United States Environmental Protection Agency
Office of Emergency and Remedial Response
EPA/ROD/R04-92/123
September 1992

EPA

Superfund Record of Decision:

Agrico Chemical, FL

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R04-92/123	2.	3. Recipient's Accession No.
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15. Supplementary Notes

PB93-964017

16. Abstract (Limit: 200 words)

The 35-acre Agrico Chemical site is a former fertilizer manufacturing facility located in Pensacola, Escambia County, Florida. Land use in the area is mixed residential, municipal, commercial, and industrial. From 1889 to 1920, sulfuric acid was produced onsite from pyrite. In 1920, the production of superphosphate fertilizer began. The source rock used in the process was fluorapatite, which also contained silica and trace levels of aluminum and uranium. Four unlined ponds used at the site for wastewater discharge are referred to as PFP I through PFP IV. By early 1957, city officials shut down a public supply well because analyses indicated declining pH values and elevated levels of fluoride and sulfate in the ground water. In 1983, EPA conducted an investigation that indicated that the onsite soil and surface water were contaminated with elevated levels of fluoride and lead. In January 1987, the state conducted a ground water assessment at the site that revealed that site contaminants, primarily fluoride and sulfate, had polluted the ground water. This ROD addresses a final remedy for contaminated soil and sludge at the site as OU1 to prevent current or future exposure. Future RODs will address the treatment of contaminated ground water

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Agrico Chemical, FL
First Remedial Action - Subsequent to follow
Contaminated Media: soil, sludge
Key Contaminants: VOCs, other organics (PAHs, pesticides), metals (arsenic, lead), radioactive materials

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 62
	20. Security Class (This Page) None	22. Price

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

Abstract (Continued)

as OU2 and will include the results of a bayou impacts study being conducted by the PRPs on the Bayou Texar. The primary contaminants of concern affecting the soil and sludge are VOCs; other organics including PAHs and pesticide residues; metals, including arsenic and lead; and radioactive materials.

The selected remedial action for this site includes excavating an estimated 32,500 cubic yards of contaminated soil with concentrations above 1,463 mg/kg fluoride from PFP I, III, and IV, and dewatering the excavated areas; excavating, solidifying, and stabilizing all soil with lead concentrations above 500 mg/kg and arsenic levels above 16 mg/kg from PFP IV; excavating and stabilizing contaminated sludge from all ponds; consolidating the excavated soil and sludge from all areas into PFP II; constructing a slurry wall around PFP II, and covering the area with a RCRA cap; monitoring ground water; and implementing institutional controls including deed restrictions, and site access restrictions such as security fencing. The estimated present worth cost for this remedial action is $10,731,013, which includes a present worth O&M cost of $384,313.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific soil excavation goals are based on protection of ground water and include fluoride 1,463 mg/kg. The excavation goals established for lead and arsenic are based on health-based soil exposure scenarios, including lead 500 mg/kg and arsenic 16 mg/kg.

RECORD OF DECISION
OPERABLE UNIT 1

AGRICO CHEMICAL NPL SITE

Pensacola, Escambia County, Florida

Prepared By:

Environmental Protection Agency

Region IV

Atlanta, Georgia

Record of Decision

Operable Unit One

Declaration

SITE NAME AND LOCATION

Agrico Chemical Site
Pensacola, Escambia County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Agrico Chemical Site in Pensacola, Florida, which was chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the Agrico Chemical Site.

The State of Florida, as represented by the Florida Department of Environmental Regulation (FDER), has been the support agency during the Remedial Investigation and Feasibility Study process for the Agrico Chemical Site. In accordance with 40 CFR 300.430, FDER, as the support agency, has provided input during this process. Based upon comments received from FDER, it is expected that concurrence will be forthcoming; however, a formal letter of concurrence has not yet been received.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE REMEDY

This operable unit is the first action of two planned operable units for the Agrico Chemical Site. The remedy selected in this ROD addresses site soils that have been contaminated as a result of production of fertilizer and sulfuric acid at the Agrico Chemical Site. This first operable unit addresses the principal threat at the site by treating the most highly contaminated soils and waste material. Stabilized waste materials and soils contaminated at low levels will be consolidated under a RCRA cap to be constructed on site.

The major components of the selected remedy include:

- Excavation and solidification/stabilization of approximately 32,500 cubic yards of contaminated sludge and soils from site sludge ponds.

- Consolidation of all stabilized sludge and soils into one sludge pond.
- Construction of a RCRA cap over the sludge pond.
- Construction of a slurry wall around the RCRA cap.
- Implementation of institutional controls to include security fencing, access and deed restrictions.

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. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, the five-year review will apply to this action.

Patrick M Tobin

for Greer C. Tidwell
Regional Administrator

September 29, 1992
Date

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Agrico Chemical Site
Pensacola, Florida

1.0 SITE LOCATION AND DESCRIPTION

The Agrico Chemical Site (hereinafter, "the site") is located in Pensacola, Escambia County, Florida and covers approximately 35 acres. The site is located at the northwest corner of Fairfield Drive and Interstate 110 (Figure 1-1). The site is bounded by Interstate 110 to the east, Fairfield Drive to the south, the CSX railroad tracks to the west, and includes an abandoned baseball field to the north.

Site topography is flat and ground-surface elevations range from about 81 feet to 90 feet National Geodetic Datum (NGVD). Areal photographs, field observations, and a topographic map indicate that surface drainage is currently contained on site. The concrete foundations of former plant buildings remain on site. Storage warehouses, in the southern portion of the site, are the only structures on site. Areas of the site not occupied by the storage warehouses, old foundations, and the abandoned baseball field, are open and characterized by tall grass, brush, and trees. The site is currently owned by Fred L. Vigodsky, Edwin Walborsky, and James Lamar Dean, d/b/a MARGOD, a Florida partnership, and F.A. Baird, Jr.

A second baseball field is located north of the abandoned baseball field. In addition, a former excavation, or borrow pit, is located north of the site. A third baseball field has been constructed north of the site by the Potentially Responsible Parties (PRPs), Conoco Inc. and Freeport McMoRan, to replace the abandoned baseball field on-site.

Four ponds were used for wastewater discharge and designated PFP I through PFP IV for the purposes of the RI/FS documents (Figure 1-2). Aerial photographs taken from 1940 through 1990 indicate that the ponds were interconnected throughout different time periods, but the area referenced as PFP II appears to have received the majority of the sludge. A portion of PFP II is visible at land surface. In addition, historic aerial photographs show a drainage ditch through PFP IV to across Fairfield Drive. A fence has been constructed around the former ponds and southern-most baseball field.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Industrial processes at the site began in 1889 by a company that produced sulfuric acid from pyrite. The production of sulfuric acid continued at the plant until approximately 1920. The sulfuric acid was manufactured in lead pots, in a building slightly north of PFP IV (Figure 1-2). Production of normal

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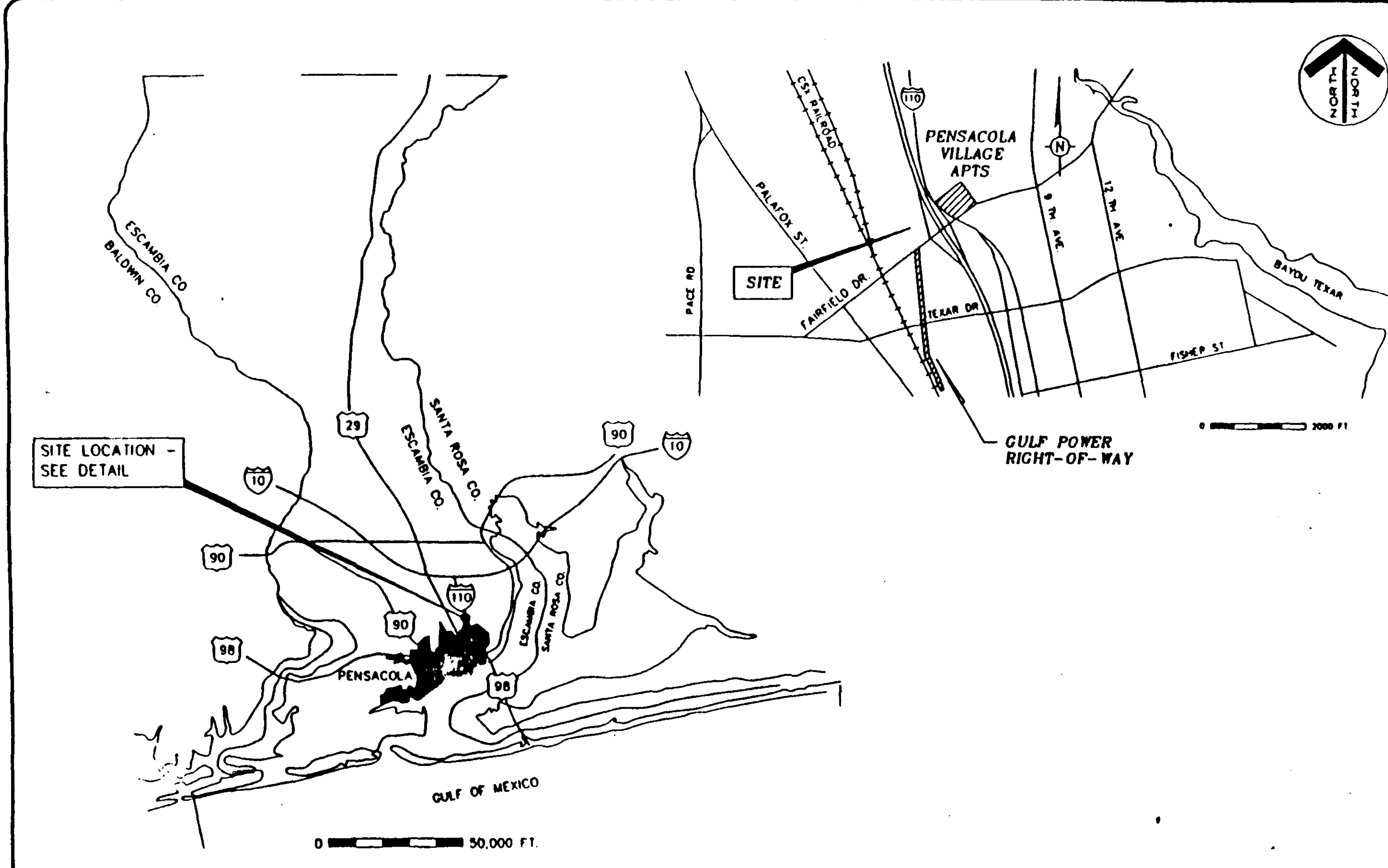

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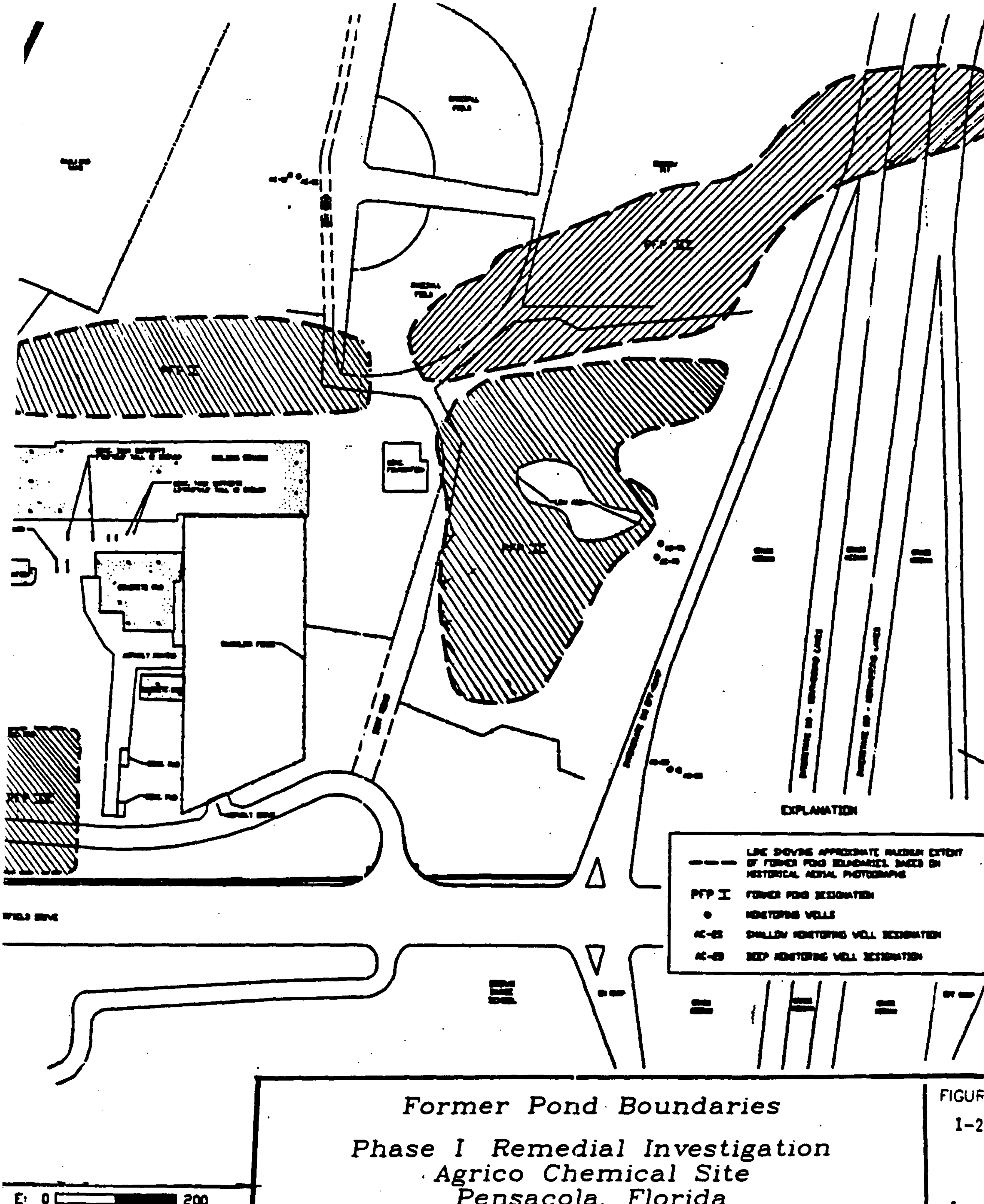
REGIONAL AREA MAP AND SITE LOCATION

FEASIBILITY STUDY
AGRICO CHEMICAL SITE
PENSACOLA, FLORIDA

FIGURE 1-1



Former Pond Boundaries

Phase I Remedial Investigation
Agrico Chemical Site
Pensacola, Florida

FIGURE 1-2

superphosphate fertilizer was initiated in 1920. The source rock used in the process was fluorapatite, which also contained silica and trace levels of many metals such as aluminum, along with uranium at 20 to 200 parts per million (ppm) as impurities. Superphosphate was produced through the digestion of the source rock with sulfuric acid and water. The reaction produced anhydrite and fluoride as byproducts. The anhydrite portion remained with the product and was sold as part of it, unlike modern wet process phosphoric acid plants which filter the anhydrite (phosphogypsum) out and stockpile it on-site.

The historic site files indicate that the plant purchased and apparently utilized some volume of spent sulfuric acid during 1967 and 1968. Dinitrotoluenes were constituents of this acid in concentrations which ranged from 5 ppm to 1600 ppm.

There is no way to determine how much spent acid was used over a given period of time. Calculating probable volumes utilized was not possible due to the lack of information concerning the amount of fertilizer produced and the amount of acid used to manufacture the product. Additional ground-water and soils samples were analyzed for organics as part of the Phase II RI study to investigate the possible movement of dinitrotoluenes from the plant, a potential source of which may have been the acid.

By early 1957, Pensacola City officials shut down a public supply well located downgradient of the site. The City's decision to remove the well from service was based on analyses indicating declining pH values and elevated levels of fluoride and sulfate in the ground water.

EPA conducted a Hazardous Waste Site Investigation in October 1983. The results of the study indicated that the on-site soils and surface water were contaminated with elevated levels of fluoride and lead. No attempt was made to install temporary wells to sample the ground water. However, an effort was made to locate any private shallow wells in the area; none were located.

The Florida Department of Environmental Regulation (FDER) conducted a ground-water assessment at the site in January, 1987. The study concluded that the site contaminants, primarily fluoride and sulfate, had polluted the area ground water. EPA listed the site on the National Priorities List (NPL) on October 4, 1989.

Conoco Inc. and Freeport McMoRan Inc. entered into an Administrative Order on Consent (AOC) on September 29, 1989. According to the terms of the AOC, the PRPs agreed to conduct the source and ground water control RI/FS at the site. The RI field study was conducted in two (2) phases. The first phase was conducted in the summer of 1990. Subsequent confirmatory sampling was necessary in 1991. The second phase RI field study was conducted in February, 1992 to more fully define the nature and extent of impacts caused by the site. This ROD addresses the source (soils and sludges) control for the site (Operable Unit #1). The results of the hydrologic RI/FS are detailed in the 1992 Phase I and Phase II RI Reports and the 1992 FS Report. There is also a bayou impacts study being conducted by the PRPs on the Bayou Texar. The results of the study will be reported in an addendum to the RI/FS Reports and will be addressed in a subsequent Proposed Plan and ROD (Operable Unit #2).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with public participation requirements of CERCLA Sections 113(k) (2) (B) (i-v) and 117, a comprehensive community relations program was developed and implemented throughout the remedial process at the Agrico Chemical site. EPA conducted community interviews in the winter of 1990.

In June 1990, a Remedial Investigation /Feasibility Study (RI/FS) Kick-Off Fact Sheet was prepared and delivered to interested citizens and local officials included on the site's mailing list. This fact sheet explained the overall process of Superfund, the incoming RI/FS at the site, and opportunities for community involvement. A RI/FS Kick-Off Public Meeting was held on June 5, 1992 with approximately 35 interested citizens of Pensacola, Florida to discuss the activities that were to take place as part of the investigation, and to answer any questions the public had regarding the upcoming investigation. Television interviews were conducted with the local ABC affiliate station on two occasions during the field investigations. EPA also met with members of the church for whom the new baseball field was built to discuss potential site risks.

The Public comment period for this ROD was from August 6, 1992 to September 5, 1992. During the comment period, the Administrative Record was available to the public at both the information respository maintained at the Pensacola Public Library and at the EPA Region IV Docket Room in Atlanta, Georgia. A Proposed Plan public meeting was held on Thursday, August 13, 1992. At the meeting, representatives from EPA presented EPA's preferred alternative for source cleanup of the site and answered any questions the public had regarding the preferred alternative. Approximately 50 interested parties attended this meeting. A response to the comments received for the Agrico Chemical site during the public comment period and at the Proposed Plan public meeting is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the selected source control remedial action for the Agrico Chemical site in Pensacola, Florida, chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the Administrative Record for the site.

4.0 SCOPE AND ROLE OF OPERABLE UNIT

As with many Superfund sites, the problems at the Agrico Chemical site are complex. As a result, EPA organized the remedy into two operable units (OUs). These are:

- OU One:. Contamination of the soils.
- OU Two: Contamination of the ground water.

This ROD will address EPA's selected remedy for OU One, contamination of the on-site soils and sludges. Potential ingestion of soils and sludges poses the principal threat at the site because the EPA's acceptable risk range is exceeded. In addition, contaminant concentrations in soils and sludges are greater than those established by the Agency and the State of Florida as protective of ground water. The purpose of this response is to prevent current or future exposure to the contaminated soils and sludges on the site. In addition, this response will eliminate further impacts to the ground water. This first operable unit will be the first response action for the site. The remedial action for OU Two, treatment of contaminated ground water, will be selected in a subsequent ROD.

5.0 SUMMARY OF SITE CHARACTERISTICS

The purpose of this section is to discuss the general site physical characteristics and to discuss the results of the source characterization Remedial Investigation. The issue of ground-water contamination is addressed in the Phase I Remedial Investigation Report, Geraghty & Miller, Inc., March 1992, and the Phase II Remedial Investigation Report, Geraghty & Miller, Inc., August 1992. A short summary of the extent of ground-water contamination is discussed in this section. However, a selected remedy for ground-water contamination is outside the scope of this document. EPA's selected remedy for ground-water contamination will be addressed in a subsequent ROD.

5.1 GENERAL SITE CHARACTERISTICS

Climate in the Pensacola area is characterized by mild winters and relatively long, humid, warm summers. The average annual rainfall is 62 inches. Pensacola is located in the coastal lowlands, a subdivision of the Coastal Plain province. The coastal lowlands are relatively level with an elevation of 100 feet NGVD or less. The most significant topographic features are step-like Pleistocene marine terraces that generally parallel the coast. The Agrico Chemical site is within a plain of a Pleistocene terrace and, as a result, is relatively flat. Site elevation varies from about 81 feet to 90 feet NGVD.

5.2 GEOLOGY

The uppermost sediments in the Pensacola area are marine terraces and beach scarps, and the Citronelle Formation. The marine terraces and beach scarps are composed mainly of quartz sand but contain some clay, silt, gravel, and iron oxide-cemented sandstone, locally referred to as hardpan. The sediments were deposited in marine, deltaic, and fluvial environments and are Middle Oligocene to Pleistocene in age (Figure 5-1).

The site geology's predominant lithologies are sands, clayey sands, and sandy clays. A geologic cross section showing the variation in lithology over the study area was constructed from monitoring wells AC-1D, AC-2D, AC-3D, AC-10D, and AC-11D (Figure 5-2). A shallow layer of sandy clay, present over much of the area, is encountered at approximately 10 feet below land surface (bls) in the vicinity of the site and is about 30 feet thick. The sandy clay layer tends to thicken towards the south of the study area where it is found at land surface. Descriptions of soil samples taken for the RI indicate that soils on the site could be classified as Lakeland and Eustis. These soils are characterized by rapid external and internal drainage, small inclusions of organic matter, low fertility, and susceptibility to erosion in sloping areas.

5.3 HYDROGEOLOGY

The upper-most water bearing unit in Pensacola is the sand-and-gravel aquifer. The upper limit of the aquifer coincides with the surface of the water table and the lower limit of the aquifer coincides with the top of the Pensacola Clay. The Pensacola Clay, which is vertically persistent in the Pensacola area, acts as a confining unit between the sand-and-gravel aquifer and the upper portion of the Floridan Aquifer. According to lithologic logs from wells installed for the Phase I and Phase II RI and previous studies, the sand-and-gravel aquifer is approximately 270 feet in thickness and extends to that depth below land surface (bls) in the vicinity of the site. The sand-and-gravel aquifer is characterized by various permeability zones. Generally, two permeability zones are identified for purposes of defining ground water flow direction. The potentiometric surface contour maps for both shallow and deep zones of the aquifer show that ground-water flow direction is essentially east-southeast in the vicinity of the Agrico site, but becomes easterly as it approaches Bayou Texar.

5.4 LAND USE

The land use surrounding the site within a 1-mile radius consists of residential, municipal, commercial, and industrial zoned areas (Figure 5-3). Immediately to the north and west of the site is an industrial zoned area. The Escambia Wood Treating

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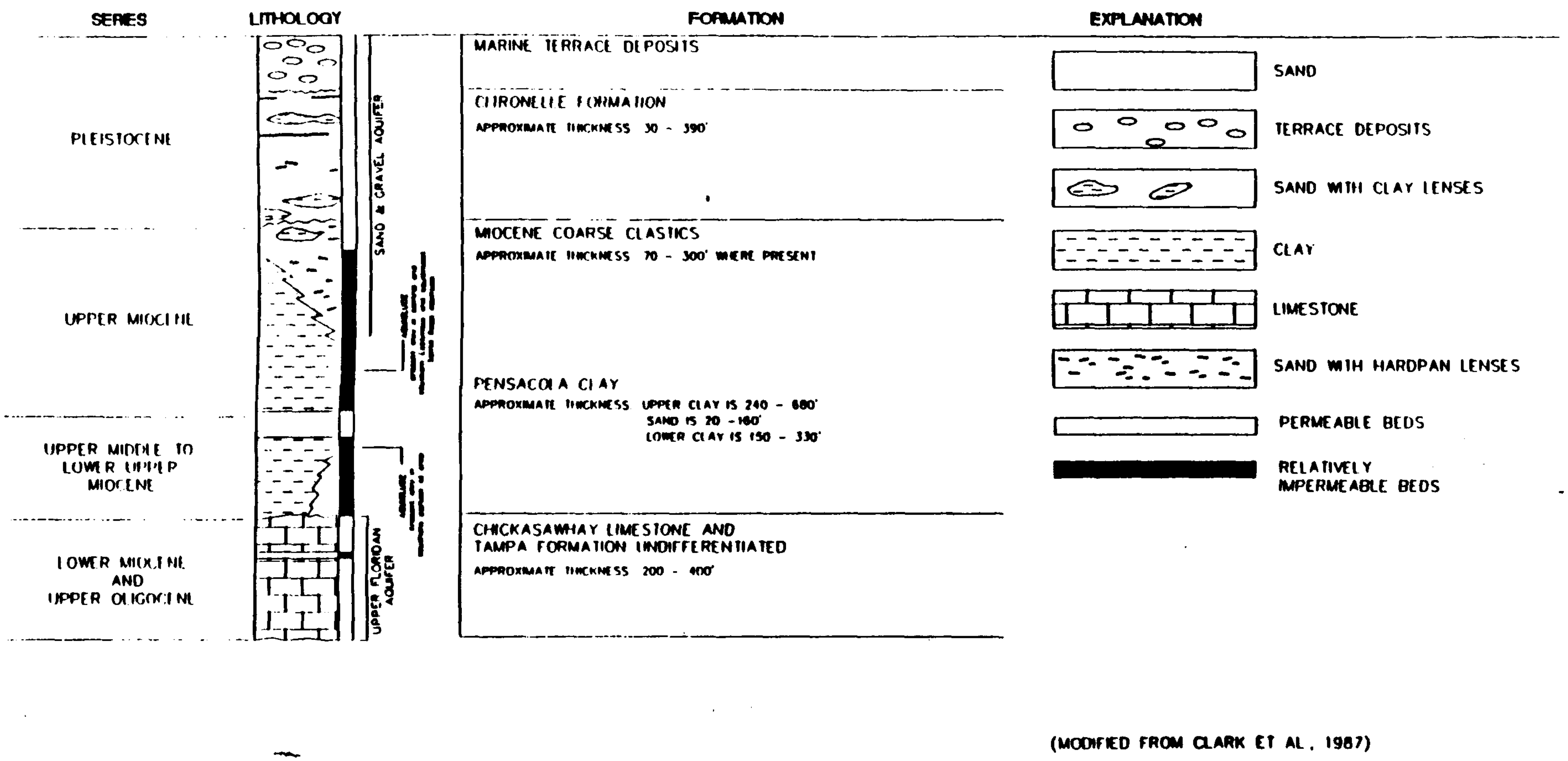

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Regional Stratigraphic and Hydrogeologic Column
Phase I Remedial Investigation
Agrico Chemical Site
Pensacola, Florida

FIGURE
5-1

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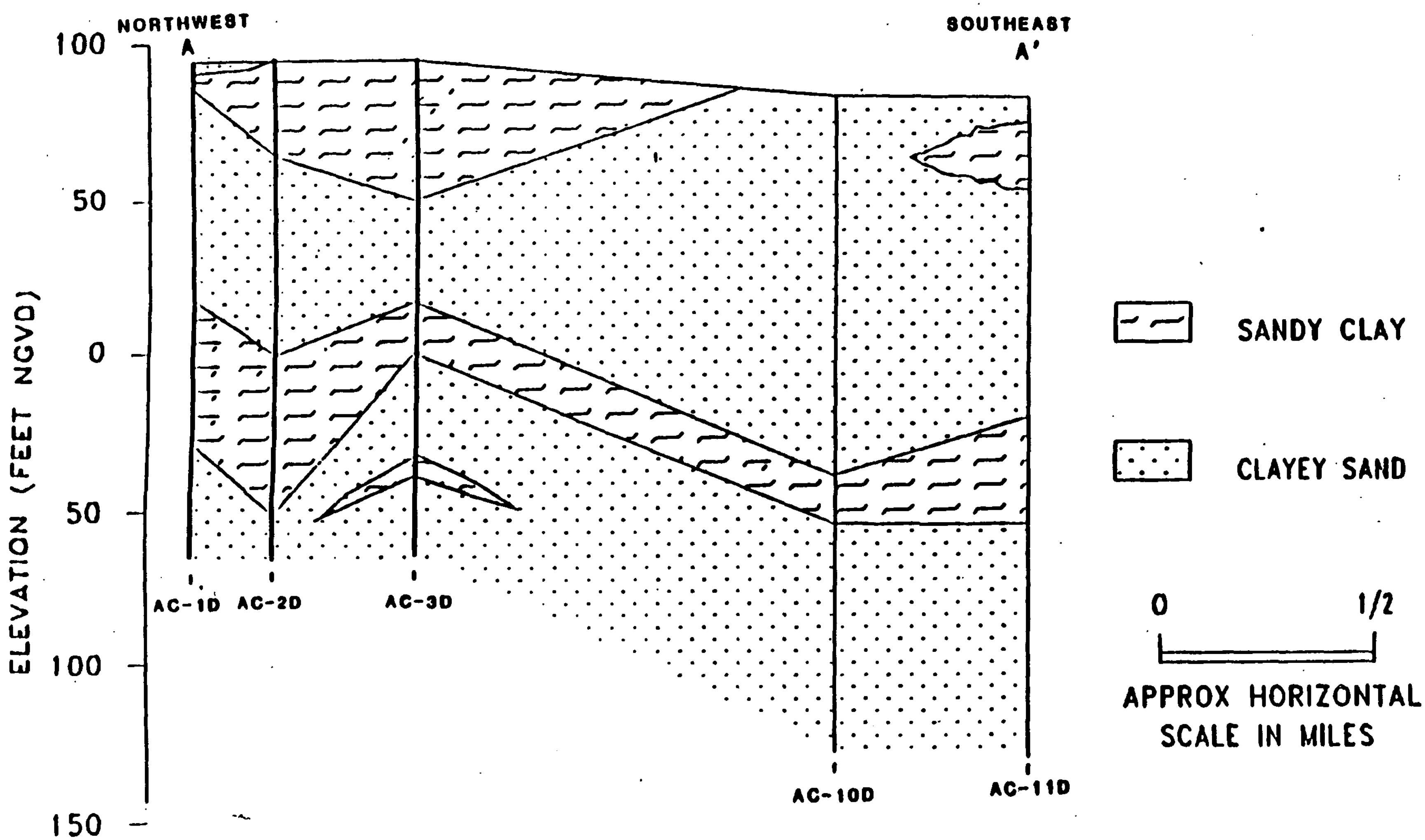
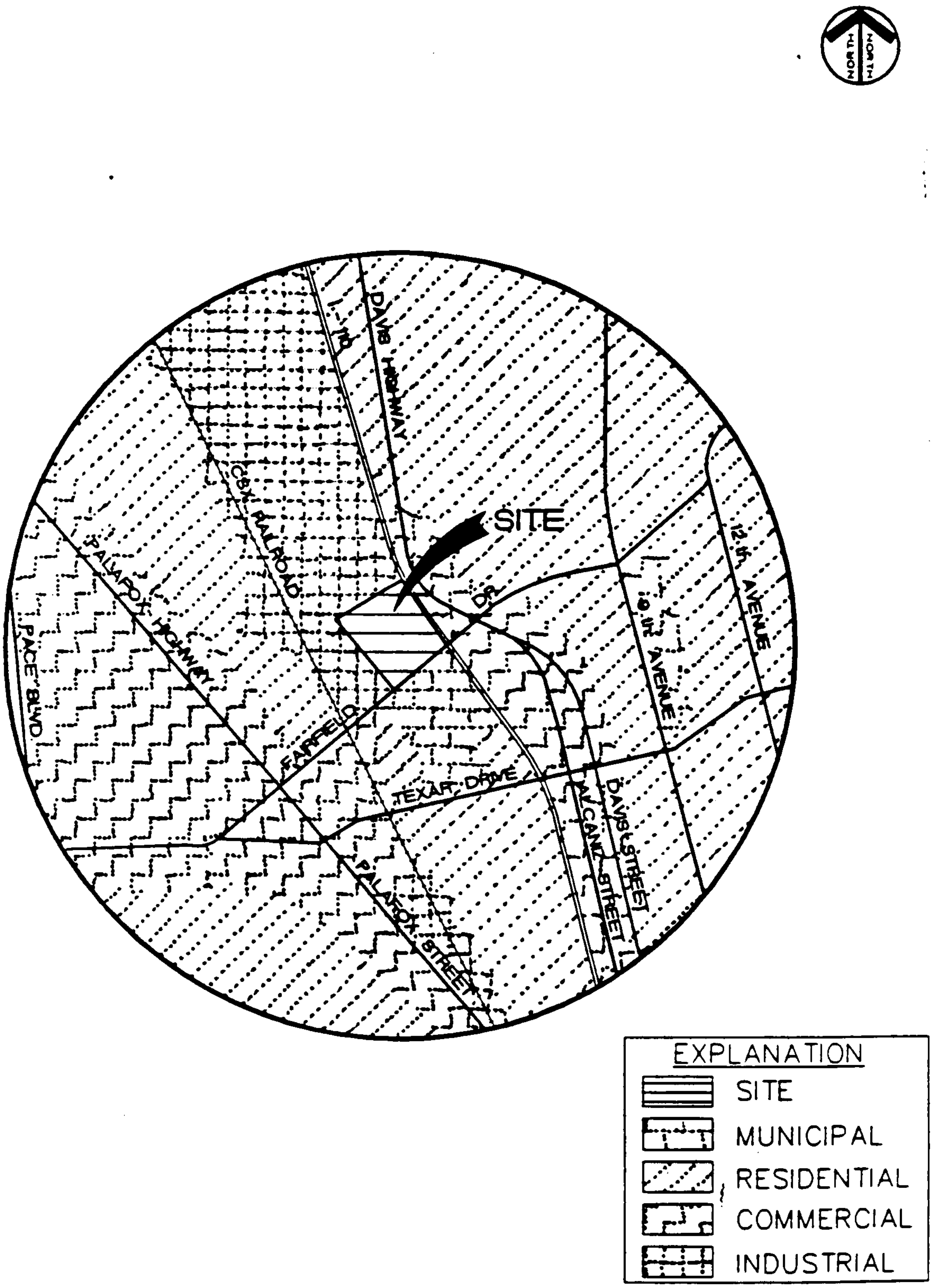


SOURCE: WILKENS, ET AL. (1988)

Geologic Cross-Section for the Study Area

Phase I Remedial Investigation
Agrico Chemical Site
Pensacola, Florida

FIGURE 5-2



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SURROUNDING LAND USE

AGRICO CHEMICAL SITE
PENSACOLA, FLORIDA

FIGURE 5-3

Company site is located in this area and is the current subject of a removal. EPA is currently excavating contaminated soil from the site and stockpiling it on site as a Superfund removal action.

5.5 RESULTS OF SITE INVESTIGATION

The Agrico Chemical site RI was conducted in two phases. Field work for the Phase I RI was initiated in mid-1990. Confirmatory sampling was required in April 1991, and again in November, 1991. Field investigations for the Phase II RI were conducted in February, 1992.

Constituents to be addressed during the Remedial Investigations were identified by locating and sampling the primary areas of waste deposition. Available records indicate that the four impoundment ponds had received industrial wastewater and sludges (Figure 1-2). Soil borings were used to investigate the horizontal and vertical extent of waste deposition within the four sludge ponds. Based on historical areal photographs, isolated areas off-site were also targeted for sampling and analyses. Samples of soil and sludge were analyzed for the TAL/TCL parameters to provide a characterization of the contamination. Elevated levels of radionuclide activity, if present at a fertilizer production plant, are generally associated with the gypsum stacks. However, at the Agrico site the anhydrite (gypsum) portion remained with the product and was sold as part of the final product. Nevertheless, EPA required that targeted areas on site were to be analyzed for radionuclides.

An existing monitoring well network, established specifically for a previous FDER investigation of the site, was supplemented by newly installed and other already existing monitoring wells. During the first phase of the RI, samples of ground water were analyzed for the TAL/TCL parameters. Ground-water sampling efforts during the second phase RI focused on site specific inorganic constituents, organic constituents, and radionuclides. It should be remembered that the ground-water contamination investigation is not complete at this time. The ground-water remediation selection is not an objective of this ROD.

5.5.1 SITE SOIL/SEDIMENT INVESTIGATION

Elevated fluoride concentrations were noted at most of the Agrico targeted and random soil and sludge locations. Fluoride concentrations in surficial soils ranged from the laboratory detection limit of 150 mg/kg to 530,000 mg/kg in a sample obtained from the on-site abandoned baseball field. Elevated levels of fluoride concentrations were detected within the boundaries of the sludge ponds PFP I, PFP II, and PFP III. However, the sampling results of the main or east impoundment pond, PFP II, clearly indicate that the most extensive contamination of fluoride is within its boundaries. Fluoride concentrations in excess of 2,500 mg/kg were noted in a soil boring collected at a depth of 25 feet below land surface (bls) within this sludge pond. The fluoride concentrations detected in soils off site were slightly above the detection limit.

Arsenic concentrations were detected either at or slightly above the detection limit in all areas of the site, except for two locations. A sample obtained from the PFP IV pond yielded an arsenic concentration level of 56 mg/kg. An arsenic detection level of 58 mg/kg was obtained from the PFP II pond.

Elevated lead concentrations were detected in the area of PFP IV impoundment pond. A surficial soil sample collected from PFP IV yielded a lead concentration of 46,000 mg/kg. The lead contamination is confined to surficial soils. Soil borings at depths of 10 feet bls in the PFP IV pond yield lead concentrations below 100 mg/kg. Lead from the site is not impacting the ground water. Site records indicate that sulfuric acid was manufactured in lead chambers located in this area.

Elevated sulfate concentrations were noted in samples obtained from the PFP II sludge pond. The concentrations of nitrate/nitrite from the PFP I, II, and III sludge ponds range from below laboratory detection to 12 mg/kg. Elevated levels of aluminum (44,000 mg/kg) were detected in samples collected from the PFP III sludge pond.

The presence of organochlorine pesticides is limited. The compound dieldrin was detected in two locations at a maximum detection of 2.4 ug/kg. 4,4-DDT was noted in two locations at levels slightly above the detection level.

The volatile organic compounds, acetone and methylene chloride, were detected at elevated levels in numerous soil samples and sample blanks. However, sample results for these contaminants did not exceed ten times the maximum amount detected in any blank. According to the Functional Guidelines for Organics (EPA 1988e), sample results not exceeding ten times the maximum amount detected in any blank should be considered a laboratory artifact. Methylene chloride is used as a solvent and carrier fluid in the gas chromatography procedure and is commonly detected by this method. The Acetone (2-proponone) detected in the samples is likely the result of residual laboratory grade isopropyl alcohol (2-propanol) used in the field decontamination procedures between sample collections.

Elevated semi-volatile organic compound levels were detected in the area of the PFP IV impoundment pond. Di-n-butyl phtalate and Di-n-octyl phthalate were detected in numerous soil samples and sample blanks. Using the above EPA guidelines, it appears these contaminants are field artifacts. The presence of the two phthalate compounds is the result of contamination from gaskets used in the analytical instruments which is detectable at very low semi-volatile organic concentrations.

Samples and analyses of radionuclides, gross alpha, gross beta, radium 226, and uranium 238 were collected from the sludge ponds PFP I, PFP II, and PFP III. Also, other alpha-emitters from the ^{232}thorium and ^{235}uranium decay series are likely present. The highest radionuclide activity was a reading for uranium 238 of 8.0 picocuries per gram (pCi/gm). The detected level for this radionuclide is lower than regional background levels of 20 to 200 parts per million.

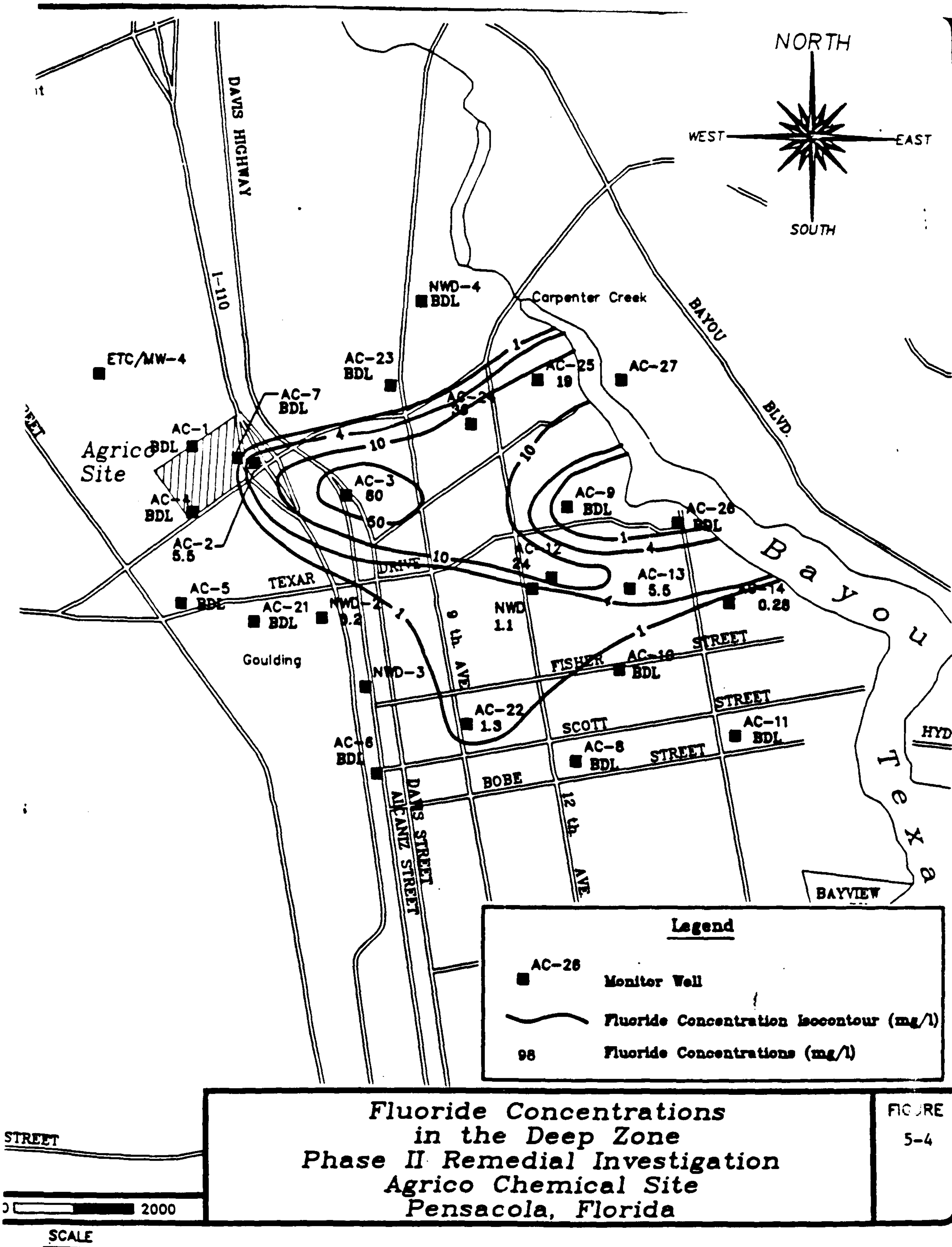
In conclusion, the contaminants of concern in the soils and sludges at the Agrico site are primarily fluoride, arsenic and lead. The highest contamination of fluoride is found in the areas of PFP II, PFP III, and PFP I. The lead and arsenic contamination is generally confined to the area of PFP IV.

5.5.2 GROUND-WATER INVESTIGATION

To further define the extent of ground-water contamination associated with the Agrico Chemical site, six (6) two-well clusters, screened in the shallow and deep zones of the sand-and-gravel aquifer, were installed during the two phased RI study. In addition, three (3) new shallow wells and three (3) new deep wells were added to the existing well network.

The discharge of wastewater has generated a ground-water plume of contaminants that is approximately 7,000 feet long and 1,300 feet wide. The monitoring well network indicates that the plume of inorganic constituents has migrated to the Bayou Texar within the northern portion of the study area (Figure 5-4). The most highly concentrated area of the plume is in the lower portion of the sand-and-gravel aquifer, approximately 2,000 feet downgradient of the site (Figure 5-5).

During phase II of the RI study, samples from 34 existing and recently installed monitoring wells were collected and analyzed for inorganic constituents related to plant processes. A plume of mainly semivolatile organic compounds is present in the deep zone of the aquifer in the northern portion of the study area. The source of the organic plume appears to be the Escambia Treating Company site, a former wood treatment facility located approximately 2,500 feet hydraulically upgradient from the Agrico site.



Fluoride Concentrations
in the Deep Zone
Phase II Remedial Investigation
Agrico Chemical Site
Pensacola, Florida

FIGURE
5-4

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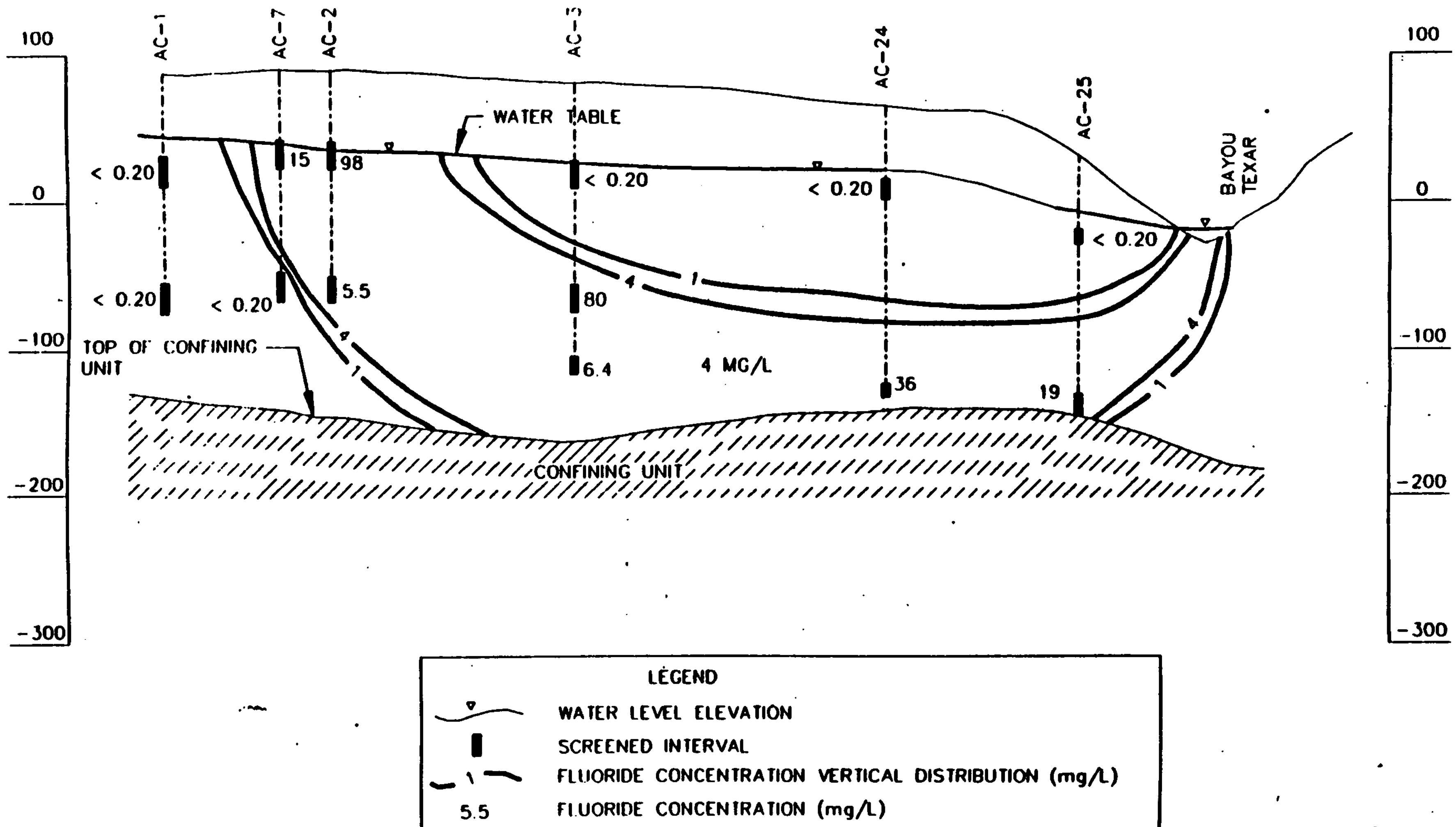

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Vertical Distribution Cross Section for Fluoride (February 1992)
Phase II Remedial Investigation
Agrico Chemical Site
Pensacola, Florida

FIGURE 5-5

A study of the ground-water impacts to the bayou is currently being conducted. After this study is complete, EPA will select a remedy for the second operable unit, contamination of the ground water.

6.0 SUMMARY OF SITE RISKS

6.1 SCOPE

The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline indicating what risks could exist if no action were taken at the site. This section of the ROD reports the results of the baseline risk assessment conducted for this site.

A baseline Risk Assessment was conducted by EPA as part of the RI to estimate the health or environmental problems that could result if the Agrico site was not remediated. Results are contained in the Final Risk Assessment Report. A Baseline Risk Assessment represents an evaluation of the "No Action" alternative, in that it identifies the risk present if no remedial action is taken. The assessment considers environmental media and exposure pathways that could result in unacceptable levels of exposure now or in the foreseeable future. Data collected and analyzed during the RI provided the basis for the risk evaluation. The risk assessment process can be divided into four components: contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The risk assessment for source control is summarized in this doucment. However, because the risk associated with ground-water contamination will be addressed in a subsequent ROD, the risk assessment for ground water is not summarized here.

6.2 CONTAMINANTS OF CONCERN

Compiled aerial photos (ranging in age from 1940 to 1990) illustrate that water from the facility operations ponded in four general areas. These areas are shown on Figure 1-2 and will be referred to in this section as PFP I, PFP II, PFP III, and PFP IV. Other site areas referred to in the following risk sections are the on-site baseball field and the former drainage ditch associated with PFP IV. The four ponds are now devoid of any surface water. Surface drainage is currently contained on site as a result of natural topography and berms associated with road construction. For the purposes of this ROD, soils are the media of potential concern at the site. Lands surrounding the site are zoned industrial to the north, commercial/office/residential to the west and south, and medium-to-low density residential further south and to the east. There is no residential development in the immediate vicinity. Therefore, it is unlikely that the future use of the property would include residential development.

Several factors are considered in determining whether a constituent detected in soils is included or dropped from consideration as a constituent of concern. Constituents not detected at concentrations above the detection limit are not retained for consideration. Constituents detected only once in a particular media at a concentration less than twice the detection limit are excluded from the above list. Constituents detected in soils at concentrations below background concentrations for soils in the vicinity of Pensacola are eliminated from consideration as contaminants of concern. Constituents that are essential human nutrients and toxic only at very high doses (i.e., much higher than those that could be associated with contact at the site) are eliminated from the quantitative risk assessment. Examples of such constituents are iron, magnesium, calcium, potassium, and sodium.

Thirty-eight (38) chemical contaminants were found in the soils and/or sediments at the Agrico Chemical site. Based on the chemical screening guidelines published in the U.S. EPA Human Health Evaluation Manual (HHEM), 1989, twenty-one (21) chemicals of potential concern were retained for the detailed health risk assessment. Those 21 chemicals are:

Inorganic Constituents

- Arsenic
- Aluminum
- Fluoride
- Nitrate
- Lead

Volatile Organic Compounds

- Acetone
- Methylene chloride

Semi-Volatile Organic Compounds

- carcinogenic Polycylcic Aromatic Hydrocarbons
- total Polycyclic Aromatic Hydrocarbons
- Di-n-butylphthalate

Pesticides

- 4,4'-DDT
- Dieldrin
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Endosulfan I
- Aldrin
- beta-BHC
- 4,4-DDE

Radionuclides

- Radium-226
- Radium-228
- Uranium-238

6.3 EXPOSURE ASSESSMENT

Two timeframes are considered in the baseline risk assessment: (1) the current risk, or the risk from the site as it exists today, and (2) the future risk from the site assuming no remedial actions are taken. The current risk assessment examines the risks for all pathways which analytical data indicates that constituents have already reached a point of exposure.

Two human receptor populations are evaluated in the current and future use scenario - resident and excavation worker. For the purpose of determining future risks associated with constituents detected in surficial and subsurface soils, it is assumed that the site is developed into a residential area. Exposure via direct dermal contact and ingestion is assumed for hypothetical adult and child residents. This is a conservative approach as residential use of the site is unlikely. Risks associated with direct contact with surficial and subsurface soils will also be determined for an excavation worker, assuming future development of the site.

Current public exposure to surficial soils and sludges in the vicinity of former pond areas PFP I, PFP II, PFP III, PFP IV, the baseball field, and the former drainage ditch is assessed in the RI/FS Risk Assessment. Routes of exposure evaluated include ingestion, dermal contact, and inhalation of suspended particulates. Low concentrations of VOCs (acetone and methylene chloride) were detected in a minimal number of soil samples. Therefore, vapor inhalation is not expected to be a significant exposure pathway for soils and not evaluated herein.

There is no current human exposure to subsurface soils. Assuming the property is developed into a residential area in the future, there is the potential for adult and child residents and excavation workers to be exposed to constituents in surficial and subsurface soils. Subsurface soils could be brought to the surface during excavation for foundations or basements.

Representative exposure point concentrations (EPC) are taken as the lesser of the 95 percent upper confidence limit (UCL) on the mean of the lognormal distribution or the maximum detected concentration of available samples by media and area. Constituent concentrations are assumed to remain constant; thus, current and future exposure point concentrations are the same. Concentrations in dust also are assumed to equal concentrations in soil for a given area. For current public exposure, only surficial soil samples are considered. Hypothetical future residents and excavation workers are assumed to be exposed to constituents in surficial and subsurface soils.

For the resident adult scenario for exposure to soils, the period of exposure is 100 days/year for 30 years. Assuming hands, face, neck, and forearms (skin surface area of 2,940 cm^2) are exposed to soil, 1.45 mg/cm^2 of soil adheres to exposed skin. For the resident child scenario, the period is 100 days/year for 6 years. Assuming skin surface area of 2,758 cm^2 exposed to soil, 1.45 mg/cm^2 of soil adheres to exposed skin. The same general exposure assumptions used to calculate current exposure to soils also apply for future exposure. For future exposure, an additional receptor, a site excavation worker, is also considered. For the excavation worker scenario for exposure to soils, the period of exposure is 8 hours/day for a 90-day exposure. Using the skin surface area of 2,940 cm^2 exposure to soil, 1.45 mg/cm^2 of soil adheres to exposed skin.

Ingestion, inhalation, external exposure, and ingestion of vegetables grown in affected soils are the exposure pathways evaluated for the radionuclides of concern, radium 226 and uranium-238, at the site. Dermal uptake is not evaluated because this route of uptake is generally not an important route of uptake for radionuclides.

6.4 TOXICITY ASSESSMENT

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

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminant(s) of concern exhibiting noncarcinogenic effects.

RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminant(s) of concern ingested from contaminated drinking water can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). Table 6-1 provides Reference Doses (RfDs), Cancer Slope Factors (CSFs) and EPA's Cancer Classification for constituents of concern.

6.5 RISK CHARACTERIZATION

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a life-time as a result of exposure to the carcinogen. Excess life-time cancer risk is calculated from the following equation:

Risk = CDI X SF

where:

risk = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer;

CDI = chronic daily intake averaged over 70 years (mg/kg-day); and SF = slope-factor, expressed as $(mg/kg\text{-}day)^{-1}$

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

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose derived for a similar exposure period. The ratio of exposure to toxicity is called a hazard quotient (HQ). By adding the HQs for all contaminants(s) of concern that affects the same target organ (e.g., liver) within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated.

The HQ is calculated as follows:

Non-cancer HQ = CDI/Rfd

Table 6-1

Reference Doses (RfDS), Cancer Slope Factors (CSFs), and EPA Cancer Classification for Constituents of Concern, Agrico Chemical Site

Constituent	RfD (mg/kg/day) Oral	RfD (mg/kg/day) Inhalation	CSF $(mg/kg/day)^{-1}$ Oral	CSF $(mg/kg/day)^{-1}$ Inhalation	EPA Cancer Classification
Arsenic	$3x10^{-4}$	ND	$1.75x10^{0}$	$5.0x10^{1}$	A
Fluoride	$6x10^{-2}$	ND	NA	NA	D
Nitrate	$1.6x10^{0}$	ND	ND	ND	D
Organics					
VOCs					
Acetone	$1x10^{-1}$	ND	NA	NA	D
Methylene chloride	$6x10^{-2}$	$8.6x10^{-1}$	$7.5x10^{-3}$	$1.6x10^{-3}$	B2
Semi-VOCs					
Di-n-butylphthalate	$1x10^{-1}$	ND	NA	NA	
2,4-Dinitrotoluene	ND	ND	$6.8x10^{-1}$	ND	B2
2,6-Dinitrotoluene	ND	ND	$6.8x10^{-1}$	ND	B2
cPAHs	$4X10^{-3}$	ND	$5.8x10^{0}$	$6.1x10^{0}$	B2
tPAHs	$4x10^{-3}$	ND	NA	NA	D
Pesticides					
Beta-BHC	ND	ND	$1.8x10^{0}$	$1.8x10^{0}$	C

(Table 6-1 continued)

4,4-DDT	$5x10^{-4}$	ND	$3.4x10^{-1}$	$3.4x10^{-1}$	B2
Dieldrin	$5x10^{-5}$	ND	$1.6x10^{1}$	$1.6x10^{1}$	B2
Endosulfan I	$5x10^{-5}$	ND	NA	NA	D

NA Not applicable
ND No data
A Known Human Carcinogen

B1 or B2 Probable Human Carcinogen, where B1 indicates that limited data is available. B2 indicates sufficient evidence in animals and inadequate or no evidence in humans.

C Possible Human Carcinogen
D Not a Carcinogen

where:

CDI = Chronic Daily Intake

Rfd = reference does; and

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, short-term).

Risk characterization for current and future direct contact with soils for resident adult, child, and excavation worker is summarized in Tables 6-2 through 6-10. Excess lifetime cancer risk associated with current ingestion, inhalation, and external exposure to radionuclides ranged from $1x10^{-7}$ in the PFP I area to $6x10^{-8}$ in the PFP II area. As is evident, these risks are lower that the EPA's target clean-up risk range for Superfund sites (10^{-4} to 10^{-6}).

The cPAHs contribute to the cancer risk for current exposure at the PFP IV area, where the cancer risk associated with cPAHs is $4.1x10^{-4}$. For the current residential scenario, Dieldrin contributes to the excess cancer risk for the former ditch location at a risk number of $1.5x10^{-4}$. Dieldren also poses a non-cancer risk at this location with a hazard index of 1.8.

Determination of current non-cancer effects, expressed as hazard indices, range from 0.2 to 5 for an adult and from 0.4 to 40 for a child. Fluoride contributes most significantly to the hazard indices. The highest hazard indices are for current exposure to soils at the baseball field.

EPA has identified a blood lead level of 10ug/dL as a concentration of potential concern for health effects in children that warrants avoidance. The results of the LEAD5 model run using the Agrico site data indicate that 100 percent of the hypothetical child residents exposed to soils at PFP IV would have blood lead levels above 10 ug/dL.

Hypothetical future risks to adults and children residents and to excavation workers exposed to constituents in surficial and subsurface soils via direct contact are found on Tables 6-5 through 6-10. Hazard indices range from under 1.0 for an adult to 100 for a child. The significant hazard index of 100 is associated with the risk from Fluoride on the baseball field. Cancer effects from dieldrin are evident in the area of the former drainage ditch with a risk of $5.1x10^{-4}$. In this same area, non-cancer effects for dieldrin yield a hazard index of 6.4. Under the future use scenario, excess lifetime cancer risk from cPAHs located in PFP IV is $1.5x10^{-3}$.

Table 6-2 **RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (CURRENT USE)**

PFP I (mg/kg)

	EPC	Calculated Risks: Adult	Calculated Risks: Child
Cancer Effects			
Arsenic	12	5.0×10^{-6}	7.4×10^{-6}
cPAHs	7.8	4.3×10^{-5}	4.2×10^{-5}
Dieldrin	0.2	1.2×10^{-5}	1.1×10^{-5}
		6.0×10^{-5} [a]	6.0×10^{-5}
Non-Cancer Effects			
Arsenic	12	2.2×10^{-2}	1.6×10^{-1}
Fluoride	11,000	1.0×10^{-1}	7.5×10^{-1}
Nitrate	2	7.0×10^{-7}	5.1×10^{-6}
tPAHs	16	8.9×10^{-3}	4.4×10^{-2}
4,4'-DDT	0.3	3.7×10^{-3}	1.6×10^{-2}
Dieldrin	0.2	3.6×10^{-2}	1.5×10^{-1}
		0.2	1.0

PFP II (mg/kg)

	EPC	Calculated Risks: Adult	Calculated Risks: Child
Cancer Effects			
Arsenic	11	4.6×10^{-6}	6.8×10^{-6}
2,4-Dinitrotoluene	11	7.1×10^{-6}	7.0×10^{-6}
2,6-Dinitrotoluene	3.9	2.5×10^{-6}	2.5×10^{-6}
cPAHs	4.7	2.6×10^{-5}	2.6×10^{-5}
		4.0×10^{-5}	4.0×10^{-5}
Non-Cancer Effects			
Arsenic	11	2.0×10^{-2}	1.5×10^{-1}
Fluoride	310,000	2.9×10^{0}	$2.1 \times 10^{+1}$
Nitrate	1.9	6.6×10^{-7}	4.9×10^{-6}
Acetone	8.6	3.9×10^{-4}	1.8×10^{-3}
tPAHs	12	6.7×10^{-3}	3.3×10^{-2}
Endosulfan I	0.024	1.2×10^{-3}	5.9×10^{-3}
		3.0	20.0

EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons
a - Cummulative risks may be slightly higher for some scenarios than additive risks on this summary page due to the low level risk contributions from other contaminants.

Table 6-3 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (CURRENT USE)

PFP III (mg/kg)

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	4.6	1.9×10^{-6}	2.8×10^{-6}
cPAHs	4.17	2.3×10^{-5}	2.3×10^{-5}
		3.0×10^{-3}	3.0×10^{-3}
Non-Cancer Effects			
Arsenic	4.6	8.6×10^{-3}	6.3×10^{-2}
Fluoride	3,900	3.6×10^{-2}	2.7×10^{-1}
Nitrate	5.6	2.0×10^{-6}	1.4×10^{-5}
Acetone	0.94	4.3×10^{-5}	1.9×10^{-4}
Methylene Chloride	0.027	2.1×10^{-6}	9.2×10^{-6}
Di-n-butylphthalate	0.34	7.0×10^{-6}	3.5×10^{-5}
tPAHs	9.3	5.2×10^{-3}	2.5×10^{-2}
Aldrin	0.005	1.2×10^{-3}	5.1×10^{-3}
4,4'-DDE	0.0056	7.0×10^{-5}	3.1×10^{-4}
Dieldrin	0.0069	1.2×10^{-3}	5.3×10^{-3}
Endosulfan I	0.0041	2.1×10^{-4}	1.0×10^{-3}
		0.05	0.4

PFP IV (mg/kg)

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	56	2.3×10^{-5}	3.5×10^{-5}
cPAHs	76	4.2×10^{-4}	4.1×10^{-4}
Aldrin	0.047	2.4×10^{-6}	2.1×10^{-6}
		4.0×10^{-4}	5.0×10^{-4}
Non-Cancer Effects			
Arsenic	56	1.0×10^{-1}	7.7×10^{-1}
Fluoride	810	7.5×10^{-3}	5.5×10^{-2}
Nitrate	1.9	6.6×10^{-7}	4.9×10^{-6}
Acetone	96	4.4×10^{-3}	2.0×10^{-2}
tPAHs	189	1.0×10^{-1}	5.2×10^{-1}
Aldrin	0.047	1.1×10^{-2}	4.8×10^{-2}
Endosulfan I	0.051	2.6×10^{-3}	1.3×10^{-2}
Heptachlor	0.043	7.7×10^{-4}	3.3×10^{-3}
		0.2	1.0

cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-4 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (CURRENT USE)

Baseball Field (mg/kg)

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	5.8	2.4×10^{-6}	3.6×10^{-6}
		2.0×10^{-6}	4.0×10^{-6}
Non-Cancer Effects			
Arsenic	5.8	1.1×10^{-3}	7.9×10^{-2}
Fluoride	530,000	4.9	$3.6 \times 10^{+1}$
		5.0	36.0

Former Drainage Ditch (mg/kg)

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
cPAHs	2.1	1.1×10^{-5}	1.1×10^{-5}
Dieldrin	2.4	1.5×10^{-4}	1.3×10^{-4}
		2.0×10^{-4}	1.0×10^{-4}
Non-Cancer Effects			
Methylene Chloride	0.01	7.6×10^{-7}	3.4×10^{-6}
Di-n-butylphthalate	4.8	9.9×10^{-5}	4.9×10^{-4}
tPAHs	3.9	2.2×10^{-3}	1.1×10^{-2}
Dieldrin	2.4	4.3×10^{-1}	1.8×10^{0}
		0.4	2.0

EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-5 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (FUTURE USE)

PFP I

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	12	1.8×10^{-5}	2.7×10^{-5}
cPAHs	7.8	1.6×10^{-4}	1.6×10^{-4}
Dieldrin	0.2	4.5×10^{-5}	3.8×10^{-5}
		2.0×10^{-4}	2.0×10^{-4}
Non-Cancer Effects			
Arsenic	12	8.2×10^{-2}	6.0×10^{-1}
Fluoride	4,500	1.5×10^{-1}	1.1×10^{0}
Nitrate	2	2.5×10^{-6}	1.9×10^{-5}
Di-n-butylphthalate	0.7	5.3×10^{-5}	2.6×10^{-4}
tPAHs	16	3.2×10^{-2}	1.6×10^{-1}
4,4'-DDT	0.3	1.4×10^{-2}	6.0×10^{-2}
Dieldrin	0.2	1.3×10^{-1}	5.6×10^{-1}
		0.4	3.0

PFP II

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	11	1.7×10^{-5}	2.5×10^{-5}
2,4-Dinitrotoluene	0.86	2.0×10^{-6}	2.0×10^{-6}
2,6-Dinitrotoluene	0.62	1.5×10^{-6}	1.4×10^{-6}
cPAHs	0.67	1.4×10^{-5}	1.3×10^{-5}
		3.0×10^{-5}	4.0×10^{-5}
Non-Cancer Effects			
Arsenic	11	7.5×10^{-2}	5.5×10^{-1}
Fluoride	270,000	9.2×10^{0}	$6.7 \times 10^{+1}$
Nitrate	1.9	2.4×10^{-6}	1.8×10^{-5}
Acetone	1.7	2.8×10^{-4}	1.3×10^{-3}
Di-n-butylphthalate	0.46	3.5×10^{-5}	1.7×10^{-4}
tPAHs	1	2.0×10^{-3}	1.0×10^{-2}
Endosulfan I	0.024	4.5×10^{-3}	2.2×10^{-2}
		9.0	70.0

EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-6 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (FUTURE USE)

PFP III

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	4.6	7.0×10^{-6}	1.0×10^{-5}
cPAHs	4.2	8.4×10^{-5}	8.3×10^{-5}
Dieldrin	0.0069	1.5×10^{-6}	1.3×10^{-6}
		9.0×10^{-5}	1.0×10^{-4}
Non-Cancer Effects			
Arsenic	4.6	3.1×10^{-2}	2.3×10^{-1}
Fluoride	12,000	4.1×10^{-1}	3.0×10^{0}
Nitrate	5.6	7.1×10^{-6}	5.2×10^{-5}
Methylene Chloride	0.027	7.5×10^{-6}	3.4×10^{-5}
Di-n-butylphthalate	1.2	9.0×10^{-5}	4.5×10^{-4}
tPAHs	9.3	1.9×10^{-2}	9.3×10^{-2}
Aldrin	0.005	4.3×10^{-3}	1.9×10^{-2}
4,4'-DDE	0.0056	2.5×10^{-4}	1.1×10^{-3}
Dieldrin	0.0069	4.5×10^{-3}	1.9×10^{-2}
Endosulfan I	0.0041	7.7×10^{-4}	3.7×10^{-3}
		0.5	3.0

PFP IV

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	56	8.6×10^{-5}	1.3×10^{-4}
cPAHs	76	1.5×10^{-3}	1.5×10^{-3}
Aldrin	0.047	8.8×10^{-6}	7.7×10^{-6}
Heptachlor	0.043	2.7×10^{-6}	2.3×10^{-6}
		2.0×10^{-3}	2.0×10^{-3}
Non-Cancer Effects			
Arsenic	56	3.8×10^{-1}	2.8×10^{0}
Fluoride	740	2.5×10^{-2}	1.8×10^{-1}
Nitrate	1.9	2.4×10^{-6}	1.8×10^{-5}
Acetone	96	1.6×10^{-2}	7.2×10^{-2}
Methylene Chloride	0.071	2.0×10^{-5}	8.9×10^{-5}
tPAHs	189	3.8×10^{-1}	1.9×10^{0}
Aldrin	0.047	4.0×10^{-2}	1.8×10^{-1}
Endosulfan I	0.053	9.9×10^{-3}	4.8×10^{-2}
Heptachlor	0.043	2.8×10^{-3}	1.2×10^{-2}
		0.9	5.0

Table 6-7 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (FUTURE USE)

Baseball Field

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
Arsenic	5.8	8.9×10^{-6} 9.0×10^{-6}	1.3×10^{-5} 1.0×10^{-5}
Non-Cancer Effects			
Arsenic	5.8	3.9×10^{-2}	2.9×10^{-1}
Fluoride	530,000	$1.8 \times 10^{+1}$ 20	$1.3 \times 10^{+2}$ 100

Former Drainage Ditch

	EPC	Calculated Risks Adult	Calculated Risks Child
Cancer Effects			
cPAHs	1	2.0×10^{-5}	2.0×10^{-5}
Dieldrin	2.3	5.1×10^{-4} 5.0×10^{-4}	4.4×10^{-4} 5.0×10^{-4}
Non-Cancer Effects			
Methylene Chloride	0.0056	1.6×10^{-6}	7.0×10^{-6}
Di-n-butylphthalate	4.8	3.6×10^{-4}	1.8×10^{-3}
tPAHs	2.6	5.3×10^{-3}	2.6×10^{-2}
Dieldrin	2.3	1.5×10^{0}	6.4×10^{0}

Note:
EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycyclic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-8 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (EXCAVATION)

PFP I

	EPC	Calculated Risks
Cancer Effects		
cPAHs	7.8	1.3×10^{-6}
		2.0×10^{-6}
Non-Cancer Effects		
Arsenic	12	8.2×10^{-2}
Fluoride	4500	1.5×10^{-1}
Nitrate	2	3.1×10^{-6}
Di-n-butylphthalate	0.7	5.3×10^{-5}
tPAHs	16	3.2×10^{-2}
4,4'-DDT	0.3	1.4×10^{-2}
Dieldrin	0.2	1.3×10^{-1}
		4.0×10^{-1}

PFP II

	EPC	Calculated Risks
Cancer Effects		
Non-Cancer Effects		
Arsenic	11	7.5×10^{-2}
Fluoride	270,000	9.2×10^{0}
Nitrate	1.9	2.4×10^{-6}
Acetone	1.7	2.8×10^{-4}
Di-n-butylphthalate	0.46	3.5×10^{-5}
tPAHs	1.0	2.0×10^{-3}
Endosulfan I	0.024	4.5×10^{-3}
		9.0

EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-9 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (EXCAVATION)

PFP III

	EPC	Calculated Risks
Cancer Effects		
Non-Cancer Effects		
Arsenic	4.6	3.1×10^{-2}
Fluoride	12,000	4.1×10^{-1}
Nitrate	5.6	7.1×10^{-6}
Methylene Chloride	0.027	7.5×10^{-6}
Di-n-butylphthalate	1.2	9.0×10^{-5}
tPAHs	9.3	1.9×10^{-2}
Aldrin	0.005	4.3×10^{-3}
4,4'-DDE	0.0056	2.5×10^{-4}
Dieldrin	0.0069	4.5×10^{-3}
Endosulfan I	0.0041	7.7×10^{-4}
		0.5

PFP IV

	EPC	Calculated Risks
Cancer Effects		
cPAHs	76	1.3×10^{-5}
Non-Cancer Effects		
Arsenic	56	3.8×10^{-1}
Fluoride	740	2.5×10^{-2}
Nitrate	1.9	2.4×10^{-6}
Acetone	96	1.6×10^{-2}
Methylene Chloride	0.071	2.0×10^{-5}
tPAHs	189	3.8×10^{-1}
Aldrin	0.047	4.0×10^{-2}
Endosulfan I	0.053	9.9×10^{-3}
Heptachlor	0.043	2.8×10^{-3}
		0.9

Note:
EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycylcic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Table 6-10 RISK CHARACTERIZATION FOR DIRECT CONTACT WITH SURFICIAL SOILS (EXCAVATION)

Baseball Field

	EPC	Calculated Risks
Cancer Effects		
Non-Cancer Effects		
Arsenic	5.8	3.9×10^{-3}
Fluoride	530,000	$1.8 \times 10^{+1}$
		18

Former Drainage Ditch

	EPC	Calculated Risks
Cancer Effects		
Dieldrin	2.3	4.2×10^{-6}
Non-Cancer Effects		
Methylene Chloride	0.0056	1.6×10^{-6}
Di-n-butylphthalate	4.8	3.6×10^{-4}
tPAHs	2.6	5.3×10^{-3}
Dieldrin	23	1.5×10^{0}
		2.0

EPC - Exposure Point Concentrations
cPAHs - sum of carcinogenic Polycyclic Aromatic Hydrocarbons
tPAHs - total Polycyclic Aromatic Hydrocarbons

Risks calculated for the hypothetical scenario are higher than current risk estimates because of exposure to constituents in subsurface as well as surficial soils, higher exposure frequencies associated with residential exposure, and additional exposure pathways. Constituent concentrations were assumed to remain at current levels, and an additional receptor (site excavation worker) is also considered.

In summary, fluoride, tPAHs, and dieldrin contribute most significantly to non-cancer risks. Fluoride contributes most significantly to the hazard indices on the baseball field. The PAHs and dieldrin pose the worst health hazard in the former drainage ditch area. In addition, cPAHs and dieldren contribute most significantly to cancer risks in the drainage ditch area and the PFP IV area. The subchronic assessment of lead exposure to potential on-site children conclude that the levels of lead in on-site soils in the area of PFP IV are sufficiently contaminated to be of health concern.

Uncertainty is inherent in the risk assessment process. Each of the three basic building blocks for risk assessment (monitoring data, exposure scenarios, and toxicity values) contribute uncertainties. Environmental sampling itself introduces uncertainty, largely because of the potential for uneven distribution of constituents in environmental media. However, the use of upper-bound assumptions, no attenuation, and the conservatism built into the reference doses and cancer slope factors are believed to result in an over-estimate of human health risk. Therefore, actual risk may be lower than the estimates presented here but are unlikely to be greater.

6.6 ENVIRONMENTAL RISK

Potentially exposed populations in the environment include: (1) those at the site, (2) threatened or endangered species in the area, and (3) the bayou communities. A study of the Bayou Texar is currently being conducted to assess the extent of (1) the contaminated ground-water plume associated with the site and (2) potential impacts to bayou communities. Once the bayou study is complete, an environmental risk assessment for impacts from ground water can be concluded.

Vegetation communities within the site consist of open field/scrub-shrub mix; forested (oak and wax myrtle); potential wetland; and open field. The site is predominantly covered by an open field/scrub-shrub community. This biotic community is characterized by a predominance of woody vegetation not exceeding approximately 6 feet in height. Potential wetland areas are located in the western section of the site and adjacent to the borrow pit and near the Interstate off-ramp. These areas are predominantly vegetated by cattails. A jurisdictional wetland review will be conducted for the site and included with the subsequent Bayou Texar study. Terrestrial effects from exposure to constituents in surficial soils at the site either through direct contact or from fugitive dust are likely to be harmful to vegetation in some instances. Constituents detected in on-site surficial soils at concentrations potentially toxic to vegetation include aluminum, arsenic, chromium, fluoride, manganese, and sodium. By remediating surface soils for fluoride, the potential for exposure of the biota to the other surface soils contaminants should also decrease. Except for the area of PFP II, no visible signs of stressed vegetation has been observed. Remediation of soils in the PFP II area will eliminate stress to the vegetation in this area. Animal inhabitants on site are limited to invertebrates (insects and worms). Vertebrates (e.g., birds and rabbits) may occasionally pass through the site, but the site is not conducive to providing a habitat for a resident population. Therefore, wildlife exposure to site contaminants is expected to be low to sporadic.

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

7.0 DESCRIPTION OF ALTERNATIVES

7.1 REMEDIAL ACTION OBJECTIVES

Soil cleanup goals are required for direct contact, ingestion and inhalation of dust (risk-based). A soil level is also necessary which is protective of ground water (leachability-based), for both organic and inorganic constituents.

Risk based remediation goals were determined for several exposure scenarios. Due to the expected continued industrial zoning at the Agrico site, risk based action levels based on an industrial cancer risk of $1x10^{-6}$ is considered appropriate. Remedial goals that are protective of ground water were also developed. A number of contaminants evaluated in the Baseline Risk Assessment and the Feasibility Study are not assigned remediation goals; because the contaminant was present, but in very low concentrations or isolated areas. Also, those contaminants that were determined not to be site related were not assigned remediation goals. This included the organic contaminants. A variety of methods were used to develop these goals.

The method used to determine the leachability-based cleanup level for organic components was the Summers Model. The Summers model assumes that some percentage of rainfall will infiltrate and desorb constituents present in the soil matrix which will eventually reach the ground water. This adsorption mechanism is based on soil:water partition coefficients.

Ultimately, remediation goals were appropriate for fluoride, arsenic, and lead. The remedial goal established for fluoride is based on protection of ground water. Fluoride, arsenic and lead are considered representative of the entire inorganic profile and are used as target compounds. The remedial goals established for lead and arsenic are calculated based on health based soil exposure scenarios.

To determine a cleanup level for fluoride in soil protective of ground water, a site specific approach was developed. The cleanup level for fluoride is calculated based on the maximum allowable perimeter ground-water concentration of 4 mg/l for fluoride, and translated to a maximum allowable total characteristic leachate parameter (TCLP) concentration via a dilution factor. The calculation accounts for the mixing and dilution in the aquifer, does not assume any retention, or attenuation of constituents in saturated soil; and presents a worst case, maximum concentration effect of leachate on ground water. This approach was recommended by the Florida Department of Environmental Regulation (FDER), with EPA concurrence. In addition, the calculation used was based on total fluoride concentrations found in the soil. Based on the above site specific approach, the soil remediation goal for total fluoride was calculated to be 1,463 mg/kg.

The lead contamination is confined to surficial soils in the area of PFP IV. In addition, the lead and is not impacting the ground water. Therefore, the lead remediation goal of 500 mg/kg is based on health risk associated with the hypothetical future child residential scenario. The conservative approach for a lead cleanup goal was determined by the lead uptake/biokinetic (UBK) model. The soil cleanup number represents the concentration which the model predicts would result in 95% of a hypothetical future child residential population having a blood lead concentration less than the Agency benchmark of 10 ug/dl.

The remedial goal for arsenic in soils of 16 mg/kg is based on an industrial scenario at the 10^{-6} risk level based on ingestion and inhalation pathways. In summary, the soil remediation goals are:

Chemical	Remediation Goals (mg/kg)
Fluoride	1,463 mg/kg
Lead	500 mg/kg
Arsenic	16 mg/kg

Based on soil treatability studies conducted as part of the FS, solidification/stabilization of the fluoride will result in solidification/stabilization of the lead and arsenic as well. Lead is known to have a low mobility in soils. Site specific data supports the assumption, because the lead contamination is confined to surficial soils in the area of PFP IV only.

7.2 VOLUMES

The volumes of sludge and contaminated soils have been calculated based on the estimated boundaries of the pond areas PPF I, II, III, and IV and the inorganic constituent concentrations found on site. The horizontal extent of soil contamination is limited to the area documented to be the approximate boundary of the pond areas (+/- 25 feet). The vertical extent of soil contamination is limited to roughly a depth of 10 to 15 feet beneath the majority of the pond areas. The soils are contaminated to a depth of 25 to 30 feet from an area extending from the exposed portion of Pond PFP II in a northwesterly direction towards the east end of PFP I.

The total volume of soils present beneath the estimated PFP pond boundaries, to a depth of 25 feet is approximately 600,000 cubic yards (cy). The volume of soils and sludge containing fluoride concentrations exceeding the site specific clean up level for fluoride is approximately 400,000 cy. The volume of sludge on site is 32,500 cy. The volume of soils exceeding fluoride, arsenic, and lead clean up levels in the area of PFP IV is 20,800 cy.

In summary, volumes of soils and sludges to be remediated at the site are as follows:

- Soils (low to moderately contaminated) 400,000 yd^3
- Soils (highly contaminated) 20,800 yd^3
- Sludge (highly contaminated) 32,500 yd^3

7.3 ARARs

Section 121 (d) (2) (A) of CERCLA specifies that Superfund Remedial Actions must either meet any Federal standard, requirement, criteria or limitations that is determined to be an applicable or relevant and appropriate requirement (ARAR). ARARs fall into three categories: contaminant-specific; location specific; and action-specific. Some rules do not specifically apply to a remedial action, however, because of their subject matter, they may provide some guidance in implementing a chosen RA. These rules are called to-be-considereds (TBCs). Potential ARARs and TBCs are discussed below.

Federal standards regarding action-specific ARARs for soils management relate to the manner in which the selected remedy is implemented. Regulations regarding capping and landfill construction are included in 40 CFR 264.228, 40 CFR 264.258, and 40 CFR 264.310 pertaining to closing a landfill, surface impoundment or waste pile as a landfill. Additional capping standards regulate post-closure use of property to prevent damage to the cover, and management of run-on and run-off. General performance standards are included in 40 CFR 264.111 for clean closure.

Chemical-specific ARARs, other criteria, and site-related factors serve to initially identify remedial alternatives. Chemical-specific ARARs define acceptable exposure levels and therefore are used in establishing remediation goals.

The chemical ARARs for ground-water constituents detected at the Agrico site were obtained from the promulgated proposed primary maximum contaminant levels (MCLs) for drinking water for the State of Florida (F.S. 17-550). In instances where there is no state MCLs for a given constituent, proposed or promulgated Federal MCLs (40 CFR 141) are referenced to identify ground-water ARARs. According to the NCP, MCLs are only used for ARARs when the MCLGs are zero. In other instances, MCLGs will take precedence over MCLs. If there are no Federal MCLs for a given constituent, health-based criteria are developed using Federal Water Quality Criteria (FWQC), Lifetime Health Advisories (HAs) and reference doses (RfD). The technical approach and calculations were derived under the guidance of EPA and FDER, and are discussed previously in Section 7.1.

7.4 DEVELOPMENT AND SCREENING OF ALTERNATIVES

7.4.1 PROCESS

As a part of the process, the FS preliminarily evaluates the number of different technologies for remedial action. The technologies are generally evaluated on the basis of their effectiveness, implementability and cost in relation to the remedial action goals for the site. After the screening, four major alternatives were determined to be worth developing into detailed alternatives for evaluation as the final cleanup plan. For ease of crossreference with the FS, this ROD has maintained the numbering system used in the FS. The retained alternatives are as follows:

Alternative 1 - No Action

Alternative 4 - Solidification/Stabilization, RCRA Multimedia Capping, Slurry Wall

Alternative 7 - Solidification/Stabilization, RCRA Clay Capping, Slurry Wall

Alternative 8 - Soil Washing, Solidification/ Stabilization, Clay capping, Slurry Wall

Alternative 10 - Off-Site Disposal, Solidification/ Stabilization, Consolidation, Clay Cap

7.4.2 ALTERNATIVE 1 - NO ACTION

Major Components of the Remedial Alternative - The National Contingency Plan (NCP) requires the development of a no action alternative as a basis for comparison with the other alternatives. The No Action alternative is presented as a baseline case. The No Action alternative would include the use of deed restrictions to limit site access and land use to prevent site development or any excavating of contaminated soils (or sludge) on the site. These restrictions would prevent dermal contact or ingestion of contaminants. However, this alternative does not meet the remedial action objectives for preventing dermal contact, ingestion, or mitigation of ground-water contamination.

Since construction would not be involved in this alternative, the implementability concerns, engineering, equipment and materials, health and safety, and schedule are not applicable. Because no ground-water monitoring would be conducted under this alternative, there would be no cost associated with quarterly sampling and analyses. Therefore, there is no estimated present worth cost; nor is there capital cost included with this No Action alternative.

7.4.3 ALTERNATIVE 4 - SOLIDIFICATION/STABILIZATION, RCRA CAPPING, SLURRY WALL

Major components of the Remedial Alternative - This alternative includes the excavation and consolidation of the impacted soils above 1,463 mg/kg of fluoride from PFP I, PFP III, and PFP IV into PFP II. This alternative also includes excavation, solidification/stabilization, and consolidation of the impacted soils above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV into PFP II. All sludge from all PFPs would be excavated, stabilized, and consolidated into PFP II. A slurry wall would be constructed around PFP II and adjacent areas. A multimedia RCRA cover system would be constructed over the area enclosed in the slurry wall. This alternative would also include ground-water quality monitoring, access, and deed restrictions.

Containment Component - The containment of the solidified/stabilized material and low to moderately contaminated soils would prevent direct contact risk and continued contamination of the ground water from leachate generation. The construction of a low permeability cap over the stabilized material and moderately contaminated soils would minimize the amount of rainfall infiltrating through it. The multimedia RCRA cap would be comprised of a minimum of seven layers of materials of various thickness. In ascending order, these layers include: 1) landfill preliminary grade; 2) compacted clay layer; 3) flexible membrane liner; 4) drainage layer; 5) geotextile fabric; 6) general fill; and 7) topsoil. The construction of a slurry wall would eliminate lateral movement of "perched" water zones through the fill area. The wall would not be anchored to a subsurface impermeable rock formation, but would be built to a depth of 30 feet, which is 20 feet above the water table. In addition, the slurry wall will be approximately 2 to 4 feet in width.

General Component - The soils, located outside of the proposed cap area, containing fluoride at concentrations exceeding the remedial action criteria of 1,463 mg/kg would be excavated and consolidated into the RCRA containment area. In addition, soils contaminated above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV would be excavated, stabilized, and consolidated into PFP II. Sludges in the containment area would be excavated and stabilized, using a combination of sludge, Portland cement, fly ash, and other additives to improve physical and chemical characteristics of the sludge. Construction of a bermed area adjacent to PFP II would provide an area to stockpile stabilized sludge. Dewatering of excavation areas, especially PFP II, would probably be necessary. At a minimum, a 10,000 gallon tanker truck or above-ground portable pools would be utilized for storage of construction water. Construction of the slurry wall around the containment area would entail excavation of a trench, which would be backfilled with a fluid cement or bentonite and soil mix.

The capital cost for this alternative is estimated to be $10,347,000. The total present worth cost of the alternative is $10,730,000.

ARARs Component - The major federal ARARs and TBCs for this alternative are as follows:

- Safe Drinking Water Act, 40 CFR 141.11 -141.16, 141.50, 141.51;

- Resource Conservation and Recovery Act (RCRA) - Proposed Rule for Corrective Action for Solid Waste Management Unit, 40 CFR Parts 264.111, 264.258, 264.228, 264.310; 40 CFR 261 Land Ban.

The major State ARARs and TBCs are as follows:

- Florida Drinking Water Standards, FAC 17-550.

This alternative will meet all Federal and State ARARs.

7.4.4 ALTERNATIVE 7 - SOLIDIFICATION/STABILIZATION, CLAY CAPPPING, SLURRY WALL

Major Components of the Remedial Alternative - This alternative includes the excavation and consolidation of the impacted soils above 1,463 mg/kg fluoride from PFP I, PFP III, and PFP IV into PFP II. In addition, soils contaminated above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV would be excavated, stabilized, and consolidated into PFP II. All highly contaminated sludge and soils from all PFPs would be excavated, stabilized, and consolidated into PFP II. A slurry wall would be constructed around PFP II and adjacent areas. A clay cover system would be constructed over the area enclosed in the slurry wall. This alternative would also include ground-water quality monitoring, access, and deed restrictions.

Containment Component - The containment of the solidified/stabilized material and low to moderately contaminated soils would prevent direct contact risk and continued contamination of the ground water from leachate generation. The construction of a low permeability clay cap over the stabilized material and moderately contaminated soils would minimize the amount of rainfall infiltrating through it. The clay cap would be comprised of a minimum of compacted clays and topsoil covers. The construction of a slurry wall would eliminate lateral movement of "perched" water zones through the fill area. The wall would not be anchored to a subsurface impermeable rock formation, but would be built to a depth of 30 feet, which is 20 feet above the water table.

General Component - The soils, located outside of the proposed cap area, containing fluoride at concentrations exceeding the remedial action criteria of 1,463 mg/kg would be excavated and consolidated into the clay cap containment area. Soils contaminated above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV would be excavated, stabilized, and consolidated into PFP II. All highly contaminated sludges and soils in the containment area would be excavated and stabilized, using a combination of sludge, Portland cement, fly ash, and other additives to improve physical and chemical characteristics of the sludge.

Because the soils and sludges treated under a clay cap must meet stricter clean up standards than those under a RCRA cap, the volume of treated soils and sludges would be significantly greater for this alternative. The clay layers would be installed in loose lifts, and compacted to specified density to attain the desired permeability. Construction of a bermed area adjacent to PFP II, and dewatering of excavation areas, would be necessary. As in alternative 4, construction of a slurry wall around the containment area would entail excavation of a trench, which would be backfilled with a fluid cement or bentonite and soil mix. The capital cost for this alternative is $13,500,000. The total present worth cost is $13,657,000.

ARARs Component - The major federal ARARs and TBCs for this alternative are as follows:

- Safe Drinking Water Act, 40 CFR 141.11 -141.16, 141.50, 141.51;
- Resource Conservation and Recovery Act (RCRA) - Proposed Rule for Corrective Action for Solid Waste Management Unit, 40 CFR Parts 264.111, 264.258, 264.228, 264.310; 40 CFR 261 Land Ban.

The major State ARARs and TBCs are as follows:

- Florida Drinking Water Standards, FAC 17-550.

This alternative will meet all Federal and State ARARs.

7.4.5 ALTERNATIVE 8 - SOIL WASHING, SOLIDIFICATION/ STABILIZATION, CLAY CAPPING, SLURRY WALL

Major Components of the Remedial Alternative - The soils, located outside of the proposed cap area, containing fluoride at concentrations exceeding the remedial action criteria of 1,463 mg/kg would need to be excavated and consolidated into the clay cap containment area. Soils contaminated above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV would be excavated, treated, and consolidated into PFP II. All highly contaminated soils from all PFP ponds would be excavated, soil washed and subsequently used as clean backfill. A slurry wall would be constructed around PFP II and adjacent areas. A clay cap system would be constructed over the area enclosed in the slurry wall. This alternative would also include ground-water quality monitoring, access, and deed restrictions.

Containment Component - Soil washing of the highly contaminated soil would significantly reduce the volume of sludges/soils to be managed within the containment area. The containment of the stabilized material and moderately contaminated soils would prevent direct contact risk and continued contamination of the ground water from leachate generation. The construction of a low permeability clay cap over the stabilized material and low to moderately contaminated soils would minimize the amount of rainfall infiltrating through it. The clay cap would be comprised of a minimum of compacted clays and topsoil covers. The construction of a slurry wall would eliminate lateral movement of "perched" water zones through the fill area.

General Component - Soil washing involves treating the contaminated soils and sludges by removing a wide range of organic and inorganic contaminants. The treatment works upon the concept that contaminants have a propensity to reside in specific particle grain-size domains. The system separates the waste stream into four major "cuts" and focuses treatment appropriate to this contaminant/grain size relationship. The final product of this process would be a much reduced volume of froth and sludge which would require disposal at a hazardous waste facility. The larger volume of "clean" soil would be returned to the site. The solidification/stabilization of remaining soils would be done in the same manner as the previously discussed alternatives. In addition, the construction of the clay cap and slurry wall would be conducted in a similar fashion as alternatives 4 and 7. The capital cost for this alternative is $28,227,000. The total present worth of this alternative is $28,488,000.

ARARs Component - The major federal ARARs and TBCs for this alternative are as follows:

- Safe Drinking Water Act, 40 CFR 141.11 -141.16, 141.50, 141.51;

- Resource Conservation and Recovery Act - Proposed Rule for Corrective Action for Solid Waste Management Unit, 40 CFR Parts 264.111, 264.258,264.228, 264.310; 40 CFR 261 Land Ban.

The major State ARARs and TBCs are as follows:

- Florida Drinking Water Standards, FAC 17-550.

This alternative will meet all Federal and State ARARs.

7.4.6 ALTERNATIVE 10 - CONTAINMENT WITH CLAY CAP, SLURRY WALL, SOLIDIFICATION/STABILIZATION, AND OFF-SITE DISPOSAL

Major Component - Remedial Alternative 10 consists of the excavation and consolidation of impacted soils exceeding 1,463 mg/kg of fluoride from PFP I, PFP III, and PFP IV into PFP II. Soils contaminated above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV would be excavated, treated, and consolidated into PFP II. All highly contaminated soils from PFP II would be transported offsite for disposal at a RCRA facility. A slurry wall would be constructed around PFP II and the adjacent impacted area. A clay cap and soil cover would be constructed over the PFP II containment area containing stabilized material and moderate to low contaminated soils. Ground-water monitoring would also be conducted. Access and deed restrictions would also be implemented as part of this alternative remedy.

Containment Component - The containment of the solidified/stabilized material and moderately contaminated soils would prevent direct contact risk and continued contamination of the ground water from leachate generation. The construction of a low permeability cap over the stabilized material and low to moderately contamianted soils would minimize the amount of rainfall infiltrating through it. The clay cap would be comprised of a minimum of compacted clays and topsoil covers. The construction of a slurry wall would eliminate lateral movement of "perched" water zones through the fill area. The disposal off-site of the highly contaminated soils and sludges would greatly reduce the volume of treated soils/sludges within the containment area, and would provide enhanced containment of the most heavily impacted sludges/soils.

General Component - Alternative 10 would greatly minimize future generation of impacted ground water by excavating and transporting the highly contaminated soils and sludges for off-site disposal to a RCRA facility. 40 CFR 268 requires the EPA to evaluate each RCRA sludge to determine if land disposal prohibitions are appropriate. Careful consideration of this federal regulation would be required to successfully implement this alternative. The solidification/stabilization of the remaining sludge would be done in the same manner as the previously discussed alternatives. In addition, the construction of the clay cap and slurry wall would be conducted in a similar fashion as alternatives 4, 7 and 8. The capital cost for this alternative is $39,946,000. The total present worth of this alternative is $40,206,000.

ARARs Component - The major federal ARARs and TBCs for this alternative are as follows:

- Safe Drinking Water Act, 40 CFR 141.11 -141.16, 141.50, 141.51;
- Resource Conservation and Recovery Act - Proposed Rule for Corrective Action for Solid Waste Management Unit, 40 CFR Parts 264.111, 264.258, 264.228, 264.310; 40 CFR 261 Land Ban.

The major State ARARs and TBCs are as follows:

- Florida Drinking Water Standards, FAC 17-550.

This alternative will meet all Federal and State ARARs.

8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in Section 121 of CERCLA and in Section 300.430 of the NCP. The major objective of the FS is to develop, screen, and evaluate alternatives for the remediation of the Agrico Chemical site.

8.1 CRITERIA FOR EVALUATING REMEDIAL ALTERNATIVES

The remedial alternatives selected from the screening process are evaluated using the following nine evaluation criteria:

Overall Protection of Human Health and the Environment - Assesses degree to which alternative eliminates, reduces, or controls health and environmental threats through treatment, engineering methods, or institutional controls.

Compliance with Applicable or Relevant and Appropriate Requirements - Assesses compliance with Federal/State requirements.

Cost - Weighs the benefits of a remedy against the cost of implementation.

Implementability - Refers to the technical feasibility and administrative ease of a remedy.

Short-Term Effectiveness - Length of time for remedy to achieve protection and potential impact of construction and implementation of a remedy.

Long-Term Effectiveness - Degree to which a remedy can maintain protection of health and environment once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume Through Treatment - Refers to expected performance of the treatment technologies to lessen harmful nature, movement or amount of contaminants.

State Acceptance - Consideration of State's opinion of the preferred alternative.

Community Acceptance - Consideration of public comments on the Proposed Plan.

The NCP categorizes the nine criteria into three groups:

- **Threshold Criteria** - overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection;

- **Primary Balancing Criteria** - long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability, and cost are primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies; and

- **Modifying Criteria** - state and community acceptance are modifying criteria that are formally taken into account after public comment is received on the proposed plan and incorporated in the ROD.

The selected alternative must meet the threshold criteria and comply with all ARARs or be granted a waiver for compliance with ARARs. Any alternative that does not satisfy both of these requirements is not eligible for selection. The Primary Balancing Criteria are the technical criteria upon which the detailed analysis is primarily based. the final two criteria, known as Modifying Criteria, assess the public's and the state agency's acceptance of the alternative. Based on these final two criteria, EPA may modify aspects of a specific alternative.

The following analysis is a summary of the evaluation of alternatives for remediating the Agrico Chemical Superfund Site under each of the criteria. A comparison is made between each of the alternatives for achievement of a specific criterion.

Threshold Criteria

8.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

All of the alternatives, except the no-action alternative, are protective of human health and the environment by eliminating, reducing, or controlling risk through treatment of soil contaminants, engineering controls, and/or institutional controls.

Alternatives 8 and 10 provide the best long-term protection to human health and the environment from direct contact with the impacted material, through treatment (8) and off-site disposal (10). However, potential short-term exposures to the community during excavation for treatment and off-site disposal of the waste reduce the overall protectiveness of this alternative. Alternatives 4 and 7, through containment, would provide similar and acceptable levels of overall protection, since the proposed cover systems prevent dermal contact and ingestion of contaminated soils/sludge. Alternatives 4 and 7 also minimize infiltration of surface water and resulting generation of leachate, and are protective of ground water. The institutional controls associated with alternatives 4, 7, 8, and 10 minimize site usage through deed restrictions and, therefore, further reduce exposure to contaminants remaining onsite.

Since the no-action alternative does not eliminate, reduce, or control any of the exposure pathways, it is therefore not protective of human health or the environment and will not be considered further in this analysis as an option for the soil wastes.

8.3 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Of the five (5) alternatives evaluated, Alternatives 4, 7, 8, and 10 will attain or exceed ARARs. These alternatives include source control remedial actions (capping and stabilizing) that would achieve site specific and remedy/site specific cleanup levels to be protective of ground water and to attain the State of Florida drinking water standards for the impacted aquifer.

Primary Balancing Criteria

8.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

Excavation and solidification/stabilization closure is proposed in all of the alternatives. The RCRA cap (4), in conjunction with the slurry wall, would function to provide the ground water a greater degree of protection throughout the life of the cover system than the clay caps (7), (8), and (10) since the annual infiltration rates for a RCRA and clay cap are less than .25 and 2 inches, respectively. Alternatives 8 and 10 would immediately reduce the residual risks at the site through treatment or off-site removal of the highly contaminated soils and sludges. The potential risks associated with alternatives 4, 7, 8, and 10 are perched water and ground water. The risks should be greatly minimized within five years for all alternatives.

8.5 REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

Only Alternative 8 implements treatment to reduce the volume and subsequently the mobility. Alternatives 4, 7, 8, and 10 employ stabilization to effectively reduce mobility and provide enhanced load bearing capacity. These alternatives contain the soil contamination, therefore the mobility is reduced.

8.6 SHORT-TERM EFFECTIVENESS

Alternatives 4, 7, and 10 have the potential to provide the best short-term effectiveness. Alternative 8 has lower short-term effectiveness due to the length of implementation time and potential adverse impacts on human health and the environment.

Alternatives 4, 7, 8, and 10 involve earthwork at the site and have the potential to provide similar protection to the community and on-site workers during construction activities. Measures may be required at the site during earthwork activities associated with these alternatives to reduce the potential for fugitive dust emissions. The heavy earth moving equipment required to implement these alternatives may create noise nuisances for nearby residents during remediation activities. In addition, alternatives 8 and 10 require additional contaminated soil handling for soil washing and off-site deposal of soils/sludges, respectively.

Alternative 8 will require adherence to strict operation procedures to protect the community during remediation activities. Alternative 8 may require the most stringent monitoring and health and safety plan due to the nature of the proposed treatment technology.

Alternatives 4, 7, 8, and 10 are expected to significantly reduce the potential for direct human or wildlife contact with the contaminated soils. In addition, these alternatives will virtually eliminate the hypothetical risks at the site by removing the potential exposure pathways.

8.7 IMPLEMENTABILITY

Alternative 7 is the most implementable of the four alternatives that involve full scale remedial activities; although, alternative 4 is very similar and the level of increased difficulty with implementation is minimal. Due to quality assurance and control tasks required to construct/install the HDPE membrane of the RCRA cover, alternative 4 would be slightly more difficult to implement than alternative 7. However, alternatives 4, 7, 8, and 10 contain many of the same components; therefore, the level of difficulty to implement would be similar. Alternatives 8 and 10 possess additional logistics problems associated with soil washing and off-site disposal, respectively. In addition, alternative 8 would require the construction of an on-site soil washing facility.

8.8 COST

The comparative present worth cost of the four alternatives are as follows:

Alternative 4	$10,730,000
Alternative 7	$13,657,000
Alternative 8	$28,488,000
Alternative 10	$40,206,000

Modifying Criteria

8.8 STATE ACCEPTANCE

The State of Florida, as represented by the Florida Department of Environmental Regulation (FDER), has been the support agency during the Remedial Investigation and Feasibility Study process for the Agrico Chemical Site. In accordance with 40 CFR 300.430, FDER, as the support agency, has provided input during this process. Based upon comments received from FDER, it is expected that concurrence will be forthcoming; however, a formal letter of concurrence has not yet been received.

8.9 COMMUNITY ACCEPTANCE

The community had no major concerns about the remedy EPA proposed for public comment. The concerns of the community are discussed in detail in the Responsiveness Summary, which is Appendix A of this ROD.

9.0 SELECTED REMEDY

Based on consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, EPA has selected Alternative 4 as the source control remedy for this site. At the completion of this remedy, the risk associated with this site has been calculated at an industrial $1x10^{-4}$ which is within EPA's acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. EPA has determined that this risk range is protective of human health and the environment. The total present worth cost of the selected remedy, Alternative 4, is estimated to be $10,730,000.

Major Components of the Remedial Alternative - This alternative includes the excavation and consolidation of the impacted soils above 1,463 mg/kg of fluoride from PFP I, PFP III, and PFP IV into PFP II. Soils and sludge contaminated with lead above 500 mg/kg and arsenic above 16 mg/kg in the area of PFP IV would be excavated, stabilized, and consolidated into PFP II. All sludge from all PFPs will be excavated, solidified/stabilized, and consolidated into PFP II. A slurry wall shall be constructed around PFP II and adjacent areas. The construction of a slurry wall would eliminate lateral movement of "perched" water zones through the fill area. The wall will not be anchored to a subsurface impermeable rock formation, but will be built to a depth of 30 feet, which is 20 feet above the water table. A multimedia RCRA cover system shall be constructed over the area enclosed in the slurry wall.

This alternative will also include ground-water quality monitoring, access, and deed restrictions. A deed restriction or a perpetual conservation easement pursuant to Section 104 (j) of CERCLA and in accordance with the provisions of Section 704.06, Florida Statutes (1990) is appropriate after completion of remedial action of the source material at the site.

Treatment Component - The solidification/stabilization technology utilizes a feed system, mixing vessels, and a curing area. The excavated material is mixed with a variety of stabilization reagents and sorbents. The types of materials possibly used for solidification could include cement kiln dust, lime kiln dust, or fly ash. Sorbents that might be added to the stabilization process could include natural or modified clays, zeolites, activated alumina, or activated carbon. (Soil treatability studies currently recommend the formation of calcium fluoride (CaF), whose solubility in water is 20mg/L, to immobilize the fluoride).

Containment Component - The containment of the solidified/stabilized material and low to moderately contaminated soils will prevent direct contact risk and continued contamination of the ground water from leachate generation. The construction of a low permeability RCRA cap over the stabilized material and moderately contaminated soil will minimize the amount of rainfall infiltrating through it. The multimedia RCRA cap is comprised of a minimum of seven layers of materials of various thickness. In ascending order, these layers include: 1) landfill preliminary grade; 2) compacted clay layer; 3) flexible membrane liner; 4) drainage layer; 5) geotextile fabric; 6) general fill; and 7) topsoil. The construction of a slurry wall will eliminate lateral movement of "perched" water zones through the fill area. The slurry wall will not be anchored to a subsurface impermeable rock formation, but will be built to a depth of 30 feet, which is 20 feet above the water table.

General Component - The soils, located outside of the proposed cap area, containing fluoride at concentrations exceeding the remedial action criteria of 1,463 mg/kg will be excavated and consolidated into PFP II, the RCRA containment area. This alternative also includes excavation, solidification/stabilization, and consolidation of the impacted soils above 500 mg/kg of lead and 16 mg/kg of arsenic from PFP IV into PFP II. All sludge from all PFP ponds will be excavated, stabilized, and consolidated into the PFP II area, with the remaining low to moderately contaminated soils. A slurry wall shall be constructed around PFP II and adjacent areas.

A multimedia RCRA cover system shall be constructed over the PFP II pond and adjacent areas. This alternative shall also include ground-water quality monitoring, access, and deed restrictions. Construction of a bermed area adjacent to PFP II will provide an area to stockpile stabilized sludge. Dewatering of excavation areas, especially PFP II will probably be necessary. As a minimum, a 10,000 gallon tanker truck or above-ground portable pools will be utilized for storage of construction water. Construction of the slurry wall around the containment area will entail excavation of a trench, which will be backfilled with a fluid cement or bentonite and soil mix.

Performance Standards (Excavation)

Performance standards for excavation of the soils/sludges were developed to protect human health, to prevent contamination of the ground water and to be in compliance with ARARs. Excavation shall continue until the remaining soils/sludges are at or below the selected performance standards. All excavation shall comply with ARARs. Testing methods approved by EPA shall be used to determine whether the performance standards have been achieved. The standards selected for the chemicals of concern are as follows:

Chemical	Performance Standards (mg/kg)
Fluoride	1,463
Lead	500
Arsenic	16

Performance Standards (Treatment/Containment)

After the contaminated material has been excavated, all sludge from PFP I, II, III, and IV will be excavated and stabilized before being placed into the containment area. The stabilization of the sludges must attain strength requirements (50 psi) for installation of a RCRA cap. USEPA OWSER Directive, No. 9437.00-2A considers 50 psi sufficient unconfined compressive strength for supporting a final cover and the construction equipment necessary for installing the cover.

The installation of a RCRA Cap to contain stabilized sludges and contaminated soils will reduce the infiltration of surface water to a negligible amount, thereby all but eliminating the generation of leachate containing fluoride. The reduced infiltration rate was calculated using the Hydrogeologic Evaluation of Landfill Performance (HELP) model. The infiltration rate was calculated to be less than .25 inches per year, based on the climatological data for Mobile, Alabama, 50 miles west of Pensacola, and geotechnical properties of locally available soils to be utilized for the construction of the low permeability clay soil layer and soils for the final cover of the RCRA Cap.

The performance standards for this component of the selected remedy include, but are not limited to, the following treatment/containment standards:

Parameter	**Performance Standard**	**Testing Methodology**
Permeability	$1x10^{-10}$cm/sec	EPA Method 9100-SW846
<u>Strength Testing</u>		
Unconfined Compressive Strength	50 psi	ASTM D2166
Penetrometer	50 psi	ASTM D1558-Modified

Because certain performance standards may not be determined until the Remedial Design phase, and because more minor performance standards need not be listed, it should be understood that the list of performance standards in this section is not exclusive and may be subject to addition and/or modification by the Agency in the RD/RA phase.

ARARs Component - The major federal ARARs and TBCs for this alternative are as follows:

- Safe Drinking Water Act, 40 CFR 141.11 -141.16, 141.50, 141.51;
- Resource Conservation and Recovery Act - Proposed Rule for Corrective Action for Solid Waste Management Unit, 40 CFR 264.111, 264.258, 264.228, 264.310; 40 CFR 261 Land Ban.

The major State ARARs and TBCs are as follows:

- Florida Drinking Water Standards, FAC 17-550.

This alternative will meet all Federal and State ARARs.

Cost

The capital cost for alternative 4 is $10,346,700. The present worth for Operations and Maintenance is $384,313. The total present worth for alternative 4 is $10,731,013.

10.0 STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedy for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy for the Agrico Chemical site meets these statutory determinations.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy for the Agrico Chemical Site protects human health and the environment through extraction and treatment of the affected on-site soils. Treatment of the contaminated soils on site will effectively reduce risk from exposure to surficial soils as well as prevent further contamination of the ground water. The combined institutional controls along with the monitoring requirements will serve to ensure protection of human health and the environment.

The current risk associated with the site is a non-carcinogenic risk for on-site residents. Fluoride contributes most significantly to the hazard indices of 5 for an adult and 40 for a child. The current risk associated exposure to lead in surficial soils, as a result of modeling, is a 100 percent child population having a blood lead level above 10 ug/L.

Hypothetical future risks to adults, children residents, and on-site excavation worker is based on exposure to fluoride. The hazard indices using this scenario range from under 1.0 for an adult to 100 for a child.

Through implementation of the selected remedy risk levels should be effectively reduced to acceptable levels. Potential short term risks will be controlled through the utilization of standard engineering practices.

10.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121 (d) (2) (A) of CERCLA incorporates into the law the CERCLA Compliance Policy, which specifies that Superfund remedial actions must mmet any federal and state standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Also included is the provision that state ARARs must be met if they are more stringent than federal requirements.

Applicable requirements are defined as cleanup standards,

standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

All potential ARARs for treating the contaminated soils and sludge at the Agrico Chemical Site are presented below. The recommended alternative was found to meet or exceed the following ARARs.

10.2.1 Chemical Specific ARARs

Clean Water Act (CWA)/ Safe Drinking Water Act (SDWA)

Safe Drinking Water Act (40 C.F.R. 141, 142, and 143), which specifies the MCLs for the contaminants of concern that will be applicable as the remediation levels for contaminated ground water. However, should the State drinking water standard under Florida Administrative Code (FAC) 17-550, for a particular contaminant be more stringent, the State standard will be used as the remediation level. (Applicable requirement)

Clean Water Act (40 C.F.R. 122-125), which specifies the substantive requirements of the National Pollutant Discharge Elimination System (NPDES) applies to handling of construction water around PFP II. Should the State effluent limitations for surface water, under 17-302, be more stringent, the State standard will be applicable. (Applicable requirement)

Resource Conservation and Recovery Act (RCRA)

40 C.F.R Part 261 Land Ban - The RCRA land disposal restriction ("LDR") (40 CFR 268) promulgated in the 1984 HSWA amendments require that RCRA hazardous wastes be treated to BDAT (Best Demonstrated Available Technologies) Standards prior to placement into the land. EPA promulgated treatment standards in May 1990. The onsite wastes are characterized as RCRA wastes for lead and arsenic, because the wastes exhibit TCLP Toxicity as defined 40 CFR 261. Excavation and treatment in a separate unit is considered to be placement under RCRA LDR. Therefore, LDR will be an applicable/or relevant and appropriate requirement. The selected remedy will meet BDAT standards For RCRA characteristic waste. The treatment process will immobilize the metals to the extent that the waste will not longer be hazardous waste as define by RCRA. (Applicable requirement)

Florida Administrative Code Chapter 17-3

Construction of the RCRA cap and slurry wall would insure that water quality standards are met for surface water and ground water affected by leachate and storm runoff from the site.

10.2.2 Action Specific Requirements

Resource Conservation and Recovery Act (RCRA)

40 C.F.R. Part 264 Subpart G - Closure and Postclosure requires capping standards to regulate post-closure use of the property to prevent damage to the cover, and management of run-on, run-off. (Applicable requirement)

40 C.F.R. 264.228, 40 C.F.R.258, 40 C.F.R. 264.310 - Capping and landfill construction standards pertaining to closing a landfill, surface impoundment or waste pile as a landfill are applicable and will be met when implementing the selected remedy. (Applicable requirement)

Florida Administrative Code Chapter 17.701

FAC 17.701 establishes standards for landfill construction, capping, and disposal of solid waste. (Applicable requirement)

Florida Administrative Code Chapter 17-736

FAC 17-736 requires that warning signs be placed on all sides of the fenced containment area (RCRA cap and slurry wall) with the warning that there is a hazardous waste site present. (Applicable requirement)

10.2.3 Location Specific Requirement

Endangered Species Act (ESA)

The selected remedy is believed to be protective of species listed as endangered or threatened under the ESA. Requirements of the Interagency Section 7 Consultation Process, 50CFR Part 402 will be met. The U.S. Department of Interior (DOI) and the U.S. Fish and Wildlife Service will be consulted during the RD to ensure that endangered or threatened species are not adversely impacted by implementation of this remedy. There is currently no information to indicate that the site is visited by or contains such species. (Relevant and Appropriate requirement)

National Historical Preservation Act (NHPA)

The NHPA requires that action be taken to preserve or recover historical or archaeological data which might be destroyed as a result of site activities. No information exists to indicate that the Agrico Chemical site has any historic or archaeological significance. (Relevant and Appropriate requirement)

10.3 COST EFFECTIVENESS

This remedy employs a proven technology which can be easily

This remedy employs a proven technology which can be easily implemented at the Agrico Chemical Site. This technology provides the most cost effective treatment when compared to the other alternatives due to its ability to most effectively treat and limit further spread of contamination.

10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGY OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA and the Florida Department of Environmental Regulation have 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 contaminant treatment at the Agrico Chemical site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA and the State have determined that the selected remedy provides the best overall balance of tradeoffs in terms of the five balancing criteria: long-term effectiveness; and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; and cost. Additionally, the selected remedy fulfills the two modifying criteria: state acceptance; and community acceptance.

The selected remedy meets the statutory preference to utilize permanent solutions and treatment technologies, to the maximum extent practicable. Remediation of the source will effectively remove the threat from exposure to surficial contamination and will prevent further contamination of the ground water.

10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By treating the source and through institutional controls, the selected remedy addresses the principal threats posed to human health and the environment by the site through the use of a proven treatment technology. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

10.6 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Agrico Chemical site was released for public comment on August 6, 1992. The Proposed Plan identified Alternative 4 as the preferred alternative for this action. EPA reviewed all written and verbal comments submitted during the public comment period.

EPA has determined that a significant change to the remedy, as it was originally presented in the Proposed Plan, is necessary. EPA has determined that a remedial goal of 16 mg/kg for arsenic is appropriate for the site based on a risk level of 10^{-6} for an industrial scenario. This change may increase the estimated volume of soils in the PFP IV area to be excavated and stabilized. The increase in volume could affect the estimated cost of the remedy. The changes in volume and cost will be determined during Remedial Design.