System							
Barrier, Lime Curtain, and Cover					$55,000		Present Worth Factor:
Ditches/Swales					$5,000		- PWF = 15.3725
Subtotal					$60,000	$922,350	
Groundwater Monitoring (semi anually - 30 yrs)							
Analytical	36	ea	$970		$34,920		
Collection (labor and expenses)					$5,500		
Subtotal					$40,420	$621,356	
Annual Review & Site Inspection					$5,600		
Subtotal					$5,600	$86,086	

Table 7

COST ESTIMATE BREAKDOWN ($1995)
SOURCE REMEDY
ALTERNATIVE 7 – CONTAINMENT, LIME CURTAIN, PHYSICAL STABILIZATION OF LIFT 3, STABILIZATION/SOLIDIFICATION OF LIFT 2, MONITORING, AND INSTITUTIONAL CONTROLS
SUPPLEMENTAL TREATABILITY AND FEASIBILITY STUDY
WHITEHOUSE WASTE OIL PITS SUPERFUND SITE
JACKSONVILLE, FLORIDA

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST	ANNUAL COST	PRESENT WORTH	COMMENTS
Operation & Maintenance Costs (Cont'd)							
Data Review and Report (Every 5 Years)							Present Worth Factor:
Principal	48	hours	$125	$6,000			– six 5-year periods, i = 5% per year
Senior Engineer	100	hours	$85	$8,500			– i per period = 27.63%
Project Hydrogeologist	128	hours	$70	$8,960			– PWF = 2.7818
Staff Hydrogeologist	80	hours	$55	$4,400			
Draftsman	30	hours	$50	$1,500			
Secretarial	20	hours	$45	$900			
Copying/Printing	20	reports	$60	$1,200			
Contingency (5%)				$1,573			
Subtotal				$33,033		$91,891	
Total Operation and Mainenance Cost						$1,721,684	
TOTAL – SOURCE REMEDY – ALTERNATIVE 7						$8,454,670	

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Table 8

Contaminant of Concern	Soil Cleanup Goal (mg/kg)[a]	Groundwater Cleanup Goal (ug/l)[c]
Inorganics		
Antimony	42	6
Arsenic	32	50
Barium	5,262	2,000
Cadmium	53	5
Chromium	526	100
Copper	3,905	1,300[d]
Lead	400[b]	15[d]
Manganese	NA	50[e]
Nickel	2,105	100
Selenium	NA	50
Vanadium	NA	150[f]
Zinc	NA	5,000[e]
Organics		
Acetone	NA	1,700[f]
Benzene	0.4	1
Benzo(a)pyrene	0.1	0.2
Bis(2-ethylhexyl)phthalate	61.5	6
Chlorobenzene	42	NA
1,4-Dichlorobenzene	36	NA
Carbon Disulfide	NA	1,640[f]
Di-N-Butyl Phthalate	7,911	NA
Ethylbenzene	NA	30[e]
Methylene Chloride	115	NA
Methylethyl Ketone	NA	8,460[f]
3/4-Methylphenol	NA	850[f]
2-Methylnaphthalene	NA	67[f]
Naphthalene	317	1,500[g]
PCB 1260	1[b]	NA
Phenol	47,467	10,000[f]
Tetrachloroethene	4	NA
Toluene	2,000	40[e]
Trichloroethene	1	3
Xylene	NA	20[e]

[a] Risk-based soil cleanup goals calculated by EPA and presented in June 11, 1992 memorandum (in the administrative record).

[b] Lead soil cleanup goal based on OSWER Directive 9355.4-12 (July 14, 1994) and PCB soil cleanup goal based on OSWER Directive 9355.4-01 (August 1990).

[c] Groundwater cleanup goals are Federal and/or State primary MCLs, unless otherwise noted.

[d] Treatment technique action level enforceable under Federal and State drinking water regulations.

[e] Florida secondary MCLs.

[f] Risk-based groundwater cleanup goals from Table 8-2 of Final Risk Assessment, September 1991.

[g] Risk-based groundwater cleanup goal corresponding to a hazard index of 1.0.

NA No cleanup level established for this contaminant in this medium

Table 9

Contaminant of Concern	Class III State Surface Water Quality Criteria (ug/l)[a]
Inorganics	
Antimony	4,300
Arsenic	50
Barium	NA
Cadmium[b]	$e^{(0.7852[\ln H]-3.49)}$
Chromium	11
Copper[b]	$e^{(0.8545[\ln H]-1.465)}$
Lead[b]	$e^{(1.273[\ln H]-4.705)}$
Manganese	NA
Nickel[b]	$e^{(0.846[\ln H]+1.1645)}$
Selenium	5
Vanadium	NA
Zinc[b]	$e^{(0.8473[\ln H]+0.7614)}$
Organics	
Acetone	NA
Benzene[c]	71.28
Benzo(a)pyrene[c]	0.031
Bis(2-ethylhexyl)phthalate	NA
Chlorobenzene	NA
1,4-Dichlorobenzene	NA
Carbon Disulfide	NA
Di-N-Butyl Phthalate	NA
Ethylbenzene	NA
Methylene Chloride	NA
Methylethyl Ketone	NA
3/4-Methylphenol	NA
2-Methylnaphthalene	NA
Naphthalene	NA
PCB 1260	0.014
Phenol	300
Tetrachloroethene	8.85
Toluene	NA
Trichloroethene	80.7
Xylene	NA

a Values represent the maximum concentration not to be exceeded at any time, unless otherwise noted.

b "lnH" means the natural logarithm of total hardness expressed as mg/l of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set a 25 mg/l if actual hardness is <25 mg/l and set at 400 mg/l if actual hardness is >400 mg/l.

c The maximum concentration at average annual flow conditions (see FAC 62-4.020(1)).

NA No criterion has been established for this contaminant.

remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

11.1 Overall Protection of Human Health and the Environment

The selected remedy satisfies the statutory requirement to be protective of human health and the environment. The potential human health and ecological risks associated with direct contact, ingestion, and inhalation of contaminated soil, sediment, and sludge are reduced or eliminated through the isolation of these media within the containment system. In addition, the potential risks associated with ingestion, direct contact, and inhalation of contaminated groundwater are reduced or eliminated through the following actions: isolation of the majority of contaminated groundwater within the containment system; natural attenuation of the contaminated groundwater outside of the containment system to drinking water standards; and provision of an alternate water supply to nearby residents whose private supply wells draw water from the "rock" aquifer.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The selected remedy satisfies the statutory requirement to comply with all applicable or relevant and appropriate Federal and State ARARs. The ARARs which apply to the selected remedy and other non-enforceable guidance and criteria which are "to be considered" (TBC) are presented below:

<u>Federal ARARs</u>

Safe Drinking Water Act (SDWA)

- 40 CFR Part 141. SDWA Maximum Contaminant Levels (MCLs) for contaminants of concern (listed in Table 8) are **relevant and appropriate** as cleanup goals for the natural attenuation of groundwater outside the containment system.

Resource Conservation and Recovery Act (RCRA)

- 40 CFR Part 264.228. RCRA requirements for the closure of surface impoundments are **relevant and appropriate** to the stabilization of Lifts 1 and 2 and capping of the waste pits. This includes by reference the requirements for closure and post-closure care in 40 CFR 264 Subpart G.

- 40 CFR Parts 264.552. Requirements for the designation and use of a CAMU are potentially **applicable** if off-site soil and sediment contamination requiring excavation and consolidation onsite are found during the planned RD sampling activities.

Clean Water Act (CWA)

- The substantive requirements of Section 404 of the Clean Water Act (CWA), 33 U.S.C. Section 1344, the Section 404(b)(1) Guidelines, 40 CFR Part 230, and Nationwide Permit

38, may be **relevant and appropriate** to the capping of wetlands adjacent to the oil pits, the installation of the slurry wall, and the realignment of the McGirts Creek tributary.

Endangered Species Act (ESA)

- The requirements of the Endangered Species Act (ESA) may be **applicable** to the capping of wetlands adjacent to the oil pits, the installation of the slurry wall, and the realignment of the McGirts Creek tributary, if threatened or endangered species or their habitat are identified in the site area. EPA will seek an informal Section 7 consultation with the U.S. Fish and Wildlife Service to ensure that threatened or endangered species are not adversely impacted by implementation of the selected remedy.

State ARARs

- Florida Primary and Secondary Drinking Water Standards, FAC 62-550.310-320. Maximum contaminant levels for the contaminants listed in Table 8) are **relevant and appropriate** as cleanup goals for the natural attenuation of contaminated groundwater outside the containment system.

- Florida Surface Water Quality Standards, FAC 62-302.530. Surface water quality criteria for Class III surface water are **relevant and appropriate** as performance standards for determining the effectiveness of the selected remedy.

- Florida Rules on Hazardous Waste Warning Signs, FAC 62-730.181(3). Requirements for the design, location, and spacing of warning signs are **applicable** to the posting of signs around perimeter and at entrances of site.

To Be Considered

- Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047. Guidelines for the design of final covers for surface impoundments shall be considered in the development in the surface cap for the site.

- Considering Wetlands at CERCLA Sites, EPA/540/R-94/019.

- Stabilization/Solidification of CERCLA and RCRA Wastes, EPA/625/6-89/022. Physical and chemical testing procedures for stabilized wastes shall be considered in evaluating the performance of the S/S treatment of Lifts 1 and 2.

11.3 Cost Effectiveness

The selected remedy meets the statutory criteria of being cost effective. Although Alternative 3 is the least expensive alternative which meets the threshold criteria, the selected remedy provides important advantages over this alternative. The S/S treatment of Lifts 1 and 2 reduces the mobility of contaminants in Lift 2 and enhances the structural strength and bearing capacity of the waste, which is a substantive requirement of 40 CFR Part 264 and is critical to ensuring the long-term effectiveness of the surface cap.

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

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the Whitehouse site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost.

The selected remedy ranks among the highest against the other alternatives and the 1992 AROD remedy with respect to the criteria of short-term effectiveness, implementability, and cost. While the remedy selected in the 1992 AROD provides the greatest degree of treatment, treatability tests have shown that the numerous elements of both the source and groundwater remedies will not be effective in addressing the wastes at the site. The other alternatives would provide substantial risk reduction through a combination of treatment, containment, and institutional controls, but each, including the selected remedy, would also require perpetual maintenance of the containment system components to ensure long-term effectiveness. The selected remedy is easily implemented using conventional construction methods, and by utilizing in-situ S/S to limit the amount of waste disturbed, it minimizes the short-term impacts to workers and the public during implementation. As such, the selected remedy utilizes treatment to the maximum extent practicable when balanced against the implementation challenges associated with the 1992 AROD remedy and the remaining alternatives.

11.5 Preference for Treatment as a Principal Element

Although this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site, because treatment of the principal threat of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The acidity of the sludge and the variety of contaminants precluded effective treatment of the source materials, while the anticipated volume of residuals generated by treatment of the groundwater rendered cost-effective treatment of groundwater impracticable.

12.0 Documentation of Significant Changes

The Proposed Plan for the Whitehouse site was released for public comment in December 1997, identifying Alternative 7 as the preferred alternative for the amended remedy. A review of the cleanup levels from the 1992 AROD revealed that several were based on proposed MCLs, proposed State groundwater guidance or standards, or outdated EPA guidance. After consultation with FDEP, EPA has updated the groundwater cleanup levels for the following compounds to reflect current Federal and State primary and/or secondary MCLs: antimony, barium, bis(2-ethylhexyl)phthalate, ethylbenzene, toluene, and xylene. The groundwater cleanup goal for naphthalene was revised to correspond to a hazard index of 1.0, since no Federal or State primary or secondary standard exists for this compound. The soil cleanup level for lead was revised to reflect current EPA guidance reflected in "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities," OSWER Directive 9355.4-12, July 14, 1994. EPA has reviewed all verbal comments submitted during the public comment period and has determined that no other significant changes to the remedy as originally identified in the Proposed Plan are necessary.

Whitehouse Waste Oil Pits
Jacksonville, Duval County, Florida

3. RESPONSIVENESS SUMMARY

In accordance with Sections 113 and 117 of CERCLA, as amended, EPA has conducted community involvement activities at the Whitehouse site to solicit community input and ensure that the public remains informed about site activities. EPA's Proposed Plan Fact Sheet for the Record or Decision (ROD) amendment was mailed to the public on December 10, 1997, and a copy of the Administrative Record was made available in the information repository at the Whitehouse Elementary School. Public notices were published in *The Florida Times-Union* in Jacksonville, Florida, on December 12 and 13, 1997, advising the public of the availability of the Administrative Record and the date of the upcoming public meeting. EPA held a public meeting on December 16, 1997, in the Media Center at the Whitehouse Elementary School to answer questions and receive comments on the Agency's preferred alternative for addressing site contamination. Comments received during the public meeting were recorded in an official transcript of the meeting, a copy of which is included in the Administrative Record. In addition, a public comment period was held from December 12, 1997 to January 12, 1998.

This Responsiveness Summary provides information about the views of the community and potentially responsible parties regarding EPA's proposed action, documents how the Agency has considered public comments during the decision-making process, and provides answers to major comments received during the comment period. It consists of the following sections:

1.0 Overview: This section discusses the recommended action for the site and the public reaction to this alternative.

2.0 Background on Community Involvement: This section provides a brief history of community interest in the site and identifies key public issues.

3.0 Summary of Comments Received and EPA's Responses: This section provides EPA's responses to oral and written comments submitted during the pubic comment period.

4.0 RD/RA Concerns: This section discusses community concerns raised during the comment period regarding ongoing remedial action activities at the site.

1.0 Overview

EPA's Proposed Plan for the ROD amendment recommended Alternative 7 for addressing contamination at the Whitehouse site. This alternative involves the isolation of contaminated soil, sediment, and groundwater within a containment system consisting of a surface cap, vertical barrier, and lime curtain. The stabilization of the top lifts of material is also planned to improve the bearing capacity of the waste for construction of the cap. No written comments were received during the comment period.

During the public meeting, the primary concerns raised by residents related to the extension of the City water supply to residents in Whitehouse and concerns over the migration of contaminants downstream as a result of previous spills and flooding. However, the comments received during the public meeting were supportive of EPA's preferred alternative.

2.0 Background on Community Involvement

Community concern regarding the Whitehouse site has been limited throughout the Superfund process. There has been no formal, organized community involvement with the site to date. Most of the nearby residents are aware of the existence of the site but seem to be neither particularly interested in it or concerned by it. In the past, the highest level of interest in the site has been from the owner of the site, the late Mr. Richard Peters, and adjacent property owners. The large tract of land immediately south of the site has recently been developed into a mobile home subdivision known as Kittrell Pines.

Property owners and residents adjacent to the site and along Machelle Drive have expressed concern about the migration of contaminants from the site associated with previous spills and flooding events and about the quality of their drinking water, which is drawn from private wells completed in the "rock" aquifer. Periodic sampling of private wells along Machelle Drive by the Duval County office of the Florida Department of Health has confirmed that the drinking water supply has not been impacted.

3.0 Summary of Comments Received and EPA's Responses

All of the comments below were submitted orally at the public meeting.

1. Q. How deep does the waste in the pits go?

   A. Based on the average thickness of each lift, the depth of the pits range from about 7 to 14 feet below the surface.

2. Q. A resident commented that he came to a meeting one time when EPA said they had installed a slurry wall at the site and it did not work, and he wondered if this was true?

   A. EPA proposed the installation of a slurry wall in the 1985 ROD, but this remedy was never constructed. During the design of the original 1985 remedy, the issues that were raised concerning the slurry wall centered primarily on its location within a zone of contaminated soil and groundwater. Testing was performed to evaluate the performance of slurry mixes which used both clean and contaminated soil and clean and contaminated groundwater. The tests revealed that the performance of the slurry was adversely affected by the use of contaminated soil and contaminated groundwater in the mix. However, slurry mixes using clean off-site soil and fresh water performed well. Additional tests were conducted to evaluate the long-term effect of the contaminated groundwater on the permeability of the slurry wall. These tests indicated that the leaching of contaminated groundwater through the slurry mixtures would not significantly alter the permeability of the slurry. The results of these tests have been included in the administrative record for consideration during the design of the 1998 amended remedy. In addition, calculations performed during the STFS demonstrated that the predicted rate of leakage of contaminated groundwater through the vertical barrier would be relatively low. Furthermore, the addition of the lime curtain would reduce the impacts of the contaminated groundwater leakage outside of the containment system by raising the pH and promoting the precipitation of Manganese. In summary, EPA believes that the vertical barrier and remaining components of the remedy can be designed to provide for effective containment of contaminated groundwater from the site.

3. Q. A number of people expressed concern that contaminants from the site had escaped during spills into the nearby residential areas and downstream of the site. Several anecdotal reports of oily material having migrated off-site were voiced during the public meeting.

A. To address this concern, EPA has included as a requirement in the 1998 AROD that additional sampling of both surface soil in the residential area southwest of the site and in the sediment of McGirts Creek and the northeast tributary be done during design. Should additional contamination which represents a threat to human health and the environment be identified in these areas, EPA will at that time determine whether additional response actions are necessary.

4. Q. How high were the levels of metals and organics found [in the groundwater]? Were they at the maximum contaminant levels (MCLs)?

A. Based on the most recent data, eleven compounds (both metals and organics) exceeded either the MCL or another applicable standard for groundwater. The greatest number of compounds (10) exceeding EPA's groundwater cleanup goals are in the shallow unconfined aquifer.

5. Q. A resident inquired where EPA would tap into the city water supply to provide water hookups for the residents along Machelle Drive. Other residents questioned why the City water supply would not be extended to more residents.

A. The City water main that would probably be tapped to service Machelle Drive is along U.S. 90 (Beaver Street). Periodic sampling of the private supply wells along Machelle Drive have shown no exceedances of drinking water standards. However, since some contamination has been found in the "rock" aquifer near the site and the overlying shallow groundwater zones are heavily contaminated, EPA is providing an alternate water supply to the Machelle Drive residents as a precautionary measure because they are the nearest downgradient groundwater users. With the proposed containment remedy, EPA does not believe other residents farther from the site are threatened by site-related groundwater contamination.

6. Q. How long will it take to remediate the groundwater outside the vertical barrier?

A. If the tributary of McGirts creek is realigned and the slurry wall is placed to maximize groundwater containment, natural attenuation of groundwater contaminants outside the containment system is expected to take 3 years for organic parameters and 6 years for metals. However, if the creek is not realigned, natural attenuation of groundwater contaminants outside the vertical barrier would take up to 14 years.

7. Q. When Pit 5 was excavated during the additional investigatory work and the fumes took the leaves off the trees, what did it do to the community here in Whitehouse? Maybe that's why we have sinus problems today?

A. The fuming and production of acidic vapors during excavation of Lift 4 were short term events. It is difficult to assess what, if any, impacts these releases may have had on area residents. However, as soon as it became evident that the generation of acidic vapors was likely, a number of precautions were taken to prevent further releases and ensure protection of nearby residents. The pit was filled with a layer of water (a water "blanket") and hydrated lime was blended with the sludge to raise the pH. In addition, the frequency of air monitoring at downwind site boundaries was increased. On occasion, a spray-on odor control medium known as ConCover was sprayed on exposed materials to control potential odors. With these measures in place, EPA believes the potential impacts to the community were minimized.

8. Q. One resident noted that if the waste were taken off-site, it would have to be carried by her house, and she did not think she would like that. A resident also voiced concern that digging up the material in the pits would produce "that smoke" (i.e. acidic fumes) experienced during earlier investigations.

A. EPA agrees. EPA was concerned about the short-term impacts of excavating the pits based on the experience during the additional investigatory work. For this reason, EPA believes the proposed containment remedy combined with in-situ stabilization of the upper two lifts of material will reduce or eliminate the short-term impacts (such as fuming) associated with the alternatives which involve excavation of contaminated material from the pits.

9. Q. A trailer park owner asked how he could get EPA to suggest that the City extend the water supply to his trailer park, which is near the Coleman-Evans site. He noted that his trailer park "empties" when workers show up at the Coleman-Evans site. He further asserted that contaminated groundwater flow from the site comes across the end of his property where his wells are located.

A. This concern should be directed to the project manager for the Coleman-Evans site.

10. Q. A couple of residents commented that they have had their water tested once a year and the results do not show any contamination but when they make tea, there were "rainbows" (lavender and pink) on the surface of the liquid.

A. This type of sheen can be associated with high iron levels in the water. EPA contacted the Florida Department of Health (FDH) office in Duval County concerning this matter, and they suggested that residents could have their wells sampled for iron by a private laboratory. If iron levels exceed 0.300 mg/l, the FDH suggests that a water softener could address the problem.

4.0 Remedial Design/Remedial Action Concerns

Residents expressed concern about the potential impacts of acidic fumes associated with disturbance of the wastes in the pits, expressing support for EPA's remedy which leaves these wastes in place. EPA's safety program during implementation of the remedy will involve both work-zone air monitoring and perimeter air monitoring to ensure protection of site workers and the nearby community.

Residents also seem concerned that EPA has not fully characterized the off-site extent of contamination. To address this concern, EPA will conduct surface soil and sediment sampling activities during the initial stages of the design to evaluate whether site-related contamination has migrated off of the Whitehouse site at levels which pose a threat to human health or the environment.

EPA will continue to keep the community informed during Remedial Design and Remedial Action (RD/RA) activities through the use of fact sheets and informal public availability sessions.