Superfund Record of Decision

Palmer Barge Line Superfund Site
Port Arthur, Jefferson County, Texas

September 2005

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6

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PALMER BARGE LINE SUPERFUND SITE
PORT ARTHUR, JEFFERSON COUNTY, TEXAS
RECORD OF DECISION

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PART 1: DECLARATION

SITE NAME AND LOCATION

The Palmer Barge Line Superfund Site is located in Port Arthur, Jefferson County, Texas. The National Superfund Database (CERCLIS) identification number for this Site is TXD068104561. This Site has not been divided into separate operable units and all areas and media within the Site are addressed together in this Record of Decision.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Palmer Barge Line Superfund Site located in Port Arthur, Jefferson County, Texas, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9631(k), and is available for review at the Port Arthur Public Library, 4615 9th Avenue, Port Arthur, Texas; at the Texas Commission on Environmental Quality (TCEQ) offices in Austin, Texas; and at the United States Environmental Protection Agency (EPA) Region 6 offices in Dallas, Texas. The Administrative Record Index (Appendix B to the Record of Decision) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The State of Texas, through the TCEQ, concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

This ROD sets forth the selected remedy for the Site, which will protect human health and the environment by removing contaminated materials that exceed risk based levels from the Site.

The major components of this remedy are:

- Excavation of approximately 1,204 cubic yards of the upper two feet of soil that exceed risk-based levels at each of the response areas;
- Confirmation sampling at each of the response areas. Confirmation samples will be collected from each response area and analyzed for Contaminants of Potential Concern (COPC);
- Backfilling of excavated areas that exceed risk based levels with clean soil;
- Off-site disposal of the excavated soils at a permitted disposal facility;
- Implementation of Institutional Controls to restrict future land use to industrial purposes only. The Institutional Control shall be a restrictive covenant by the property owner, to the benefit of the State of Texas and the United States Government, recorded in the real property records of Jefferson County, Texas;
- Abandonment of existing monitoring wells - Five (5) existing monitoring wells at the Site will be abandoned; and
- Wastewater Above-ground Storage Tank (AST) demolition and sludge removal - Sludge contained within one remaining Wastewater AST will be removed and disposed of off-site. The tank will be decontaminated and reused as scrap metal by the site owner.

STATUTORY DETERMINATIONS

The selected remedy for the soil and sediment contamination is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. The contaminated soil and sediment "hot spots" in several areas of the Site are considered to be "low-level threat wastes" based on the absence of a highly toxic or highly mobile characteristic. Since the soil and sediment contamination represents a low-level threat waste, the selected remedy does not utilize treatment to reduce the toxicity, mobility, or volume of contamination and therefore does not satisfy the statutory preference for treatment as a principal element of the remedy.

Since the selected remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted to ensure that the remedy remains protective of human health and the environment. Pursuant to CERCLA Section 121(c), 42 U.S.C. § 9621(c), and as provided in the current guidance on Five Year Reviews [OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (June 2001)], the EPA will conduct a statutory five-year review within five years from initiation of the remedial action.

ROD DATA CERTIFICATION CHECKLIST

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

- Chemicals of concern (COCs) and their respective concentrations (see the Identification of Chemicals of Concern Section);
- The baseline risk represented by the COCs (see the Risk Characterization Section);
- Cleanup levels established for the COCs and the basis for these levels (see the Remedial Action Objectives and Goals Section and the Expected Outcomes of Selected Remedy Section);
- Source materials constituting principal threat wastes have not been identified in the soil and sediment at this Site (see the Principal and Low-Level Threat Wastes Section);
- Current and potential future beneficial land and water uses used in the ROD (see the Current and Potential Future Land and Ground Water Uses Section);
- Potential land and water use that will be available at the Site as a result of the Selected Remedy (see the Expected Outcomes of Selected Remedy Section);
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs; discount rate, and the number of years over which the remedy cost estimates are projected (see the Summary of Estimated Remedy Costs Section); and,
- Decisive factor(s) that led to selecting the remedy (see the Summary of the Rationale for the Selected Remedy).

AUTHORIZING SIGNATURE

By: John R. Hepola, for
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Date: 9/30/05

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PALMER BARGE LINE SUPERFUND SITE
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PALMER BARGE LINE SUPERFUND SITE
PORT ARTHUR, JEFFERSON COUNTY, TEXAS
RECORD OF DECISION

PART 2: DECISION SUMMARY

SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Palmer Barge Line Superfund Site is located on Pleasure Islet on the western shore of Sabine Lake, in Jefferson County, Texas. The site is located approximately 4.5 miles east-northeast of the City of Port Arthur. A site location map is provided in Figure 1-1. The Palmer Barge Site encompasses approximately 17 acres and is located on Old Yacht Club Road on the South Industrial Islet. The Site is bounded to the north by vacant property, to the west by Old Yacht Club Road, to the south by the State Marine Superfund Site, and to the east by Sabine Lake. There is very little topographical relief to the Site. The Site is located approximately 0.5 miles southwest of the confluence of the Neches River and the Sabine Neches Barge Canal.

SITE BACKGROUND AND ENFORCEMENT ACTIVITIES

Site History

The Site, along with the adjacent properties to the north and south, were used as a Municipal Landfill for the City of Port Arthur from 1956 to 1987. Although disposal at the landfill has long since ceased and the landfill contents have been covered with dredged sediments, the contents are still present on the Site in the subsurface soils.

In April 1982, John Palmer, President of Palmer Barge Line, Inc., purchased approximately 17 acres from the City of Port Arthur, for the purpose of servicing and maintaining barges and marine vessels. In July 1983, Barker Phares, a trustee of Jefferson County, placed a lien on the Palmer Barge Line Property. In October 1994, Wrangler Capital assumed all claims from the Palmer Barge Line, Inc. In July 1997, Wrangler Capital purchased Palmer Barge Line from receivership, and the company ceased operations on the property. The current owner is Mr. Chester Slay. At present, the Site is used by Mr. Slay for industrial purposes. Metal structures on-Site are being salvaged, and the salvaged metal is being used by the current owner to construct marine equipment on the Site.

During operation, the typical activities performed at the Site included cleaning, degassing, maintenance, and inspection of barges and other marine equipment. Cleaning operations included the removal of sludge and other residual material by pressure steaming the vessel holds, engines and boilers. Engines were degreased, and accumulations of sludges were removed. Degassing activities involved the removal of explosive vapors from vessel holds using nitrogen or boiler exhaust. Maintenance and inspection activities included the replacement and/or repair of valves, engine repairs, and line leak repairs followed by pressure tests. A flare was located on-site to burn excess gases and liquids produced during facility operations.

History of Federal and State Investigations

Previous investigations of the Site include the following:

- December 1996: Texas Natural Resource Conservation Commission (TNRCC, now named the Texas Commission on Environmental Quality, or TCEQ) Region 10 Field Office personnel conducted a multi-media investigation. The purpose of this study was to determine the compliance status of the facility.

- March 1998: TNRCC Region 10 Field Office with EPA Region 6 conducted an investigation to identify potential sources and to sample soil and sediment. Five areas of stained soil were identified on-site, which included the following: stained soils near sumps, stained soil near the boiler house, stained soil near the flare, stained soil near aboveground storage tanks, and stained soil near wastewater tanks. Sample results indicated the presence of inorganic constituents such as metals, semi-volatile organic constituents (SVOCs), and pesticides in on-site soil. Metals and SVOCs were detected in offshore sediment adjacent to the Site.

- July 1999: TNRCC Region 10 Field Office sampled aboveground storage tanks, roll off-boxes and "slop" tanks to characterize materials stored.

- October 1999: EPA Region 6 conducted an Expanded Site Inspection (ESI; Weston 2000) to determine the presence and nature of constituent occurrence on-site and off-site and to determine migration routes and routes of exposure of site related constituents. Results of the inspection indicated the presence of volatile organic constituents (VOCs), SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals.

- In 2000, the Site was ranked and was placed on the National Priority List (NPL). The Hazard Ranking concluded that constituents present in Sabine Lake sediments adjacent to the Site were a potential threat to human health primarily via the fish consumption exposure pathway (USEPA, 2000).

- 2003: URS Corporation (URS), on behalf of the Potentially Responsible Parties (PRPs), conducted a remedial investigation (RI) at the Site in July 2003, which characterized the nature and extent of constituents present in environmental media at the Site and in adjacent Sabine Lake surface water and sediments (URS, 2004d).

History of CERCLA Removal Actions

In August 2000, EPA Region 6 conducted a Removal Action to remove source materials stored on-site. Activities included waste removal, water treatment, oil/water separation, and sludge stabilization. Approximately 250,000 gallons of water were treated on site; 500 cubic yards of sludge stabilized; and 100,000 gallons of oil/styrene were separated and removed from the site. All of the above-ground storage tanks were removed except for a 25,000 gallon AST on the northern portion of the site that contains sludge. Several of the concrete AST foundations remain along with gravel throughout the Site.

History of CERCLA Enforcement Activities

On September 30, 2002, EPA Region 6 issued an Administrative Order on Consent to conduct the remedial investigation and feasibility study (RI/FS) for the Palmer Barge site. Voluntary respondents to the Order were: E. I. du Pont de Nemours and Company, Chevron/Texaco Inc.; Kirby Inland Marine, LP; Kirby Inland Marine, Inc. of Louisiana; and Ashland Inc.

National Priorities List

The EPA published a proposed rule on May 11, 2000, to add the Palmer Barge Line Site to the National Priorities List (NPL) of Superfund sites. The Site was added to the NPL in a final rule published on July 27, 2000 [Federal Register Listing (FRL-6841-3), Volume 65, Number 145, Pages 46096 - 46104].

COMMUNITY PARTICIPATION

The Remedial Investigation and Feasibility Study Report, along with the Proposed Plan for the Palmer Barge site in Port Arthur, Texas, were made available to the public on July 27, 2005. These and other Site documents can be found in the Administrative Record file and the information repositories at the following locations: Port Arthur Public Library located at 4615 9th Avenue, Port Arthur, Texas; the U.S. Environmental Protection Agency Region 6 located at 1445 Ross Avenue, Dallas, Texas; and the Texas Commission on Environmental Quality located at 12100 Park 35 Circle, Building E, 1st Floor, Austin, Texas. The notice of the availability of these documents was published in the Port Arthur News on July 28, 2005. A public comment period was held from July 27, 2005 to August 25, 2005. The EPA and the Texas Commission on Environmental Quality conducted a public meeting on August 11, 2005, to discuss the Proposed Plan and receive comments from the community. The public meeting was held at the West Groves Education Center, located at 5840 West Jefferson, in Groves, Texas. These activities meet the community participation requirement of CERCLA 300.430(f)(3) and the NCP. In the Responsiveness Summary, EPA responded to all comments received during the public comment period. The Responsiveness Summary is included as part of this ROD.

SCOPE AND ROLE OF RESPONSE ACTION

In August 2000, EPA conducted a Time Critical Removal Action at the site to remove, transport, and dispose off-site all hazardous substances (except for approximately 233 cubic yards), pollutants, and contaminants located on the Site. The removal action consisted of waste removal, water treatment, oil/water separation, and sludge stabilization. Approximately 250,000 gallons of water were treated on site; 500 cubic yards of sludge stabilized; and 100,000 gallons of oil/styrene were separated and removed from the site. All of the above-ground storage tanks were removed except for a 25,000 gallon AST on the northern portion of the site that contains approximately 233 cubic yards of sludge that may be hazardous. Several of the concrete AST foundations remain along with gravel throughout the Site.

This response action is the final Site remedy and is intended to address the remaining threats to human health and the environment posed by the conditions at this Site. The purpose of this response action is to implement a remedy that prevents exposure to contaminated soils and sediments and prevents future runoff of contaminants to the Sabine Lake sediments. This response action addresses the remaining "hot spots" at the Site that pose a risk to human health and ecological receptors that were not addressed by the prior removal action. This remedial action will also remove approximately 233 cubic yards of sludge from the remaining AST.

SITE CHARACTERISTICS

Sources of Contamination

As part of the ESI conducted in October 1999, a site reconnaissance was performed to identify Areas of Concern (AOCs) on the Site. The following AOCs were identified on site:

- Wastewater Aboveground Storage Tanks (ASTs): Four ASTs were located in the northeastern portion of the Site. The four ASTs included one 25,000-gallon tank and three 5,000-gallon tanks. They were constructed of steel and surrounded by an earthen berm. The tanks were used for bulk storage during barge cleaning operations.

- Boiler House ASTs: Four ASTs were located adjacent to the boiler house located in the southwestern portion of the Site. The ASTs were approximately 7,000-gallon capacity each. Three of the four boiler house ASTs were reportedly used to store diesel fuel for steam boilers that were operated as part of the barge cleaning process. The fourth boiler house AST was used to store fresh water. The ASTs were located on the ground surface and did not have containment berms or dikes.

- Open Top Slop Tanks: Four open top slop tanks were located on the western portion of the Site near the flare area. The tanks were constructed of steel and measured 8 feet by 5 feet by 4 feet. The tanks were placed on the ground and did not have secondary containment.

- Horizontal ASTs: The horizontal ASTs were located in the southeastern portion of the Site near the Sabine Lake shoreline. The three ASTs had a capacity of 10,000 gallons each. A concrete berm surrounded the three ASTs. The tanks were used as part of the barge cleaning and degassing system.

- Twelve ASTs: Twelve (12) ASTs were located in the eastern portion of the Site near the shoreline of Sabine Lake. Each tank was approximately 7,000 gallons in capacity. The tank farm is surrounded by a concrete berm measuring 95 feet by 30 feet lateral dimension by 1 foot in height. The tanks were likely used for liquid transfer and liquid separation activities during cleaning operations.

- Flare: A flare was located in the central portion of the Site. The flare was used to burn excess gases produced during cleaning operations.

Locations of these AOCs are shown in Figure 1-2. EPA's removal action in August 2000, removed all above-ground storage tanks except for a large tank on the northern portion of the site that contains sludge. Several of the concrete AST foundations remain along with gravel throughout the Site.

Remedial Investigation Summary

The following summarizes findings related to the extent of constituents identified during the RI conducted in July 2003:

- Generally, there appear to be a number of metals present in soil above the background 95% upper confidence limit (UCL). These concentrations are quite variable with high metals often being present in soil with obvious signs of municipal waste and other times in soil with no apparent sign of "impact." The background data set itself had some results that appeared to be "outliers" from the rest of the background set suggesting that the soil used as "cap material" for the site may not be uniform. The origin of this cap material could not be determined, therefore it is unknown if constituents found in the cap material are naturally occurring or from another contaminated site.

- Wastewater AST Area: Soil contained a large number of semivolatile constituents as well as pesticides such as pentachlorophenol (PCP). It is unknown if the PCP was related to the Wastewater activities, because the highest concentrations of PCP were found in soil that also contained municipal waste. The groundwater impact downgradient is minimal as indicated by the MTBE detected concentration of 32 ug/l.

- Boiler House ASTs: Soil contaminated with SVOCs was detected in this area. There is no apparent ground water impact downgradient from this area.

- Open Top Slop Tanks: Soil from near the Slop Tanks contained SVOCs and metals. The high concentrations were not associated with the soil near the unit, but rather the soil that surrounded a drum of black sludge that was formerly buried near this area. The groundwater impact downgradient is minimal.

- Horizontal ASTs: Concentrations of benzene and isopropylbenzene were detected near this area. However, there were no constituents in soil above residential criteria in this area.

- Twelve ASTs: Soil near this area contained VOCs, SVOCs, and metals. The distribution of these results suggest more VOCs are present in soil from the north and east sides of the unit. The ground water impact downgradient from this area appears minimal based on the low detection of 18 ug/l of MTBE. Metals detected in ground water were comparable to those from the background well.

- Flare: Soil samples from this area indicated that surface soils did not contain detectable constituents related to the Flare, except for a "J-value" concentration of benzene, which indicates that the concentration is an estimated value below levels that can be reliably quantified. The deeper soil that contained municipal waste contained numerous metals above the background 95% UCL and three "J-value" pesticide/PCBs. The ground water impact downgradient appears minimal as indicated by the "J-value" concentration of 3 ug/l of MTBE. Metals detected in groundwater were comparable to those from the background well.

- Surface Water: Samples of surface water did not contain any site-related VOC constituents. The only SVOC detected was bis(2-ethylhexyl)phthalate, which appeared in the lab blank associated with these samples. Four metals were detected above the practical quantification limit in surface water (aluminum, manganese, mercury, and zinc). Four additional metals were detected at "J-value" concentrations (barium (J), copper (J), chromium (J), and nickel (J)).

- Sediment: Site-related VOCs were not detected in the eight sediment samples collected adjacent to the Palmer Site. The largest number of quantifiable detections of SVOCs/pesticides/PCBs were at a location closest to the south end of the sheet piling.

Geologic Setting

The Palmer Barge Site is located on the seaward margin of the southeastern Gulf Coastal Plain of Texas. In general, the sediment in this area is tens of thousands of feet thick at the coastline. The unconsolidated sediment sequence consists of sand, silt, and clay and represents depositional marine and non-marine environments. As a result of subsidence of the Gulf Coast basin these sediments thicken toward the Gulf.

In general, the near surface soils along waterways in this area of the Coastal Plain consist of fill and spoil material dredged from Sabine Lake. In the subsurface, the Coastal Plain sediments are primarily Quaternary alluvium, composed of clay and silt. The Beaumont Clay, Montgomery Formation, and Willis Sand make up the underlying Chicot Aquifer. Based on historical information, the Palmer Barge Site and associated barge cleaning operations have been built on top of fill and sediment that was removed during dredging of the Intercoastal Waterways and the Sabine-Neches ship channel. This dredged material was placed adjacent to the shipping canals. The former municipal landfill was developed on this small manmade island.

Surface soils are a variable mixture of dark brown to black clay, sand, and silt often with shell material. The majority of the site subsoil is derived from dredge sediment from Sabine Lake. Part of the islands was use as a municipal landfill by the City of Port Arthur and a layer of cap material was placed over the landfill areas. The origin of the cap material has not been determined. Aside from areas that are mowed or have gravel, or concrete foundations, most of the soil is covered by tall grasses. No distinct soil horizons have formed, nor is there a clearly distinct "trash layer" of municipal waste. The upper 1-2 feet of surface soil consists of sand and silt and are typically free of municipal waste material. This upper cover often has roots from site vegetation or shell from dredging. Waste was encountered sporadically in the fill between about one foot to five feet below ground surface (bgs). The interval from about five feet bgs to approximately 18 feet is a mix of dark gray to gray clay, silt, and fine sand. At a depth of about 18 feet bgs, the top of the native Sabine Lake sediments is encountered. This gray silty clay is much more homogeneous than the overlaying dredge fill and becomes firmer with depth. This unit is much more consistent than the dredge spoil unit and extends to at least 30 feet bgs.

Hydrogeologic Findings

Groundwater was encountered in the sandy portions of the dredge fill unit. The first shallow water-bearing zone at the Palmer Barge Site is typically encountered at depths of approximately 4 feet bgs. Static water levels ranged from almost 9 feet above Mean Sea Level (MSL) at an upgradient well to slightly over 1 foot above MSL at the edge of Sabine Lake. This water bearing zone is not part of the deep Chicot Aquifer that is generally used as a drinking water source. The surficial shallow water-bearing zone resulted from the adjacent shipping channel dredge materials that were used to build the island where the site is located. Groundwater in this unit also includes infiltrated precipitation. This groundwater flows towards and discharges to Sabine Lake.

Sediment Sampling - Sabine Lake

Sediment sampling results indicated the presences of several polycyclic hydrocarbons (PAHs) at low concentrations. No pesticides, PCBs or VOCs were detected in the sediment samples collected. Several metals were detected in the sediment samples. Most of these such as chromium, copper, lead, manganese, nickel, and vanadium were reasonably consistent. Barium and zinc results had more variation, and there were some detections of mercury. Organic carbon results ranged from 8,630 mg/kg to 16,300 mg/kg (0.8% to 1.6%). The ratio of simultaneously extracted metal/acid-volatile sulfide (SEM/AVS) ranged from 0.06 to 0.30. The SEM/AVS ratio can be used to infer the bioavailability of divalent metals to benthic organisms. The lower the SEM/AVS ratio, the lower the bioavailability of the metal.

Surface Water Sampling - Sabine Lake

The only constituents detected in surface water from Sabine Lake were "J-value" concentrations of bis(2-ethylhexyl)phthalate (believed to be due to blank contamination), and aluminum, barium, manganese, and zinc. Mercury (0.00008 ug/L) was detected at one location. Calcium carbonate hardness was also measured, and it ranged from 1000 mg/L to 1080 mg/L.

CURRENT AND POTENTIAL FUTURE LAND AND GROUND WATER USES

Land Uses

The former Palmer Barge site is currently being operated by the site owner as an industrial property for metal scraping activities. Future use of the Site is also anticipated to be limited to industrial use due to its location and other surrounding industrial sites. The closest school is located approximately 2.7 miles from the site. There are only fourteen (14) residential properties located within a 1-mile radius.

Ground Water Uses

There is no current or anticipated future use of the shallow ground water at the site. The shallow ground water at the site is not considered a potential drinking water source. The shallow ground water resulted from the dredging activities that formed the isle where the former Palmer Barge site is located.

SUMMARY OF SITE RISKS

Baseline Human Health Risk Assessment

The primary sources of information used in the Baseline Human Health Risk Assessment (BHHRA) conducted in June 2005, are the Expanded Site Inspection Report (ESI) (Weston, 2000) and the Remedial Investigation (RI) Report for Palmer Barge Line Superfund Site (URS, 2004d). The Site Conceptual Exposure Model for the risk assessment indicates that the primary exposure scenarios of interest are on-site industrial worker exposure to constituents present in surface soil and off-site exposure to a recreational fisherman primarily via consumption of fish from Sabine Lake that may have accumulated site-related constituents from surface water and sediment.

The primary constituents of concern detected at the Site are polycyclic aromatic hydrocarbons (PAHs), pesticides, and metals. Baseline risk calculations for surface soil were performed for each of six AOCs based on analytical data reported in the RI. Risks for the recreational fisherman were estimated using data from the RI report supplemented by data from other investigations of Sabine Lake sediment and fish tissue concentrations. Each of the media and pathways evaluated in the baseline calculations resulted in risk estimates within the range of risk management criteria typically employed in the Superfund program (10^{-6} to 10^{-4} cancer risk and a noncancer hazard index of 1.0), with one exception. The maximum concentration of benzo(a)pyrene present in sediment resulted in an estimated cancer risk via fish consumption that is slightly above the upper end of the target risk range. However, actual fish tissue data from Sabine Lake indicates that the benzo(a)pyrene result does not represent a threat to human health.

An uncertainty analysis was performed to identify sources of uncertainty in the baseline risk calculations. A significant observation of the uncertainty analysis was that historic pre-RI soil data would likely produce risk estimates approximately an order of magnitude greater than the estimates developed based on the RI soil data. Therefore, Site soil concentrations from both the historic and RI data were compared to risk-based preliminary remediation goals (PRGs) that were developed for the range of applicable target risk criteria (10^{-6} to 10^{-4}).

Several surface soil sample locations with concentrations exceeding PRGs for the 10^{-5} target risk range were identified as "hot spots" to be addressed in the selected remedy. Addressing the identified "hot spots" in the selected remedy will result in a risk level that is protective of human health and the environment.

Identification of Chemicals of Concern

Chemicals of potential concern (COPCs) were identified from the remedial investigation which exceeded commercial/industrial medium specific screening level (MSSL) values to prepared the site specific Human Health Risk Assessment (HHRA). Table 1 summarizes the COPCs and contains the exposure point concentrations used to evaluate the reasonable maximum exposure scenario (RME) in the baseline risk assessment. Lead was analyzed separately.

Table 1
Summary of Chemicals of Concern and Exposure Point Concentrations from RI

Receptor	Exposure Medium	Chemical of Concern	Maximum Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure
Industrial Worker	On-Site Surface Soil	Aroclor-1254	4.18	4.18	Maximum Detection
		Benzene	2.02	2.02	Maximum Detection
		Benzo(a)pyrene	3.3	3.3	Maximum Detection
		Benzo(b) fluoranthene	2.73	2.73	Maximum Detection
		Dieldrin	0.4	0.4	Maximum Detection
		Pentachlorophenol	150	150	Maximum Detection

Table 1 Summary of Chemicals of Concern and Exposure Point Concentrations from RI					
Receptor	**Exposure Medium**	**Chemical of Concern**	**Maximum Concentration (mg/kg)**	**Exposure Point Concentration (mg/kg)**	**Statistical Measure**
		Arsenic	120	120	Maximum Detection
Key: **mg/kg**: milligrams per kilogram					
The table presents the COCs and exposure point concentration for each of the COCs detected in the media (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the maximum concentrations detected for each COC, the exposure point concentration (EPC), and how the EPC was derived.					

Exposure Assessment

The exposure scenarios evaluated for Human Health Risk are:

On-site Industrial Worker exposed by way of:

- Incidental ingestion of soil;
- Dermal contact with soil;
- Inhalation of airborne dust; and
- Inhalation of vapors emanating from volatile constituents in soil;

Recreational Angler exposed by way of:

- Dermal contact with surface water during angling; and,
- Ingestion of fish harvested from Sabine Lake.

In accordance with Risk Assessment Guidance for Superfund (RAGS), exposure assumptions for the risk assessment were selected to represent the reasonable maximum exposure (RME) that could occur at the Site. For the industrial worker scenario, these assumptions were taken from EPA's Region 6 MSSLs. A summary of these assumptions is presented on Tables 2 and 3 below.

The concentration that an individual would be exposed to over the chronic exposure periods assumed in the risk assessment would be best represented by an arithmetic average of the concentrations present throughout the medium where the exposure would occur over that time period. To account for uncertainty in what the true average concentration is based on the limited sample data available, risk assessments often utilize an upper confidence limit (UCL) of the mean to represent the exposure concentration. However, statistical evaluation of this sort for the Palmer Barge Site was complicated by the presence of non-detect results in the sample data set. This was particularly the case for this site since constituents were not detected in a majority of the samples analyzed for the many COPCs identified for the Site. For the Palmer Barge Site, the simple and conservative approach taken for this assessment was generally to assume that the receptor was exposed to the maximum detected concentration of the COPC. This approach will probably result in an overestimation of actual risks associated with the Site.

One exception to the use of maximum detected concentrations in the risk assessment was for the evaluation of lead (Pb) in soil. Since the distribution of lead concentrations in soil ranged from below background to above MSSLs, and the frequency of detection was high, a 95% UCL was utilized to represent the exposure concentration of lead in soil.

Exposure Assumptions for Industrial Worker

Table 2
Exposure Assumptions for Industrial Worker

Symbol	Definition	RME Value	Units	Source
EF	Exposure Frequency	225	days/yr	a
ED	Exposure Duration	25	yrs	a
IRs	Ingestion Rate of Soil	100	mg/day	a
BW	Body Weight	70	kg	a
ATc	Averaging Time-carcinogenic effects	70	yrs	a
ATnc	Averaging Time-noncancer effects	25	yrs	a
IRa	Inhalation Rate of Air	20	m^3/day	a
SA	Surface Area of Skin Exposed	3300	cm^2/day	a
AF	Adherence Factor	0.2	cm^2/day	a
PEF	Particulate Emission Factor	$1.32x10^9$	mg^3/kg	a

Exposure Assumptions for Recreational Fisherman Scenario

Table 3
Exposure Assumptions for Recreational Fisherman Scenario

Symbol	Definition	RME Value	Units	Source
EFf	Exposure Frequency for Fish Consumption	365	days/yr	a
EFd	Exposure Frequency for Dermal Contact	100	days/yr	d
ED	Exposure Duration	30	yrs	a

Table 3 Exposure Assumptions for Recreational Fisherman Scenario				
Symbol	**Definition**	**RME Value**	**Units**	**Source**
IRf	Ingestion Rate of Fish (annual average)	0.0175	kg/day	b
BW	Body Weight	70	kg	a
ATc	Averaging Time-carcinogenic effects	70	yrs	a
ATnc	Averaging Time-noncancer effects	30	yrs	a
SA	Surface Area of Skin Exposed	5170	cm^2/day	c
Isc	Thickness of Strateum Corneum	0.001	cm	c

Notes:
a - EPA Region 6 Medium-Specific Screening Levels, January 2004
b - Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health, EPA 2000
c - Supplemental Guidance for Dermal Risk Assessment, RAGS Part E, EPA 2001
d - Conservative assumption for a recreational angler fishing 2 times per week 50 weeks/year

Fish Tissue Concentrations

Evaluation of potential exposures via fish consumption as a result of impacts in groundwater, surface water, and sediment data involves use of a bioaccumulation model to estimate the concentration of COPCs in fish tissue. Use of bioconcentration factors (BCFs), bioaccumulation factors (BAFs), and biota-sediment accumulation factors (BSAFs) are a significant source of uncertainty in the risk assessment due to the complex metabolic processes being simulated by these published factors. Therefore, the risk assessment relied preferentially on measured fish tissue concentrations from the 1995 Texas Department of Health (TDH) study in lieu of modeled estimates where possible. While use of measured fish tissue concentrations eliminates the uncertainty of the modeled estimates, it also results in an evaluation of risks associated with all sources of loading to the fish tissue that is not limited to impacts that might have originated specifically from the Palmer Barge Site. Although samples in the TDH were collected from various locations throughout Sabine Lake, the risk assessment utilized the maximum detected concentration identified in any species from any sample location in Sabine Lake as a conservative measure to account for any uncertainty associated with the age or quality of the data.

Since the TDH study did not analyze all Palmer Barge COPCs, modeled fish tissue concentrations were generated for these constituents as necessary. In addition, in cases where the maximum measured fish tissue concentrations were reported as not detected, modeled fish tissue concentration estimates were generated and compared to the detection limit. If the modeled estimate was lower than the measured detection limit, the modeled estimate was used to represent the fish tissue concentration as an estimate of the censored concentration that might be present below the analytical detection. If the modeled estimate resulted in a fish tissue concentration that was higher than the detection limit in the non-detect analysis, then the measured result was used to represent the fish tissue concentration in the risk assessment since the measured result is considered more reliable than the estimated result.

Toxicity Assessment

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer slope factor. Cancer slope factors have been developed by the EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1×10^{-6} for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater that a one in a million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. The EPA's generally acceptable risk range for site related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

Carcinogenic and noncarcinogenic risk estimates were calculated using a reasonable maximum exposure (RME). Excess lifetime 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's developing cancer
- CDI = chronic daily intake averaged over 70 years (mg/kg-day)
- SF = slope factor, expressed as (mg/kg-day)-1.

A summary of the cancer toxicity data relevant to the COCs is presented in Table 4.

Table 4
Cancer Toxicity Data Summary

Chemical of Concern	Oral Cancer Slope Factor (mg/kg)/day	Dermal Cancer Slope Factor (mg/kg)/day	Inhalation Cancer Slope Factor (mg/kg)/day	Weight of Evidence/Cancer Guideline Description	Source	Date of Publication
Benzene	5.5E-02	N/A	2.9E-02	A	IRIS	01/28/2005
Pentachlorophenol	1.2E-01	1.2E-01	N/A	B2	IRIS	01/28/2005
Benzo(a)anthracene	7.3E-01	7.3E-01	N/A	B2	NCEA	07/01/1993

Table 4 Cancer Toxicity Data Summary						
Chemical of Concern	**Oral Cancer Slope Factor (mg/kg)/day**	**Dermal Cancer Slope Factor (mg/kg)/day**	**Inhalation Cancer Slope Factor (mg/kg)/day**	**Weight of Evidence/Cancer Guideline Description**	**Source**	**Date of Publication**
Benzo(a)pyrene	7.3E+00	7.3E+00	3.1E+00	B2	IRIS	01/28/2005
Benzo(a)fluoranthene	7.3E-01	7.3E-01	N/A	B2	NCEA	07/01/1993
Dieldrin	1.6E+01	1.6E+01	1.61E+01	B2	IRIS	01/28/2005
Heptachlor epoxide	9.1E+00	9.1E+00	9.1E+00	B2	IRIS	01/28/2005
PCB-1254	2.0E+00	2.0E+00	2.0E+00	N/A	IRIS	01/28/2005
Arsenic	1.5E+00	1.5E+00	1.51E+01	A	IRIS	01/28/2005

Key:
IRIS: Integrated Risk Information System, U.S. EPA
NCEA: National Center for Environmental Assessment
HEAST: Health Effects Assessment Summary Tables
N/A: Not available

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - Indicates that limited human data are available
B2 - Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans
D - Not classifiable as a human carcinogen

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

The HQ is calculated as follows: Non-cancer HQ = CDI/RfD, where:
CDI = Chronic daily intake
RfD = Reference Dose.

CDI and RfD are expressed in the same units and represent the same exposure period (*i.e.*, chronic, subchronic, or short-term). Table 5 lists the COCs and their respective non-cancer toxicity data.

Table 5 Non-Cancer Toxicity Data Summary						
Chemical of Concern	**Chronic Oral RfD Value (mg/kg-day)**	**Chronic Dermal RfD (mg/kg-day)**	**Chronic Inhalation RfD (mg/kg-day)**	**Primary Target Organ**	**Sources of RfD: Target Organ**	**Dates of RfD:**
Benzene	4.0E-03	N/A	3.0E-02	Bone Marrow	NCEA	----
Pentachlorophenol	3.0E-02	3.0E-02	N/A	Liver/ Kidney/	IRIS	01/28/2005
Dieldrin	5.0E-05	5.0E-05	N/A	Liver	IRIS	01/28/2005
Heptachlor epoxide	1.3E-05	1.3E-05	N/A	Liver	IRIS	01/28/2005
PCB-1254	2.0E-05	2.0E-05	N/A	Skin/immune system	IRIS	01/28/2005
Arsenic	3.0E-04	3.0E-04	N/A	Vascular system/skin	IRIS	01/28/2005

Key:
N/A: Not available
IRIS: Integrated Risk Information System, U.S. EPA
NCEA: National Center for Environmental Assessment

Risk Characterization

Using the elements of the Site Conceptual Exposure Model (SCEM) and associated exposure assumptions, constituent-specific cancer risk and noncancer hazard were calculated as well as cumulative cancer risk and noncancer hazard. The detailed results of the calculations are included in Appendix B of the Baseline Human Health Risk Assessment (BHHRA) RAGS Part D spreadsheets.

For all carcinogens, cumulative cancer risk, assuming simultaneous exposure to multiple carcinogens, was assumed to be additive (that is, the individual cancer risks for all carcinogenic constituents present in soil were summed). For simultaneous exposure to multiple noncarcinogens in soil, the target noncancer hazard index of 1.0 is applicable on a per organ/system basis rather than on the cumulative hazard index for an exposure scenario. Noncancer hazards are apportioned by target organ in Appendix B of the BHHRA RAGS Part D tables.

Due to the unique biokinetic metabolism of lead, a cancer risk or hazard index was not calculated for lead in the same manner as the other COPCs. For lead in soil, risk characterization consisted of comparison of the 95% UCL of soil lead concentrations to the Region 6 industrial worker MSSL for lead of 800 mg/kg. The Region 6 MSSL for lead used in this assessment is based on industrial land use and exposure of a developing fetus within an adult worker assumed to work at the site during pregnancy. Thus, exceedence of the Region 6 MSSL for lead in industrial soil would suggest that a target blood lead level in a developing fetus would be exceeded. Because the target organ (e.g. blood) for lead in adults is different from target organs for other noncarcinogenic constituents, there are no additive assumptions necessary for lead. Thus, the risk-based evaluation of lead in soil consisted of comparison of the Region 6 MSSL for lead with the 95% UCL of concentrations found at the Site.

On-Site Worker

The resulting cancer risk and hazard index estimates for the industrial worker scenario, based on the RI data, for each of the six soil AOCs are presented on Table 6. The cancer risk results range from 3x10-6 to 7x10-5 and Hazard Index results range from 0.02 to 0.5. Risk and Hazard Index results by constituent and pathway for this scenario are shown in Appendix B of the BHHRA RAGS Part D formatted tables. For lead in site soils, the 95% UCL of 590 mg/kg lead from the RI soil data is less than the Region 6 industrial worker Medium-Specific Screening Level (MSSL) for lead of 800 mg/kg.

Table 6
Cumulative Cancer Risk and Noncancer Hazard Indices for Soil from RI Data

Area of Concern	Cumulative Cancer Risk	Hazard Quotient
Wastewater AST Area	$4x10^{-5}$	0.1
Boiler House ASTs	$9x10^{-6}$	0.09
Former Open Top Slop Tanks	$4x10^{-6}$	0.02
Horizontal ASTs	$3x10^{-6}$	0.02
Twelve ASTs	$7x10^{-5}$	0.5
Flare	$1x10^{-5}$	0.4

Off-Site Recreational Angler

The resulting cancer risk and hazard index estimates for the recreational angler scenario are presented on Table 7.

Table 7
Cancer Risk and Noncancer Hazard Indices

Source Medium	Cancer Risk	Hazard Index
Ground Water	$7x10^{-9}$	0.5
Surface Water	No carcinogen COPCs	0.003
Sediment	$2x10^{-4}$	1.5

For the off-site recreational angler, the primary contributors to the $2x10^{-4}$ cancer risk associated with sediment was benzo(a)pyrene. However, interpretation of this result should consider the following factors:

- The calculated benzo(a)pyrene cancer risk was associated with a modeled fish tissue concentration. The actual measured fish tissue concentration for benzo(a)pyrene was non-detect in all samples collected from Sabine Lake in the 1995 TDH study.

- The modeled fish uptake was based on the maximum detected benzo(a)pyrene concentration in sediment (0.29J mg/kg). The maximum detected concentration of benzo(a)pyrene in sediment was a "J"-flagged result indicating that the concentration is an estimated value below levels that can be reliably quantified. Benzo(a)pyrene was not detected above laboratory detection limits in over 60% of the sediment samples analyzed. The assumption that fish uptake is based on the maximum detected concentration in sediment results in an artificially elevated estimate of the concentration that could be present in fish tissue.

- The benzo(a)pyrene in sediments adjacent to the Site may be present as a result of sources other than the barge cleaning operations performed at the site. Other potential sources may include barge traffic, and other industrial and urban runoff sources in the vicinity.

- The rapid metabolism of polycyclic aromatic hydrocarbons (PAHs) in fish into readily excreted substances prevents substantial bioaccumulation from occurring. Partitioning of PAHs from surface water and sediment into fish tissue can result in an overestimation of risk due to ingestion of fish assumed to be exposed to PAHs in surface water and/or sediment.

The primary contributors to the noncancer hazard index of 1.5 are Aroclor-1254, arsenic, cadmium, copper, mercury, and zinc. However, when apportioned out on a target organ basis the hazard index for each target organ is less than 1.0. Therefore, noncancer risk associated with PCBs and metals in sediment does not appear to be an issue from a human health perspective.

Data from Historic Investigations and Uncertainty

Although the data collected during the ESI were not combined with data collected during the RI for evaluation of soil in the body of the risk assessment, the ESI soil data were evaluated as part of the uncertainty analysis to further define any areas on or off site that exceeded risk-based target criteria.

To evaluate the significance of the ESI soil data set, concentrations from both the RI and ESI data sets were screened against Region 6 MSSLs. A review of these concentrations reveals that the maximum concentrations for each constituent on the list originates from samples collected during the ESI.

A simple baseline risk calculation performed based on the identified maximum concentrations results in risk estimates more than 10 times greater (i.e., $2x10^{-3}$ cancer risk and 4.3 hazard index) than those presented in the risk assessment based on the RI soil data only. The results of this risk calculation are shown on Table 8 below.

Table 8
Upper end Risk Estimate from RI and ESI Soil Data

Constituents (a)	Max Sitewide Soil Concentration (mg/kg) (f)	Soil Concentration for HI=1.0 mg/kg (b)	Soil Concentration for TR=$1x10^{-6}$ (mg/kg) (c)	Hazard Quotient (d)	Cancer Risk (e)
4,4'-DDE	12	---	7.8	----	1.54E-06
4,4'-DDT	11	474	7.8	2.32E-02	1.41E-06
Aldrin	9.2	20.5	0.11	4.48E-01	8.36E-05
Aroclor 1254	4.18	11.8	0.83	3.54E-01	5.04E-06
Aroclor 1260	0.85	---	0.83	----	1.02E-06
Arsenic	120	284	1.8	4.22E-01	6.67E-05
Benzene	3.1	183	1.6	1.69E-02	1.94E-06
Benzo(a)anthracene	280	---	2.3	----	1.22E-04
Benzo(a)pyrene	240	---	0.23	----	1.04E-03
Benzo(b)fluoranthene	220	---	2.3	----	9.57E-05
Benzo(k)fluoranthene	190	---	23	----	8.26E-06
Dibenzo(a,h)anthracene	110	---	0.23	----	4.78E-04
Dieldrin	4.4	34.2	0.12	1.29E-01	3.67E-05
Heptachlor	1.0	342	0.43	2.92E-03	2.33E-06
Heptachlor Epoxide	9.5	8.89	0.21	1.07E+00	4.52E-05
Indeno(1,2,3)cd-pyrene	280	---	2.3	----	1.22E-04
Naphthalene	370	210	---	1.76E+00	----
Pentachlorophenol	570	12900	10	4.43E-02	5.70E-05
			SUM	**4.27E+00**	**2.17E-03**

Notes:
a - All constituents withdetected concentrations in soil exceeding Region 6 MSSLs for an Industrial worker. Lead is evaluated separately.
b - Derived by ratios from baseline risk calculations, except Naphthalene based on published MSSL.
c - Region 6 MSSLs
d - Derived by Max Soil Concentration/Soil Concentration for HI = 1.0
e - Derived by Max Soil Concentration x 1E-6/Soil Concentration for TR = 1E-6
f - includes both RI and ESI soils data.

These results demonstrate that exclusion of the ESI data set from the baseline risk assessment for soil is a significant source of uncertainty in the soil risk assessment conclusions. Therefore, preliminary remediation goals (PRGs) were developed for the soil medium and soil concentrations from both the RI and ESI investigations. The PRGs were compared to both the RI and ESI soil test results to identify soil areas that will be addressed in the selected remedy.

Screening Level Ecological Risk Assessment

A Screening-Level Ecological Risk Assessment (SLERA) was performed for the Palmer Barge Line Superfund Site (Site) located in Port Arthur, Texas in June 2005. Ecological exposure and risk assessment for the Site were based on the 8-Step process outlined in EPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (1997), and was performed consistent with the Texas Commission on Environmental Quality (TCEQ) document entitled Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas (2001; 2004 Draft). The SLERA consists of Steps 1 and 2 of the 8-Step process.

Initially, maximum concentrations of analytes detected in ecological exposure media were identified and screened against highly conservative Ecological Screening Levels (ESLs) to select constituents of potential concern (COPCs) for the Step 2 exposure and risk calculations. Exposure and risk characterizations of COPCs for direct contact were performed using the maximum detected concentrations and risks were characterized using Hazard Quotients. Subsequently, wildlife ingestion exposure pathways were evaluated for all bioaccumulative chemicals using dose modeling with the maximum concentrations and the 95%UCLs as requested by EPA, TCEQ and the Trustees. Risks to wildlife were characterized using Hazard Quotients (HQs) calculated for No-Observable-Adverse Effect Levels (NOAEL) and Lowest-Observable-Adverse Effect Levels (LOAEL) endpoints.

Results of the SLERA showed that the COPCs identified in Sabine Lake surface water and sediment do not pose risks of sufficient magnitude to require remedial action. Risks of COPCs to aquatic biota by a direct contact pathway were few and Hazard Quotients based on highly conservative ESLs were low, with few exceedances. Hazard quotients for COPC exposure to wildlife by a food/prey ingestion pathways were all less than 1.0 based on the comparison of the 95%UCL versus the LOAEL endpoint. Therefore, the proposed ecological risk management decision for sediment is to allow degradation to naturally attenuate organic COPCs and to implement on-Site source control to prevent potential for future inputs to Sabine Lake. In addition, potentially unacceptable risks will be addressed either in part or wholly by actions undertaken as part of the Natural Resource Damage (NRD) process.

The COPCs identified in On-Site surface soil could pose an unacceptable risk to terrestrial biota by a direct contact pathway and to wildlife by a food/prey ingestion pathway if receptors were present. The current paucity of vegetation and minimal site use by terrestrial receptors in the former industrial portions of the Site justify the conclusion that ecological exposure is low.

As part of the SLERA, maximum concentrations of analytes detected in ecological exposure media were identified and screened against highly conservative Ecological Screening Levels (ESLs). The screening was completed to select constituents of potential concern (COPCs) for the Step 2 exposure and risk calculations. Exposure and risk characterizations of COPCs for direct contact were performed using the maximum detected concentrations and risks were characterized using Hazard Quotients. Wildlife ingestion exposure pathways were evaluated for bioaccumulative chemicals using dose modeling with the maximum concentrations and the 95% UCLs. Risks to wildlife were characterized using Hazard Quotients calculated for no-observable-adverse-effect-levels (NOAELs) and lowest-observed-adverse-effect-level (LOAEL) endpoints.

Results of the SLERA showed that the COPCs identified in Sabine Lake surface water and sediment do not pose risks of sufficient magnitude to warrant remedial action. Therefore, the selected remedy to address ecological risk will consist of allowing degradation to naturally attenuate organic COPCs and to implement on-site source control to prevent future run off of soil contaminants to Sabine Lake.

Results of the SLERA indicated that the COPCs identified in on-site surface soil could pose an unacceptable risk to terrestrial biota by a direct contact pathway and to wildlife by a food/prey ingestion pathway, if receptors were present. The lack of vegetation and minimal site use by terrestrial receptors justifies the conclusion that ecological risks are negligible and therefore exposure is low. However, future long-term industrial use of the Site is uncertain, and potential exposure could occur if ecological succession were to proceed naturally. Therefore, the selected remedy will include soil remediation to address uncertainty associated with the potential for future on-site ecological risk.

In order to evaluate potential response areas, Site soil concentrations from the ESI and RI data were compared to safe soil concentrations for worst case exposure to the American robin. Safe soil concentrations were back calculated for COPCs that exceeded LOAEL values. Several ecological "hot spots" were identified as response areas. Based on these results, Preliminary Remediation Goals were developed for on site contaminants that pose a risk to ecological receptors. A safe soil concentration of 497 mg/kg lead in surface soil was calculated. These safe soil concentrations factor in site-specific conditions of current and future commercial/industrial land use and the paucity of vegetation and minimal usable habitat available to the robin and other terrestrial receptors.

Preliminary Remediation Goals (PRGs)

Human Health PRGs

Based on the risk characterization, quantitative risks at the Palmer Barge Site appear to be generally within the range of risk management criteria typically employed in the Superfund program, that is a cumulative cancer risk in the range from $1x10^{-6}$ to $1x10^{-4}$ and a hazard index of 1. However, soil concentration data from a historic investigation not included in the baseline risk calculations indicate that site contaminants may pose a risk to human health at the Site.

Criteria were developed for all soil COPCs that were detected in either the ESI or RI data sets above MSSLs. However, uncertainties associated with background, occurrences of arsenic at concentrations exceeding the MSSL are prevalent at the Site yet most of these results are at concentrations that are below background. Therefore, site soil arsenic concentrations from the RI and ESI were compared to site-specific background levels. The target cleanup level for lead is based on the MSSL concentration of 800 mg/kg for an industrial/commercial site.

PRGs for the 10^{-6} level were taken directly from the Region 6 MSSL tables. Site-specific PRGs were calculated for the 10^{-5} and 10-4 target risk levels. Any COPCs on the list that are not considered carcinogenic, or in cases where the COPC exhibits both cancer and noncancer effects, the noncancer PRG based on a hazard index of 1.0 was used as the PRG if that concentration was lower than the cancer-based PRG.

In consultation with TCEQ, EPA chose a 10^{-5} target cleanup level for the Palmer Barge site based on exposure to contaminants that exceed those levels at surface soils (0 to 2 feet). The contaminants of concern and the selected PRGs are presented in Table 9. The results indicate that four (4) locations have concentrations exceeding the 10^{-5} PRGs.

Table 9
Human Health Preliminary Remediation Goals for 10^{-5} Target Risk Level

Constituent	Maximum Concentration mg/kg	PRG Cleanup Level mg/kg
Aldrin	9.2	1.1
Benzo(a)pyrene	240	2.3
Benzo(a)anthracene	280	23
Dieldrin	4.4	1.2
Heptachlor Epoxide	9.5	2.1
Naphthalene	370	210
Pentachlorophenol	570	100

Table 9 Human Health Preliminary Remediation Goals for 10^{-5} Target Risk Level		
Lead	5050	800

Note: A safe soil concentration of 497 mg/kg lead in surface soil was calculated. These safe soil concentrations factor in site-specific conditions of current and future commercial/industrial land use and the paucity of vegetation and minimal usable habitat available to the robin and other terrestrial receptors.

Ecological Safe Soil Concentrations

Based on the results of the Screening Level Risk Assessment, safe soil concentrations were developed for on site soils that would be protective of ecological receptors. The ecological safe soil concentrations for on site soils are presented in Table 10. The results indicate that seven (7) locations exceed the target cleanup levels for the site surface soils (0 to 2 feet).

Table 10
SLERA Safe Soil Concentrations

Constituent	Maximum Concentration mg/kg	Target Cleanup Levels mg/kg
Butyl Benzyl Phthalate	24	5.37
4,4-DDD	51	0.0864
4,4-DDE	26	0.0864
4,4-DDT	11	0.0865
Methoxychlor	4.7	0.09
Lead	5050	497

Basis for Action

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. The response action will address remaining "hot spots" that were not addressed during the Time Critical Removal Action conducted in August 2000.

REMEDIAL ACTION OBJECTIVES AND GOALS

Remedial action objectives (RAOs) were developed for the Palmer Barge Site for those COCs that pose a carcinogenic risk above EPA's target cancer risk range or non-carcinogenic hazard to human health and the environment based on site-specific risk calculations. RAOs are also defined such that Applicable or Relevant and Appropriate Requirements (ARARs) are met. The Remedial Action Objectives were developed based on the following:

- The reasonable anticipated land use scenario is based on the future redevelopment of this Site for industrial or commercial use, consistent with current site use and surrounding land use;
- Potential ecological risks were considered for site soils to prevent exposure to ecological receptors and prevent surface runoff of contaminants to the Sabine Lake sediments.

The remedial action objectives for this Site are:

- Prevent direct contact, ingestion, and inhalation of surface soils that exceed human health based levels, based on the industrial worker scenario, for the chemicals of concern;
- Prevent off-site migration of COCs to Sabine Lake sediments that exceed human and ecological based levels for the chemicals of concern; and,
- Prevent exposure to site soils that may pose a risk to ecological receptors.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Under CERCLA and the NCP, the ROD is required to describe the "... federal and state requirements that are applicable or relevant and appropriate to the site that the remedy will attain." 40 C.F.R. 300.400(f)(5)(ii)(A). These ARARs derive from the potential ARARs that were identified by EPA, which were identified as "requirements applicable to the release or remedial action contemplated based upon an objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site." 40 C.F.R. 300.400 (g)(1). If not applicable to a specific release, these federal or state requirements might still be determined to be "relevant and appropriate to the circumstances of the release." *See* 40 C.F.R. 300.400(g)(2). *See also* CERCLA, 42 U.S.C. §9621(d)(2)(A). An ARAR could be specific to a given action, chemical, or location at a CERCLA site. The NCP defines "applicable requirements" as follows:

> *Applicable requirements* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environment or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. 40 C.F.R. 300.5.

The NCP then goes on further to define "relevant and appropriate requirements":

> *Relevant and appropriate requirements* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under

federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and *are more stringent than federal requirements may be relevant and appropriate.* (Emphasis Added). 40 C.F.R. 300.5.

Thus, it is clear from the NCP that state requirements must be "substantive"; and as the statute commands, they must be "more stringent" than any federal standard, requirement or limitation. 42 U.S.C. §9621(d)(2)(A)(ii). ARARs deal with the degree of cleanup, or levels and standards of control and are not procedural or administrative requirements. *See* NCP Preamble, 55 Fed. Reg. 8666, 8756 (Mar. 8, 1990). *See* also *State of Ohio v. United States Environmental Protection Agency*, 997 F.2d 1520, 1526-27 (D.C. Cir., 1993). In connection with state ARARs, the NCP also amplifies and explains the nature of "promulgated" standards or limitations, where it provides:

> Only those state *standards* that are *promulgated*, are identified in a timely manner, and *are more stringent* than federal requirements may be applicable or relevant and appropriate. For purposes of identification and notification of promulgated state standards, the term promulgated means that the standards are of *general applicability and are legally enforceable.* (Emphasis Added). 40 C.F.R. 300.400(g)(4).

If a standard is not applicable, the question of whether the standard is relevant and appropriate to the circumstances of the release is addressed by several enumerated factors, which " . . . shall be examined, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and whether the requirement is well-suited to the site, and is therefore both relevant and appropriate." 40 C.F.R. 300.400(g)(2). Finally, there is a category of other federal or state advisories, criteria, or guidance, which may be used to develop a CERCLA remedy that falls into a category called "to be considered (TBC)" guidelines. 40 C.F.R. 300.400(g)(3).

ARARs are divided into three categories: chemical specific, action specific, and location specific. These classifications are described as follows:

> *Action Specific ARARs* are technology or activity based requirements or limitations on actions taken regarding hazardous substances, pollutants, and contaminants.
>
> *Chemical Specific ARARs* are promulgated values that include health or risk based standards, numerical values, or methodologies that, when applied to site-specific conditions, establish the acceptable amount or contaminant concentration that may be detected in or discharged to the ambient environment. These values focus on protecting

public health and the environment. However, technological or cost limitations may influence some values, such as maximum contaminant levels (MCLs).

Location Specific ARARs relate to the geographical position of the site, such as state and federal laws and regulations that protect wetlands or construction in flood plains. The extent to which any location specific requirements may be considered depends solely on the sensitivity of the environment and any possible impact caused by remedial activities.

The ARARs pertaining to RA activities at the Site are divided into action, chemical, and location specific categories as described in the following tables. In addition, any TBCs and potential waivers are discussed.

Table 11
Action Specific ARARs

Requirement	Justification
Federal	
Storm Water Regulations 40 CFR Parts 122, 125	National Pollution Discharge Elimination System (NPDES) permits are addressed relative to storm water discharges associated with industrial activity. These regulations require the development and implementation of a storm water pollution prevention plan or a storm water best management plan. Monitoring and reporting requirements for a variety of facilities are outlined. Applicable to the Site.
Permits and Enforcement; CERCLA Section 121(e)	This section specifies that no federal, state, or local permit shall be required for any portion of a CERCLA remedial action that is conducted on the site of the facility being remediated. This includes exemption from the RCRA permitting process. Applicable to the Site.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; 40 CFR Part 264 Subparts B, C, D and G	Subparts B, C, and D establish minimum standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste. Subpart G establishes standards for closure and post closure care for site design and operation. These standards will be relevant and appropriate to the Site if wastes onsite are identified as RCRA hazardous wastes or are sufficiently similar to RCRA hazardous wastes.
National Contingency Plan, 40 CFR Part 300.430; Baseline Human Health Risk Assessment, RI/FS, and ROD	Evaluates baseline human health risk as a result of current and potential future site exposures, and establishes contaminant levels in environmental media for protection of public health. Also provides guidelines and requirements for conducting RI/FS and ROD. Applicable to the Site.

Exceptions to ARAR Rules; CERCLA 121(d)(4)	Allows EPA to waive compliance with ARARs in six circumstances: 1. The selected action is only part of a total remedial action that will comply with the ARAR requirements when completed. 2. Compliance with the ARAR requirements would present greater health/environmental risks than alternative options. 3. Compliance with the ARAR requirements is technically impracticable from an engineering perspective. 4. The selected remedy will attain a standard of performance that is equivalent to an ARAR required standard through use of another method or approach. 5. With respect to a state requirement, the state has not demonstrated consistent application of the requirement in similar circumstances. 6. Where the remedy is to be fund-financed (as opposed to private-party financed), meeting the ARAR standard would not provide balance between the need for cleanup at the site in question considering the amount of fund resources that must be used at other sites in need of cleanup. These provisions are applicable to the Site.
Permits and Enforcement; CERCLA Section 121(e)	This section specifies that no federal, state, or local permit shall be required for any portion of a CERCLA remedial action that is conducted on the site of the facility being remediated. This includes exemption from the RCRA permitting process. Applicable to the Site.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; 40 CFR Part 264 Subparts B, C, D and G	Subparts B, C, and D establish minimum standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste. Subpart G establishes standards for closure and post closure care for site design and operation. These standards will be relevant and appropriate to the Site if wastes onsite are identified as RCRA hazardous wastes or are sufficiently similar to RCRA hazardous wastes.
Use and Management of Containers Tank Systems; 40 CFR Part 264 Subparts I and J	Subpart I sets operating and performance standards for container storage of hazardous waste. These requirements would be relevant and appropriate to the Site for containers used for storage of liquids, soil, or other wastes as part of the remedial action. Subpart J outlines similar standards but applies to tanks rather than containers.
Standards for Waste Piles and Landfills; 40 CFR Part 264 Subparts L and N	Subpart L sets design and operating requirements for the storage or treatment of wastes in piles. If the waste piles are closed with wastes left in place, Subpart N requirements must be met. Subpart N establishes construction, design, performance, closure, and operation requirements pertaining to hazardous waste landfills. If treatment, storage, or disposal of RCRA waste in piles is included as part of the remedial action, Subpart L and/or N would be relevant and appropriate to the Site. Subpart N would be applicable to the Site in the event that hazardous wastes are identified at the Site.

Miscellaneous Units; 40 CFR Part 264 Subpart X	Relates to "miscellaneous" units that treat, store, or dispose of hazardous wastes. Provides general performance standards for location, design, construction, operation, monitoring, and closure/post closure. If the remedial action includes treatment, storage, or disposal of hazardous waste in a miscellaneous unit, these requirements would be relevant and appropriate to the Site.
Land Disposal Restrictions (LDRs); 40 CFR Part 268 Subpart C, Prohibitions on Land Disposal; Subpart D, Treatment Standards	40 CFR Part 268 establishes restrictions on land disposal unless treatment standards are met or a "no migration exemption" is granted. LDRs establish prohibitions, treatment standards, and storage limitations before disposal for certain wastes as set forth in Subparts C and D. Treatment standards are expressed as either concentration-based performance standards or as specific treatment methods. Wastes must be treated according to the appropriate standard before wastes or the treatment residuals of wastes may be disposed in or on the land. The Universal Treatment Standards (UTS) establish a concentration limit for 300 regulated constituents in soil regardless of waste type. The LDRs are applicable to the Site if hazardous wastes are identified.
Requirements for Identification and Listing of Hazardous Wastes; 40 CFR Part 261	These regulations establish the requirements for the identification and listing of hazardous wastes. These requirements are applicable to the Site and would require that potential hazardous wastes be tested for identification and listed if appropriate.
Standards Applicable to Generators and Transporters of Hazardous Waste; 40 CFR Part 262 and Part 263	Part 262 establishes the record keeping requirements and manifesting requirements for the transport of hazardous wastes. Part 263 establishes requirements for the transport of hazardous wastes. These requirements would be applicable to the Site if hazardous wastes are identified and shipped offsite for disposal.
Department of Transportation Requirements Governing the Transportation of Hazardous Materials; 49 CFR Parts 107 and 171-179	Establishes the requirements for the transportation of hazardous materials as defined by the U. S. Department of Transportation. These requirements would be applicable to the Site if the hazardous wastes are identified and transported offsite for disposal.
State	
TPDES Construction Storm water Permit; 30 TAC 205	Requires submission of Notice of Intent (NOI) for coverage under the general permit for storm water discharges resulting from construction occurring on sites greater than 1 acre in size. This requirement will be applicable to the Site during the site remedial construction.

Spill Prevention and Control; 30 TAC 327	Requires that releases of reportable quantities of listed materials be reported to the agency (TCEQ) within 24 hours. The responsible person shall submit written information, such as a letter, describing the details of the discharge or spill and supporting the adequacy of the response action, to the appropriate TCEQ regional manager within 30 working days of the discovery of the reportable discharge or spill. The regional manager has the discretion to extend the deadline. The rule is applicable to the Site if during remedial activities a release greater than the documented reportable quantity of a listed material occurs.
Control of Air Pollution from Visible Emissions and Particulate Matter; 30 TAC 111	Requires that all reasonable precautions shall be taken to prevent particulate matter from becoming airborne, including use of water or chemicals for control of dust in the construction operations, clearing of land, and on dirt roads or stockpiles. Applicable during excavation and transport of soils, or any other activity that may generate airborne particulate matter at the Site.
Texas Industrial Solid Waste and Municipal Solid Waste Regulations; 30 TAC 335	Guidelines for generators to determine if a solid waste is a hazardous waste. Requires adherence to record keeping and shipping requirements. Applicable to the soils and wastes to be removed at the Site, which may or may not be hazardous.

Table 12
Chemical Specific ARARs

Requirement	Justification
Federal	
American Conference of Governmental Industrial Hygienists-Threshold Limit Values (TLV)	TLVs are based on the development of a time weighted average (TWA) exposure to an airborne contaminant over an 8-hour work day or a 40-hour work week. TLVs identify levels of airborne contaminants at which health risks may be associated. These values are applicable to work at the Site.
Clean Air Act (CAA) 40 CFR Part 61	The CAA is the primary federal legislation protecting air quality. National Primary and Secondary Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and the New Source Performance Standards (NSPS) are promulgated by EPA under the CAA. These requirements are relevant and appropriate to the Site.

National Primary and Secondary Air Quality Standards (NAAQS); 40 CFR, Part 50	The NAAQS specify the maximum concentration of a federally regulated air pollutant (i.e., SO2, particulate matter (PM10), NO2, CO, ozone, and lead) in an area resulting from all sources of that pollutant. No new construction or modification of a facility, structure or installation may emit an amount of any criteria pollutant that will interfere with the attainment or maintenance of a NAAQS (see 40 CFR ' 51.160). For the federal NAAQS standards, all measurements of air quality are corrected to a reference temperature of 25EC and to a reference pressure of 760 mm Hg (1,013.2 millibars). These requirements may be applicable during the excavation and disposal activities at the Site.
American Conference of Governmental Industrial Hygienists-Estimated Limit Values (ELV)	ELVs are based on TLVs and converted to reflect exposure to contaminants on a 24-hour per day basis. The calculation of an ELV does not take into consideration the additive and synergistic effects of contaminants and additional exposures from media other than air. ELVs are not expected to be completely protective of the potential effects of exposures to contaminants; however, they do provide some indication of airborne contaminant levels at which adverse health effects could occur. These values are relevant and appropriate for the Site.
Safe Drinking Water Act 40 USC 399 Primary Drinking Water Standards (Maximum Contaminant Levels [MCLs]); 40 CFR Part 141	Establishes MCLs for drinking water. Surface water near the site is not designated for public or private water supply, but may be used for recreational purposes. The shallow ground water at the site is not considered as a drinking water supply source; therefore, MCLs are not applicable to the Site.
Maximum Contaminant Level Goals (MCLG); 40 CFR Part 141.50	These levels do not take into account cost or feasibility, and are fully protective of human health. They are only enforceable under CERCLA under specific community water system provisions that are not applicable or relevant and appropriate to the Site.
Federal Clean Water Act (CWA) Water Quality Criteria; 40 CFR Part 131; U.S. EPA Quality Criteria for Water, 1976, 1980, and 1986	These criteria (ambient water quality criteria) apply to water classified as a fisheries resource. These requirements are relevant and appropriate to the surface water in Sabine Neches Channel. These criteria are contained in Clean Water Act (CWA) ' 303 and 304. As non-enforceable criteria, these criteria are included as to be considered only.
Hazardous Substances; 40 CFR Part 116.3 and 116.4	Establishes reporting requirements for certain discharges of reportable quantities of hazardous substances. Creates no substantive clean up requirement. May be relevant and appropriate to the Site based on the chosen remedial alternative and if discharges of reportable quantities of hazardous substances occur during implementation of the remedy.

Solid Waste Disposal Act Subtitle C Requirement; 40 CFR, Part 264, Subpart F	Governs the maximum concentration of constituents released to ground water from solid waste management units (SWMU). Applicable to the Site if the chosen remedy includes onsite disposal and ground water is adversely affected.
Designation of Hazardous Substances; 40 CFR, Part 302.4	This section provides tables of the following substances: (a) Listed hazardous substances. The elements and compounds and hazardous wastes appearing in Table 302.4 are designated as hazardous substances under Section 102(a) of CERCLA. (b) Unlisted hazardous substances. A solid waste, as defined in 40 CFR 261.2, which is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b), is a hazardous substance under Section 101(14) of CERCLA if it exhibits any of the characteristics identified in 40 CFR 261.20 through 261.24. These requirements are applicable to the Site because solid/hazardous wastes were previously disposed at the site and hazardous substances are present in soil and sediment.
Land Disposal Restrictions 40 CFR, Part 268	Establish numerical treatment standards for disposal of hazardous wastes. These requirements are potentially applicable if hazardous wastes are identified and offsite disposal is a selected remedy.
State	
Texas Surface Water Quality Standards; 30 TAC 307	Establishes limits for constituents for the protection of surface water quality. Requires the maintenance of the quality of water in the state consistent with public health and enjoyment, propagation and protection of terrestrial and aquatic life, operation of existing industries, and economic development of the state. These requirements are applicable for release of COCs from the Site into the Sabine-Neches Channel.
Hazardous Metals (30 TAC 319, General Regulations Incorporated into Permits, Subchapter B)	Establishes allowable concentrations for discharge of hazardous metals to inland waters (319.22). These requirements are potentially applicable for the Site as hazardous metals have been detected in soil and sediment samples collected from the Site and the hazardous metals may be discharged to waters of the state.
Waste Classification 30 TAC 335, Subchapter R	Establish numerical criteria for designating a waste as a hazardous waste or as one of three classes of solid waste. These requirements are applicable for classification of wastes generated during the site remediation.

Table 13 Location Specific ARARs	
Requirement	**Justification**
Federal	
Executive Order on Flood plain Management, Order No. 11988	Requires all federal agencies and associates to avoid long- and short-term adverse impacts associated with occupancy and modification of flood plains. Any actions taken to reduce the risk or impact of remedial actions should accomplish the following: • Reduce the risk of flood loss. • Minimize the impacts of floods on human safety, health, and welfare. • Restore and preserve the natural and beneficial values served by flood plains. This requirement is applicable only if the site lies within the 100-year flood plain or the remedy impacts a 100-year flood plain.
Fish and Wildlife Coordination Act 16 USC ' 661 et seq. 16 USC ' 742 a 16 USC ' 2901	Requires consultation when a modification of a stream or other water body is proposed or authorized and requires adequate provision for protection of fish and wildlife resources. These requirements are relevant and appropriate to the Site for removal of contaminated sediment from the Sabine Lake if the remedy requires contaminated sediment to be removed.
Endangered Species Act; 16 USC ' 1531 et. seq. 50 CFR Part 402	Requires that proposed action minimize impacts on endangered species within critical habitats upon which endangered species depend, including consulting with Department of Interior. Endangered or threatened species have not been identified at the Site; the Act is not an ARAR for the Site.

Table 14 To Be Considered Guidelines	
Requirement	Justification
Federal	
References Doses (RfDs), EPA office of Research and Development	The EPA Office of Research and Development provides non-enforceable toxicity data for specific chemicals for use in public health assessments. This data is used to assess the risks associated with contaminated media at the Site.

Risk Specific Doses (RSDs), EPA Carcinogen Assessment Group and EPA Environmental Criteria and Assessment Office	RSDs represent the dose of a chemical in mg/kg of body weight per day associated with a specific risk level (i.e., 10-6). RSDs are determined by dividing the selected risk level by the cancer potency factor (slope factor). This standard is used to assess the risks associated with contaminated media at the Site.
State	
Texas Risk Reduction Program (TRRP) 30 TAC 350	TRRP establishes the TCEQ's minimum remediation standards for present and past uncontrolled constituent releases. TRRP uses risk evaluation to determine if corrective action is necessary for the protection of human health and the environment and to identify acceptable constituent levels in the impacted media. TRRP defines the land use categories, ground water classifications, requirements for plume management zone, soil reuse issues, and tiered risk evaluation for affected sites. This state regulation is not applicable for the Federal superfund sites but should be considered at the Site.

DESCRIPTION OF REMEDIAL ALTERNATIVES

Statutory Requirements/Response Objectives

Under its legal authorities, the EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences, including: (1) a requirement that EPA's remedial action, when complete, must comply with all applicable, relevant, and appropriate federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; (2) a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (3) a preference for remedies in which treatment permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances. Response alternatives were developed to be consistent with these statutory mandates. However, since Principal Threat wastes are not present at the site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element is not warranted.

Technology and Alternative Development and Screening

Construction and engineering controls were evaluated in the remedial alternatives since the contaminated soils and sediments were identified as a low-level threat waste that can be reliably contained and would present only a low risk in the event of release.

CERCLA and the National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed to address the soil and sediment contamination at the Palmer Barge Site. Four remedial alternatives involving different construction and engineering control options for the soil and sediment contamination were selected for detailed analysis. Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the Feasibility Study Report. The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy or procure contracts for construction. The present-worth costs associated with the ground water monitoring requirements are calculated using a discount rate of seven percent (7%).

Common Elements

Alternatives 2 through 4 contain the following common elements:

- Institutional Controls - Implementation of Institutional Controls to restrict future land use to industrial purposes only. The Institutional Control shall be a restrictive covenant by the property owner, to the benefit of the State of Texas and the United States Government, recorded in the real property records of Jefferson County, Texas;

- Abandonment of existing monitoring wells - As the BLRA determined that groundwater at the Site does not contribute significantly to Site risk, five existing monitoring wells at the Site will be abandoned; and

- Wastewater AST demolition and sludge removal - Sludge contained within the Wastewater AST will be removed and disposed of off-site. The tank will be decontaminated, and reused as scrap metal by the property owner.

Summary of Remedial Alternatives for Soils

Alternative 1: No Further Action

Estimated Capital Cost: $0
Estimated Annual O&M Costs: $0
Estimated Present Worth (7%): $0

Regulations governing the Superfund program, 40 C.F.R. § 300.430(e)(6) require that the "no action" alternative be evaluated at every Site to establish a baseline for comparison. Under this alternative, EPA would take no further action at the Site to prevent exposure to the remaining contaminated soils and sediment at the Site.

ALTERNATIVE 2 - Institutional Controls

Estimated Capital Cost: $135,000
Estimated Annual O&M Costs: $500
Estimated Present Worth (7%): $141,205

Alternative 2 includes the following activities:

- Institutional Controls - To limit future use of the property to industrial purposes;
- Abandonment of existing monitoring wells - Five (5) existing monitoring wells at the Site will be abandoned; and
- Wastewater AST demolition and sludge removal - Sludge contained within the Wastewater AST will be removed and disposed of off-site. The tank will be decontaminated and left on site.
- The time to implement this remedy would be 1 to 3 months.

Alternative 2 involves no remedial action to address the contaminants that pose a risk to human health and the environment. Structural controls, such as posting of "no excavation" signs and fencing, would be implemented in addition to proprietary controls restricting future land use to industrial purposes only.

Effectiveness

Alternative 2 provides no physical control of exposure to impacted soils and no reduction in risk to human health. This alternative would not comply with any applicable or relevant and appropriate requirements, such as PRGs developed during the HHRA or safe soil concentrations developed based on the SLERA. The potential for sediment runoff from the Site that may contain COPCs would not be eliminated. This alternative would not provide protection to current or future site workers. Alternative 2 does not reduce the toxicity, mobility, or volume of the waste.

Implementability

There are no implementability issues associated with this alternative.

ALTERNATIVE 3 - EXCAVATION/ON-SITE DISPOSAL/SOIL COVER/ICs

Estimated Capital Cost: $310,669
Estimated Annual O&M Costs: $10,000
Estimated Present Worth (7%): $504,759

Alternative 3 includes the following activities:

- Excavation of approximately 1,204 cubic yards of the upper two feet of soil that exceed risk based levels at each of the response areas;
- Relocation of the excavated soils to a designated area on-site and consolidation. The area required for consolidation encompasses approximately 12,800 square feet;
- Confirmation sampling at each of the response areas. Confirmation samples would be collected from each response area and analyzed for COPCs.
- Backfilling of the response areas with clean soil;
- Placement of an isolation soil cover over the relocated and consolidated impacted soils consisting of a synthetic root penetration barrier and 24-inches of clean soil, including 3 to 4 inches of topsoil suitable for vegetation growth; and
- Installation of structural controls to protect human health. Structural controls to be installed as part of this alternative include fencing around the area designated for disposal and posting of "no trespassing" signs.
- The time to implement this remedy would be approximately 2 months.

Effectiveness

Placement of an isolation soil cover over surface soils reduces risk by eliminating potential pathways identified in the HHRA that included ingestion, dermal contact, and inhalation of dust/vapors. Alternative 3 complies with applicable or relevant and appropriate requirements by preventing exposure to contaminants that present a risk to human health and the environment. This alternative does not provide any reduction in the toxicity, mobility, or volume of impacted soil. Alternative 3 would involve the disturbance of surface soils exceeding acceptable risk levels. The potential for a slight, temporary increase of risk to the community and to field personnel exists; however, engineering controls (e.g., water sprays) may be implemented to reduce risk due to fugitive dust during construction.

Under Alternative 3, five response areas would be excavated and backfilled with clean soil or gravel. Therefore, the potential for sediment runoff from the Site that may contain COPCs will be eliminated. The soil cover over the consolidation area containing impacted soils would prevent or reduce the potential for runoff of contaminated soils.

To ensure long-term effectiveness of this alternative, maintenance of the isolation soil cover must be completed. Failure to properly maintain the cover could result in the potential for direct contact with impacted soils. This alternative would also rely on structural controls to reduce potential for exposure, and long-term maintenance of these controls would be required. Because this alternative would result in contaminated soils remaining onsite above health based levels, five year reviews will be conducted to ensure that the remedy continues to be protective of human health and the environment, in accordance with CERCLA 121(c).

Implementability

It is anticipated that no special techniques, materials, permits, or labor would be required to implement this Alternative. The area required to contain approximately 1,204 cubic yards of contaminated soils is approximately 12,800 square feet or a 115-foot by 115-foot cell. This amount of land is readily available onsite. The cover soil, which will consist of 24 inches of low permeability soil, is readily available, as is the synthetic root penetration barrier. The low permeability soil and topsoil required for construction is available locally.

ALTERNATIVE 4 - EXCAVATION/OFF-SITE DISPOSAL

Estimated Capital Cost: $351,975
Estimated Annual O&M Costs: $500
Estimated Present Worth (7%): $428,180

Alternative 4 consists of the following activities:

- Excavation of approximately 1,204 cubic yards of the upper two feet of soil that exceed risk based levels at each of the response areas;
- Confirmation sampling at each of the response areas. Confirmation samples would be collected from each response area and analyzed for COPCs.
- Backfilling of the response areas with clean soil;
- Off-site disposal of the excavated soils at a permitted disposal facility; and
- Implementation of Institutional Controls to restrict future land use to industrial purposes only. The Institutional Control shall be a restrictive covenant by the property owner, to the benefit of the State of Texas and the United States Government, recorded in the real property records of Jefferson County, Texas;
- The time to implement this remedy is expected to be approximately 2 months.

The objective of this alternative is to protect human health and the environment by removing materials that exceed risk based levels from the Site. Pending results of waste characterization, it could be necessary to dispose of the excavated materials at a hazardous waste landfill.

Effectiveness

Alternative 4 is protective of human health by removing the source of the risk at the Site. Alternative 4 complies with applicable or relevant and appropriate requirements by removing contaminants from the site that exceed risk based levels for protection of human health and the environment. This option does not provide any reduction in the toxicity, mobility, or volume of impacted soil through treatment. Alternative 4 would involve the disturbance of surface soils exceeding acceptable risk levels. The potential for a slight, temporary increase of risk to the community and to field personnel exists; however, engineering controls (e.g., water sprays) may be implemented to reduce risk due to fugitive dust during construction.

As part of Alternative 4, the response areas would be excavated and backfilled with clean soil or gravel. Therefore, the potential for sediment runoff from the site that may contain COPCs would be eliminated. Alternative 4 ensures long-term effectiveness and permanence by removing the source of the risk from the Site.

Implementability

Implementability issues associated with this alternative include land disposal restrictions (LDR). Alternative 4 must be implemented in accordance with applicable State and Federal LDR rules. Successful implementation of this alternative requires that the impacted soils be characterized to determine the type of disposal facility that must be used. Should waste characterization results indicate that the impacted soils are considered hazardous, disposal at a hazardous waste landfill would be required. In addition, under Federal LDR rules, all hazardous waste must be treated before land disposal to meet Universal Treatment Standards (UTS). The results of the Toxicity Characteristic Leaching Procedure (TCLP) analysis for waste characterization will determine whether incineration or disposal in a Resource Conservation and Recovery Act (RCRA) hazardous waste landfill is necessary to meet the LDR requirements in the event that the soil is found to be a hazardous waste. However, it is anticipated that the impacted soils on-site will be characterized as non-hazardous waste. Non-hazardous soils will be transported to a solid waste landfill. Safety concerns during transportation are minimal due to the relatively small volume of soil to be transported, such that the volume of additional truck traffic should not constitute a significant additional risk.

COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. The nine evaluation criteria are (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, or volume of contaminants through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) State/support agency acceptance; and (9) community acceptance. This section of the ROD profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below.

1. **Overall Protection of Human Health and the Environment** addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternatives 3 and 4 are protective of human health and the environment through the use of engineering controls to reduce or control the risk of accidental exposure to contaminated soils and sediments that exceed risk based levels. Alternative 2 provides some controls from potential exposure of site contaminants through institutional controls. Alternative 1 does not reduce or control risks from potential exposure at the Site.

2. **Compliance with Applicable or Relevant and Appropriate Requirements ("ARAR").** Section 121(d) of CERCLA, 42 U.S.C. §9621(d), and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4), 42 U.S.C. §9621(d)(4).

Alternatives 3 and 4 would meet their respective ARARs from Federal and State laws. Alternatives 3 and 4 could trigger the RCRA land disposal restrictions through the excavation and consolidation of the soils in an on-site location or the off-site disposal in a permitted RCRA landfill. Alternatives 1 and 2 do not meet Federal or State ARARs.

3. **Long-term Effectiveness and Permanence** refers to expected residual risk and the ability to maintain reliable protection of human health over time, once cleanup levels have been met.

Alternatives 3 and 4 achieve long-term effectiveness through the use of engineering controls to prevent exposure to the soils and sediments. Alternative 4 provides the most effective and permanent solution through the off-site disposal of soils that exceed the PRGs. Alternatives 3 and 4 also utilize institutional controls to prevent accidental exposure to the contaminated soils and sediments. Alternatives 1 and 2 do not provide long-term effectiveness of permanence since exposure to site contaminants would not be addressed. Alternative 2 only uses institutional controls to prevent exposure to contaminated soils and sediments.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

The use of engineering controls for containment of the waste material in Alternatives 3 and 4 are appropriate since the contaminated soils and sediments represent a low level threat at this Site. Therefore, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element does not apply at this Site.

5. **Short-term Effectiveness** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during implementation

Alternatives 3 through 4 would be effective within 2 months or less through actions to address all or part of the contaminated soils and sediments. All of the alternatives have minimal impacts to the on-site workers, the surrounding community, and the environment during implementation.

The off-site disposal of contaminated materials in Alternative 4 would result in truck traffic through the community during implementation.

6. **Implementability** considers the technical and administrative feasibility of a remedy such as relative availability of goods and services and coordination with other governmental entities.

Alternative 1 and 2 can be easily implemented in a very short period of time. The technical feasibility for consolidation and capping the materials in Alternatives 3 is the simplest in terms of readily available materials and equipment. Disposal of contaminated materials at an off-site facility under Alternative 4 will require additional actions to secure a disposal facility, costs, transportation, and supporting documentation. There are no expected administrative problems with any of the alternatives.

7. **Cost** includes estimated capital and operation and maintenance costs as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Capital costs range from $135,000 for Alternative 2 to $351,975 for Alternative 4. Annual operation and maintenance costs for the Site range from $500 for Alternatives 2 and 4 to $10,000 for Alternative 3. Cost summaries are found in Table 11 .

Table 15
Present Worth Cost Summary of the Alternatives

Remedial Alternative	Capital Cost	Present Worth of Total O&M Cost	Estimated Years of O&M	Total Present Worth Cost
1	$0	$0	0	$0
2	$135,000	$6,205	30	$141,205
3	$310,669	$124,090	30	$504,759
4	$351,975	$6,205	30	$428,180

8. **State Agency Acceptance** considers whether the State agrees with U.S. EPA's analyses in the FS Report and Preferred Remedy in the Proposed Plan.

The State of Texas, through the Texas Commission on Environmental Quality, supports Alternative 4. The state's concurrence letter is included in Appendix A.

9. **Community Acceptance** considers whether the local community agrees with U.S. EPA's analyses and preferred alternative described in the Proposed Plan.

The community provided comments on the proposed remedy components and no recommendations were made to change the preferred alternative, Alternative 4. The EPA has considered these comments before making a final remedy selection. The EPA's response to comments are included in the Responsiveness Summary.

PRINCIPAL AND LOW-LEVEL THREAT WASTES

Principal threat wastes are those source materials that are highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The source materials include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compounds. Low level threat wastes are source materials that generally can be reliably contained and that would present only a low risk in the event of release. The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable.

The Site investigation did not identify liquids or semi-liquid wastes that would appear to be a highly mobile source material. The sludge material in the remaining AST may contain waste materials that could be considered principal threat waste. The sludge materials will be sampled and disposed of at an off-site permitted facility. The disposal facility will be based on the sampling results prior to disposal. The risk evaluation did not identify other wastes materials that are highly toxic to human health under the industrial/commercial exposure scenario. Therefore, the EPA has determined the contaminated soils and sediment to be a low-level threat waste based on the overall risk posed by the contamination and the low mobility of the contaminants in the soil and sediment.

SELECTED REMEDY

Description of the Selected Remedy

The selected remedy will achieve the remedial action objectives of: 1) prevent human exposure, based on industrial/commercial worker scenarios, through dermal contact, ingestion, or inhalation, to contaminated soil above risk-based standards; 2) prevent off-site migration of contaminated soils to Sabine Lake; and, 3) prevent exposure to site soils that may pose a risk to ecological receptors. The Selected Remedy consists of the following components:

- Excavation of approximately 1,204 cubic yards of the upper two feet of soil that exceed human health and ecological risk based levels at each of the response areas;
- Confirmation sampling at each of the response areas. Confirmation samples would be collected from each response area and analyzed for COPCs.
- Backfilling of excavated areas with clean soil;
- Off-site disposal of the excavated soils at a permitted disposal facility;
- Implementation of Institutional Controls to restrict future land use to industrial purposes only. The Institutional Control shall be a restrictive covenant by the property owner, to the benefit of the State of Texas and the United States Government, recorded in the real property records of Jefferson County, Texas;;

- Abandonment of existing monitoring wells - Five (5) existing monitoring wells at the Site will be abandoned; and
- Wastewater AST sludge removal and decontamination - Sludge contained within the remaining Wastewater AST will be removed and disposed of off-site. The tank will be decontaminated and reused as scrap metal by the property owner.

Remedial Action Areas

Four (4) "hot spots" were identified at the site that exceeded the 10^{-5} human health risk-based PRGs. The location are shown on Figure 3-2 and the estimate area and volume are presented on Table 12.

Table 16
Response Areas for Human Health Risk

Response Area	Contaminant	Area square feet (Ft^{2})	Volume Assuming two foot depth cubic yards (Yd^{3})
HR-1- Open Top Slop Tanks area	PAHs	953	71
HR-2- Boiler House ASTs area	Lead	759	56 (overlaps with ECO #1)
HR-3- south of the Wastewater ASTs	heptachlor epoxide	1,983	147 (overlaps with ECO #2
HR-4	benzo(a)pyrene	1,932	143
	TOTAL	**5627**	**200**

SLERA Response Areas

The SLERA identified on site surface soils that require response action to mitigate potential future ecological risks at the Site. Analysis of on-site areas needing soil remediation to protect ecological resources were performed by calculation of safe soil concentrations for the worst case exposure to a sensitive ground feeding bird, the American robin. Response areas were then developed based on the locations where soil concentrations exceeded the safe soil values.

Safe soil concentrations for the American robin were back-calculated for all COPCs whose 95% UCL concentration resulted in a dose that exceeded a LOAEL value in the evaluation of bioaccumulative risks. Safe soil concentrations were back-calculated by interactively entering soil concentrations into the dose rate model until the exposure point concentration resulted in a dose equivalent to the toxicity reference value (TRV) LOAEL (i.e., a LOAEL-based HQ = 1.0). The calculated safe soil concentrations, or ecological PRGs, were then compared to detected concentrations to identify sampling locations where there is a potential for adverse effects to the

American robin. Locations Contaminants exceeding the safe soil concentrations are shown on Figure 3-3. Areas and volume of surface soils that exceed the safe soil concentrations are presented on Table 13.

Lead was the only metal that had a 95% UCL concentration that exceeded the TRV LOAEL. Back calculation from the TRV LOAEL resulted in a safe soil concentration of 497 mg/kg lead in surface soil. These safe soil concentrations factor in site-specific conditions of current and future commercial/industrial land use and the paucity of vegetation and minimal usable habitat available to the robin and other terrestrial receptors. Comparisons of the safe soil concentration to detected concentrations indicate that two locations from the RI data set and four locations from the ESI data set exceed the safe soil concentration for the American robin.

The evaluation of pesticides indicated that the 95% UCL concentrations of methoxychlor and DDT exceeded LOAEL doses for American robin. Detected concentrations of these pesticides exceeded calculated safe soil concentrations at two RI locations and at four ESI locations. At one location the exceedance of 4,4'-DDD is co-located with an exceedance of lead.

Based on the data presented in the SLERA, seven response areas were identified for remedial action to address ecological site risk. Two of the ecological response areas overlap with areas identified for response to human health risk.

Table 17
Response Areas for Ecological Safe Soil Levels

Response Area	Contaminant	Area square feet (Ft^2)	Volume Assuming two foot depth cubic yards (Yd^3)
ECO Area 1	lead and butyl benzyl phthalate	1,764	131
ECO Area 2	4,4'-DDD	513	38
ECO Area 3	4,4'-DDD and 4,4'-DDE	1,527	113
ECO Area 4	4,4'-DDD and 4,4'-DDE	1,647	122
ECO Area 5	4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and methoxychlor	2,419	179
ECO Area 6	lead	806	60
ECO Area 7	4,4'-DDE and lead	4,869	361
	TOTAL	**13,545**	**1,004**

Approximate Volume Requiring Remedial Action

Total soil volume to addressed locations that may pose a risk to both human health and ecological receptors is approximately 1,204 cubic yards. This estimate is based on removing contaminated soils down to a maximum depth of two (2) feet. Actual volume may be less if the contaminants are not present down to the two-foot depth or the areal extent is less than what was estimate in the Feasibility Study. The volume could increase if the areal extent of contamination increases once remedial action activities are conducted. In addition, the selected remedy includes removing approximately 233 cubic yards of sludge contained within the Wastewater AST and disposing of this material at an off-site permitted facility.

Summary of Estimated Remedy Costs

The cost estimate summary information in Table 14 is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of changes in the qualifying bids for performance of the remedial action and progress due to Site and weather conditions. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. The total present worth cost is calculated using a 7% discount rate. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Table 18
Estimated Capital Cost for Selected Remedy

Description	Unit	Estimated Quantity	Unit Costs ($)	Total
Mobilization	Lump Sum	1	$50,000	$50,000
Site Preparation/Erosion Control	Lump Sum	1	$10,000	$10,000
TCLP Testing	Lump Sum	1	$10,000	$10,000
Excavation	Cubic Yards	1,204	$6.30	$7,585
Transportation and Handling	Ton	2,047	$8.30	$16,990
Disposal (Non-Hazardous)	Ton	2,047	$50.00	$102,350
Backfilling	Cubic Yards	1,204	$12.50	$15,050
Site Restoration and Demobilization	Lump Sum	1	$10,000	$10,000
Implementation of ICs	Lump Sum	1	$5,000	$5,000
Abandon Existing Monitor Wells	Each	5	$5,000	$25,000
Wastewater AST Demolition and Sludge Removal	Lump Sum	1	$100,000	$100,000

Table 18 Estimated Capital Cost for Selected Remedy				
SUBTOTAL CAPITAL COSTS				351,975

Additional Construction Costs		
Description		
Design and Procurement Services	$30,000	$30,000
Construction Oversight	$20,000	$20,000
Reporting	$20,000	$20,000
Total Additional Construction Costs		**$70,000**

Operation and Maintenance Costs		
Annual Maintenance of ICs	$500 per year	$500
30 years O&M Net Present Value at 7.0%		**$6,205**
TOTAL ESTIMATED REMEDIAL COST		**428,180**

Expected Outcomes of Selected Remedy

The expected outcome of the selected remedy is that the contaminated soils and sediment will no longer present an unacceptable risk to future industrial and construction workers via ingestion, inhalation, or dermal exposure and the property will be suitable for redevelopment as an industrial or commercial property. The remedial action is expected to achieve the remedial objectives and goals within approximately 6 months. The Site will be available for socio-economic or community revitalization projects following implementation of the selected remedy.

Site-specific soil concentrations protective of ground water were not developed because the Site ground water is not considered a potential drinking water source. The site is located on a isle constructed from dredge materials and therefore, the site ground water does not represent a true ground water transmissive zone. The site shallow ground water resulted from the dredging operations that built the isle.

STATUTORY DETERMINATIONS

Under CERCLA section 121, 42 U.S.C. § 9621, the EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for 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 meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy protects human health and the environment through the excavation and off-site disposal of contaminated soils that pose a risk to human health and ecological receptors. Excavation and off-site disposal will provide a permanent solution to the contaminated soils that pose a risk. The placement of a clean soil cover will also prevent direct contact with contaminants that may remain on site below the two-foot depth. Placement of an institutional control on the Site property would ensure that the site remains protective for the intended industrial use. This will ensure future site development is consistent with the industrial/commercial human health exposure scenario (i.e., non-residential usage) that is the basis for the soil cleanup goals.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy complies with those Federal and State requirements that are applicable or relevant and appropriate for this remedial action. There were no location-specific ARARs pertinent to the selected remedy.

Cost Effectiveness

The estimated present worth cost of the selected remedy is $428,180. The selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following standard was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP 300.430(f)(1)(ii) (D)). The overall effectiveness of the remedy is determined by evaluating three of the five balancing criteria used in the detailed analysis of the alternatives: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, and volume through treatment; and (3) short-term effectiveness. Overall effectiveness was then compared to costs to determine cost-effectiveness. The selected remedy best attains long-term effectiveness than Alternatives 2 and 3; achieves an equal or greater reduction in toxicity, mobility, and volume as the less expensive Alternatives 2 and 3 and an equal reduction within an appropriate time frame as Alternatives 2 and 3; and, is equally effective in the short-term when compared with all the alternatives. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and hence, this alternative represents a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected remedy meets the statutory requirement to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost. The statutory preference for treatment as a principal element is not warranted for this site since principal threat waste materials were not identified during the remedial investigation.

Preference for Treatment as a Principal Element

Principal threat wastes were not identified at the Site and the contaminated soils are considered low-level threat waste and therefore treatment is not warranted.

Institutional Controls

Institutional Controls (IC's) are required to maintain the permanence and effectiveness of the Selected Remedy for soil and sediment at the Site. *The objective of the IC's is to maintain a future industrial or commercial land use scenario for the onsite impacted property.*

The Institutional Control shall be a restrictive covenant by the property owner, to the benefit of the State of Texas and the United States Government, recorded in the real property records of Jefferson County, Texas.

The timing of implementation of the IC's will be consistent with the proposed remedial action schedule, and IC's should be in place before signature of the Preliminary Closeout Report (PCOR), signifying remedial action construction completion.

EPA will be responsible for implementing the IC's, with technical assistance from the TCEQ. Future responsibilities for IC management will be negotiated with the current property owner.

Five-Year Review Requirements

Since the selected remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review must be conducted no less often than every five years from initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Pursuant to CERCLA Section 121(c), 42 U.S.C. § 9621(c), and as provided in the current guidance on Five Year Reviews [OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (June 2001)], EPA must conduct a statutory review no less often than every five years from the initiation of construction at the Site.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Palmer Barge Site was released for public comment on July 27, 2005. The Proposed Plan identified Alternative 4, Excavation and Off-Site Disposal, as the preferred alternative for the contaminated soil and sediment. Based upon its review of the written and verbal comments submitted during the public comment period, the EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

PALMER BARGE LINE SUPERFUND SITE
PORT ARTHUR, JEFFERSON COUNTY, TEXAS
RECORD OF DECISION

PART 3: RESPONSIVENESS SUMMARY

STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

The EPA has prepared this Responsiveness Summary for the Site, as part of the process for making a final remedy selection. This Responsiveness Summary documents, for the Administrative Record, public comments and issues raised during the public comment period on the EPA's recommendations presented in the Proposed Plan, and provides the EPA's responses to those comments. The EPA's actual decisions for the Site are detailed in the ROD. Pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617, the EPA has considered all comments received during the public comment period in making the final decision contained in the ROD for the Site.

Overview of Public Comment Period.

The EPA issued its Proposed Plan of Action detailing remedial action recommendations for public review and comment on July 27, 2005. These and other Site documents can be found in the Administrative Record file and the information repositories at the following locations: Port Arthur Public Library located at 4615 9th Avenue, Port Arthur, Texas; the U.S. Environmental Protection Agency Region 6 located at 1445 Ross Avenue, Dallas, Texas; and the Texas Commission on Environmental Quality located at 12100 Park 35 Circle, Building E, 1st Floor, Austin, Texas. The notice of the availability of these documents was published in the Port Arthur News on July 28, 2005. A public comment period was held from July 27, 2005 to August 25, 2005. The EPA and the Texas Commission on Environmental Quality conducted a public meeting on August 11, 2005, to discuss the Proposed Plan and receive comments from the community. The public meeting was held at the West Groves Education Center, located at 5840 West Jefferson, in Groves ,Texas.

This Responsiveness Summary summarizes comments submitted during the public comment period and presents the EPA's written response to each issue, in satisfaction of community relations requirements of the NCP. The EPA's responses to comments received during the public meeting are provided below and in some cases include subsequent expanded responses to those comments as appropriate.

Summary of Public Comments and EPA Responses

Comment: Question was asked if the remaining AST will be cleaned as part of the preferred alternative.

EPA Response: The sludge in the remaining AST will be removed and disposed of off-site and the tank will be decontaminated in the preferred alternative and all alternatives except the no action alternative.

Comment: All risks need to be considered. Digging around a landfill may present a risk. The risk of excavation on Palmer may not have been properly assessed when you start considering the difference between excavation and capping, and capping may actually provide certain improvements to preexisting conditions as far as providing a better cap for the preexisting landfill.

EPA Response: The excavation alternative will not dig into the landfill materials. Under the excavation alternatives contaminated materials would be removed to a depth of two (2) feet below ground surface and would not remove materials below this depth, which is where most of the landfill materials are located. Furthermore, information from the investigations conducted at the site indicate that the landfill materials are not found in thick layers and are mixed with the dredge fill materials. Test results do not indicate that these mixed materials present a significant risk at the Site. Areas that are excavated would be backfilled with clean soil and would be an improvement to the materials that are presently located at the site. The backfilled materials would provide a better cap for the site.

Comment: Although the Palmer Barge and State Marine sites are next to each other, you would think in general they should come out pretty much the same result but they're different levels, different type of contamination -- as measured by the R.I. process.

EPA Response: The contaminated materials at both the State Marine and Palmer Barge sites are similar since both sites were used for barge cleaning operations. After the removal action conducted in August 2000, the remaining residual contaminated is at different concentrations at both sites. Although not the same contaminants were identified as presenting a risk at each site, were are present at both sites, but may not represent the same risk. Also the distribution of contamination at the site was different. So, although the sites are next to each other and were used for the same type of activities, the remaining contaminants are at different concentrations and different risk levels.

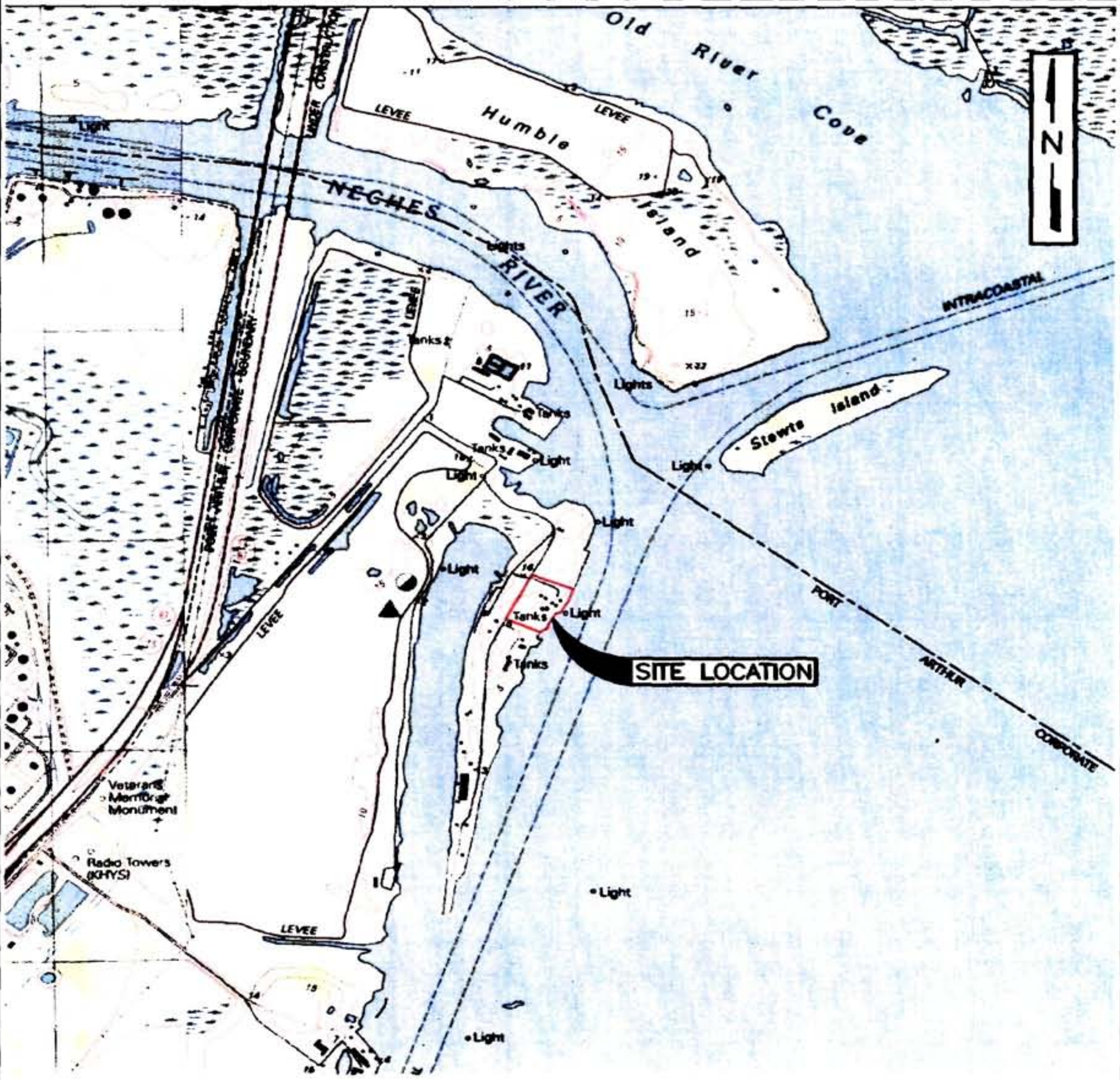
Comment: Question was asked regarding the difference in O&M cost for the Palmer Barge site and State Marine site sediment in Sabine Lake. The site soil excavation alternative for the State Marine site includes monitored natural attenuation for the sediments while the soil excavation alternative for the Palmer Barge does not. The concern raised was that all the cost for monitoring of the Sabine Lake sediments was included in the State Marine alternative.

EPA Response: The monitored natural attenuation of the State Marine sediments does not include monitoring of the sediments located next to the Palmer Barge site. The contaminant levels found in the sediments next to the State Marine site were higher than those found next to the Palmer Barge site. That is part of the reason that other alternatives are being considered for the sediments located next to the State Marine site. The monitoring of the sediments for the State Marine site would be only for the sediment next to the site and would not include monitoring for the sediments located next to the Palmer Barge site.

In addition, the preferred remedial alternative for the Palmer Barge Site will include excavation and off-site disposal of site soil that may present a risk to ecological receptors. This will further ensure that site soils do not migrate off-site to the Sabine Lake sediments and accumulate at concentrations that may pose a risk to the environment.

TECHNICAL AND LEGAL ISSUES

The Selected Remedy is consistent with the potential property redevelopment for industrial or commercial use. Institutional controls will be a necessary component of the long-term Site management to ensure future property development is consistent with the soil cleanup levels.



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SOURCE:
US GEOLOGICAL SURVEY, PORT ARTHUR NORTH QUADRANGLE, 7.5 MINUTE SERIES (TOPOGRAPHIC), AND WEST OF GREENS BAYOU QUADRANGLE, TEXAS–LOUISIANA. 1993.

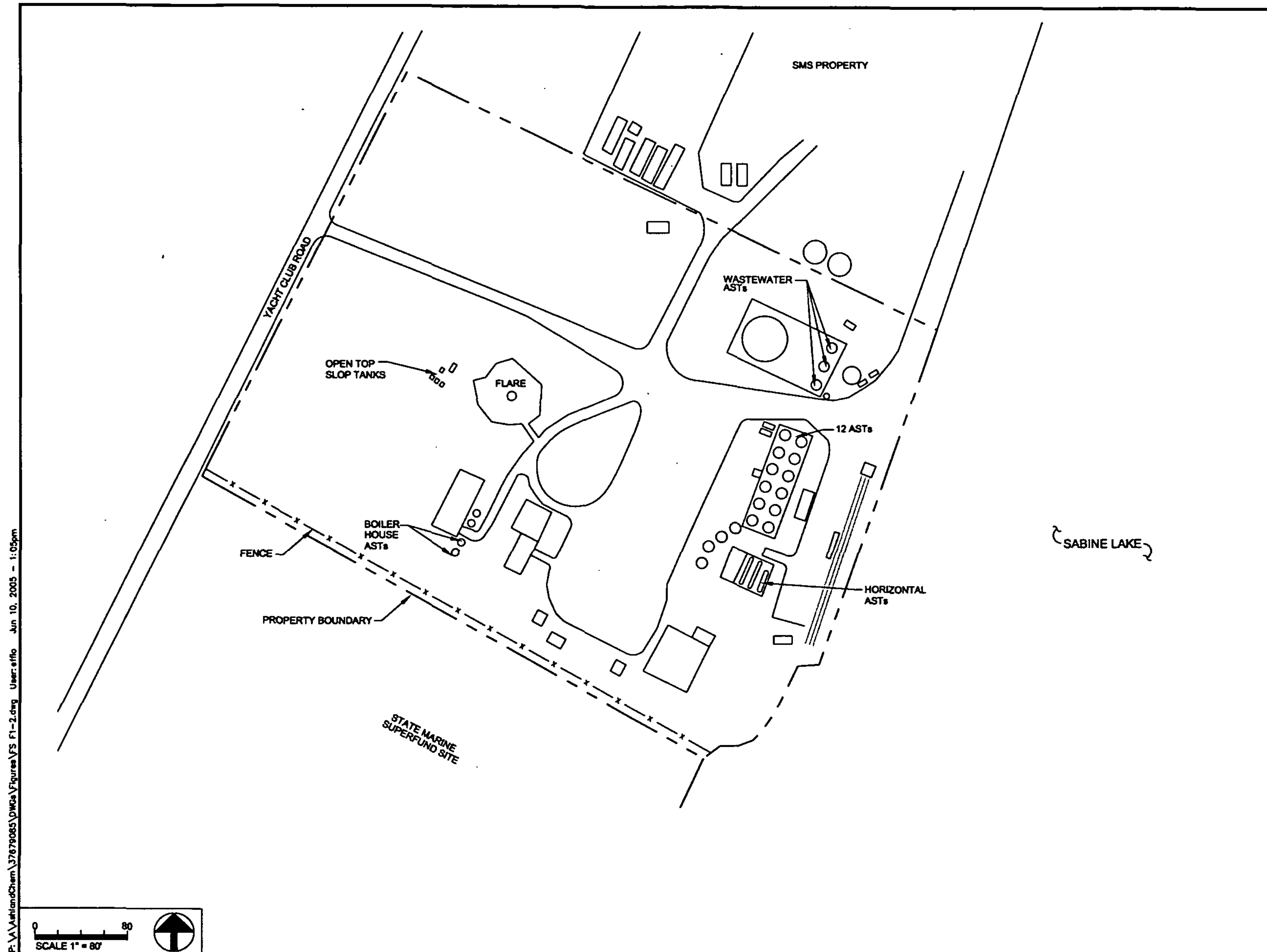
URS

Site Location Map

Feasibility Study Report
Palmer Barge Line Superfund Site
Port Arthur, Jefferson County, Texas

Palmer Barge Line Superfund Site

Scale: As Shown | Drawn by: GEG | Date: 7/15/2005 | Project No: 3767928 | Figure: **1-1**



PALMER BARGE SUPERFUND SITE
8700 Ferry Road
Port Arthur, TX

Figure 1-2
Location of AOCs

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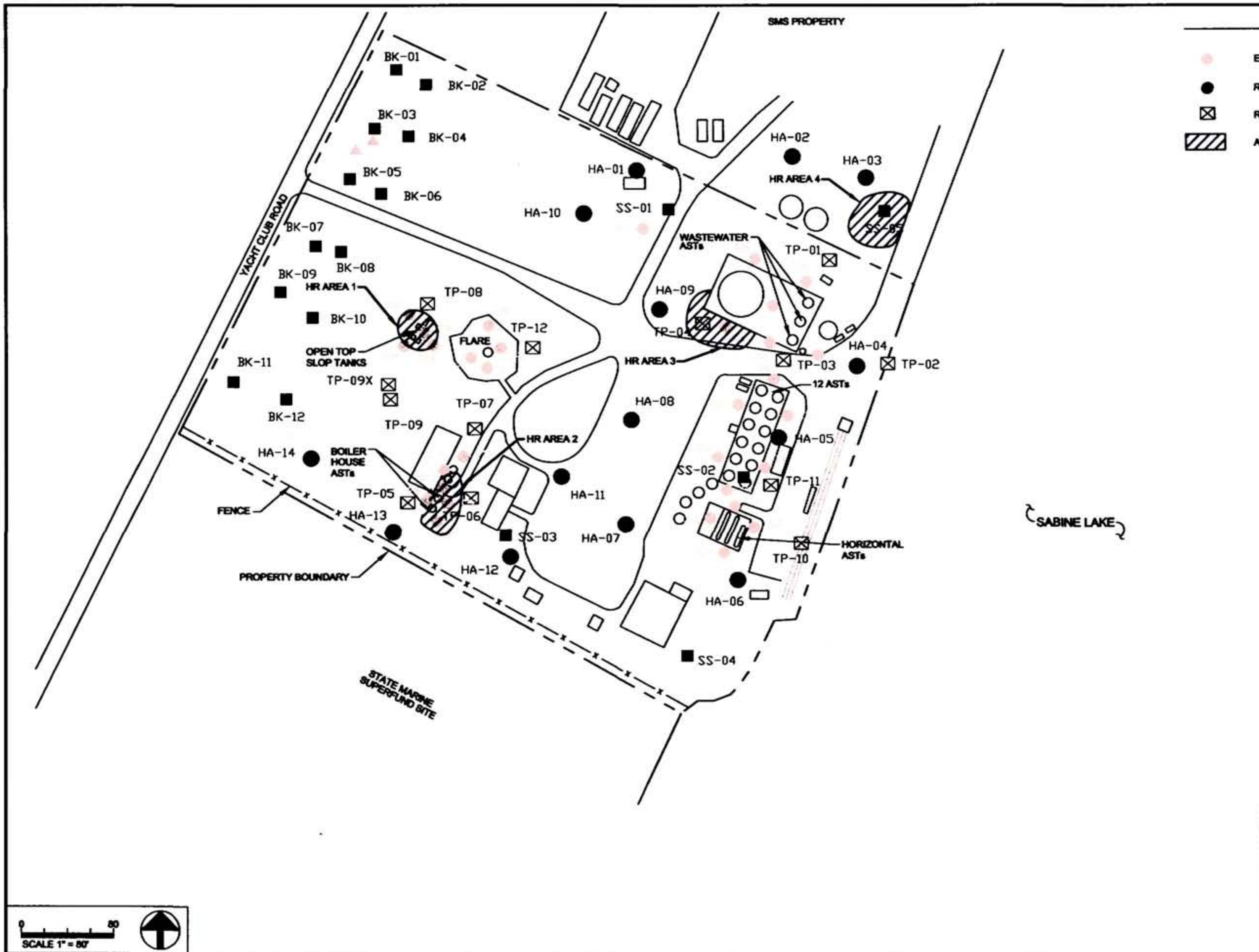

PALMER BARGE SUPERFUND SITE
8700 Ferry Road
Port Arthur, TX

Figure 3-2
Identified Response Areas for 10^{-5} Risk Soil Remedy

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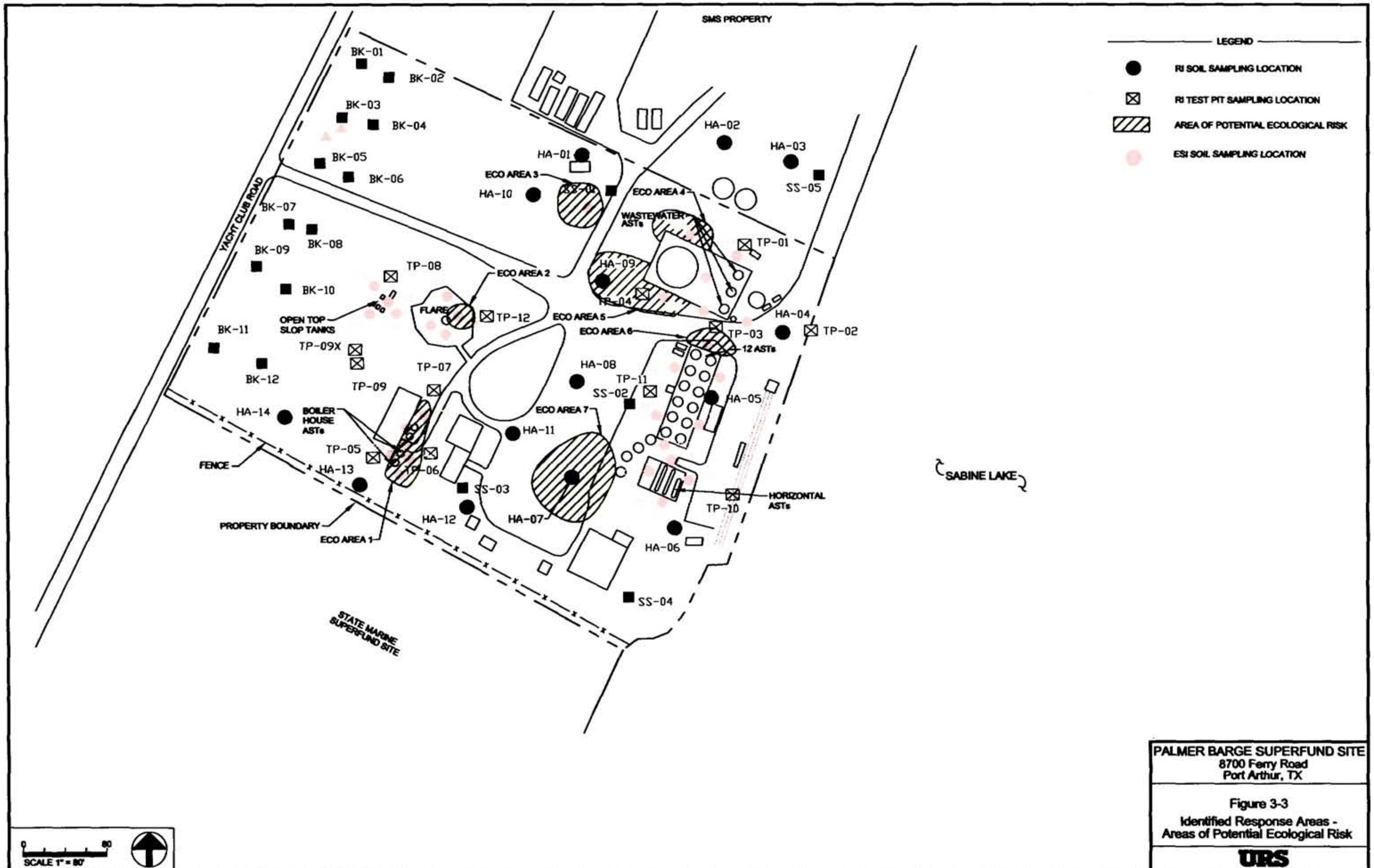

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APPENDIX A